Psychiatry Research 265 (2018) 77–81

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Six-month longitudinal associations between cognitive functioning and distress among the community-based elderly in Hong Kong: A cross-lagged panel analysis

Chantel Joanne Leung[a,b,c], Lewis Cheng[a,b], Junhong Yu[a,b], Jenny Yiend[c,*], Tatia M.C. Lee[a,b,d,*]

[a] Laboratory of Neuropsychology, The University of Hong Kong, Hong Kong
[b] Institute of Clinical Neuropsychology, The University of Hong Kong, Hong Kong
[c] Institute of Psychiatry, Psychology and Neuroscience, King's College London, United Kingdom
[d] The State Key Laboratory of Brain and Cognitive Sciences, The University of Hong Kong, Hong Kong

ARTICLE INFO

Keywords:
Aging
Cognition
Distress
Depression
Anxiety
Cross-legged model

ABSTRACT

Although previous studies have extensively documented the cross-sectional relationship between cognitive impairment and psychological distress, findings relating to their longitudinal associations remains mixed. The present study examines the longitudinal associations and mutual influence between cognitive functioning and psychological distress across six months among community-dwelling elderly in Hong Kong. A total of 162 older adults (40 males; M_{age} = 69.8 years, SD = 6.4) were administered objective and subjective measures of cognitive functioning, as well as self-reported ratings of distress, at two time points six months apart. Using structural equation modeling, we tested the cross-lagged relationships between cognitive functioning and distress. Our cross-lagged model indicated that cognitive functioning at baseline significantly predicted subsequent psychological distress. However, distress was not significantly associated with subsequent cognitive functioning. Additionally, the objective and subjective measures of cognitive functioning were not significantly correlated. These findings suggested that distress may occur as a consequence of poorer cognitive functioning in elderly, but not vice versa. The lack of correlation between objective and subjective cognitive measures suggested that the participants may not have adequate insight into their cognitive abilities. The implications of these findings are discussed.

1. Introduction

The association between cognitive impairment and affective symptoms among older adults has been well established. While depressed and anxious elderly have been found to perform poorly in various cognitive domains (Elderkin-Thompson et al., 2007; Hogan, 2003; Nebes et al., 2000; Sheline et al., 2006; Wetherell et al., 2002), affective symptoms are suggested to be predictors of cognitive decline over time (Bielak et al., 2011; Chi and Chou, 2000; DeLuca et al., 2005; Sinoff and Werner, 2003).

In recent decades, bidirectional longitudinal studies have been carried out to examine their mutual influence. Yet, findings appear to be mixed. Some studies found depressive symptoms predicted subsequent cognitive decline but baseline cognition did not predict depression (Bunce et al., 2014; Panza et al., 2009; Zahodne et al., 2014). These results suggest depression is causally implicated in subsequent cognitive decline. However, other studies have obtained the reverse – cognitive functioning predicted subsequent depressive symptoms while these symptoms were not significantly related to subsequent cognitive decline (Jajodia and Borders, 2011; Perrino et al., 2008; Vinkers et al., 2004). These conflicting results may be explained by the methodological differences across studies, such as the age range and clinical characteristics of participants. A meta-analysis study showed that depression was also associated with cognitive deficits in people under 60 years old but the magnitude of the effect size tended to be larger at older ages (Christensen et al., 2001). Older adults with psychiatric diagnoses may present relatively different cognitive decline trajectories compared to their healthy counterparts (Jajodia and Borders, 2011).

We aimed to further investigate the relationship between psychological distress and cognitive functioning in the elderly and clarify the direction of influence with the use of a cross-lagged panel analysis. Cross-lagged panel design is a type of structural equation modeling that involves the analysis of data collected at two or more time points and estimates the association between variables while controlling for

* Corresponding authors.
E-mail addresses: jenny.yiend@kcl.ac.uk (J. Yiend), tmclee@hku.hk (T.M.C. Lee).

https://doi.org/10.1016/j.psychres.2018.04.045
Received 9 October 2017; Received in revised form 12 April 2018; Accepted 12 April 2018
Available online 13 April 2018

correlations within time points. On the basis of existing literature showing effects in both directions, we expected that there would be a reciprocal relationship between psychological distress and cognitive functioning across time. Specifically, we hypothesized that cognition at baseline would predict later distress and that baseline distress would predict cognitive functioning after 6 months.

Our study extends the current literature in several additional ways. First, while most studies used only objective global cognitive measures, such as the Mini–Mental State Examination (MMSE) and Montreal Cognitive Assessment (MoCA), or standardized neurocognitive assessments to measure cognitive functions, we collected both objective and subjective measures to obtain a more comprehensive picture of cognitive functioning. Self-reported cognitive measures receive less emphasis, compared to objective measures, due to their reliability concerns. However, a growing body of research has documented the significant associations between self-reported cognitive decline and Alzheimer's disease biomarkers, such as cortical atrophy, cerebral hypometabolism, and amyloid deposition, even in the absence of objective cognitive impairment (Rabin et al., 2015).

Second, the current study included both depression and anxiety in the measurement of psychological distress. Previous related research, with a few exceptions (Bunce et al., 2012; DeLuca et al., 2005) examined either depressive or anxiety symptoms, but not both. Since there is a high comorbidity between depression and anxiety, it is important to consider both when investigating longitudinal associations between cognitive functioning and psychological distress.

2. Methods

2.1. Measures

Cognitive functioning was assessed objectively via the Mini–Mental State Examination (MMSE; Folstein et al., 1975); and subjectively via the Cognitive Self-Report Questionnaire (CSRQ; Spina et al., 2006). A validated Chinese version of the Mini–Mental State Examination was used (Chiu et al., 1994). The MMSE consisted of a number of brief tasks assessing orientation, attention, calculation, recall, language and ability to follow instructions. The MMSE was scored on a 30-point scale, and higher scores corresponded to better cognitive status. The CSRQ consisted of 20 items, each assessed on a five-point Likert scale (1 = *Always* and 5 = *Never*), measuring impairments in the social and cognitive domains over the past two weeks.[1] The possible range of scores lies from 10 to 50 for both subscales. Higher CSRQ scores relate to worse functional outcomes. The CSRQ demonstrated good internal consistency ($\alpha = 0.91$) and 2-month test–retest reliability ($r = 0.85$).

The Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith, 1983) was used to assess the level of distress in our participants. The HADS consisted of two subscales of seven items each – anxiety (HADS-a) and depression (HADS-d). Each item was scored from 0 to 3. The HADS has demonstrated excellent sensitivity and specificity in classifying mood and anxiety disorder cases in a local older adult population (Lam et al., 1995). Higher scores on the HADS corresponded to worse outcomes.

2.2. Participants and procedures

The participants of this study were from a no-contact control group of a parent intervention study conducted in Hong Kong. In the intervention study, subjects were randomly assigned into 3 groups – training, active control and no-contact control group. Recruitment procedures and inclusion criteria have been described in detail elsewhere (Leung et al., 2015). For the present study, cognitive functioning and distress symptoms were measured at baseline and six months later. This study was approved by the Institutional Review Board of a university and hospital, and conducted in accordance with the ethical standards laid out in the 1964 Declaration of Helsinki and its later amendments.

Within the no-contact control group, 162 participants were included in the study. At baseline, this sample consisted of 40 males and 122 females with a mean age of 69.82 years (SD = 6.40) and an average of 8.03 years of education (SD = 4.03). The prevalence of mild cognitive impairment in the cohort studied was 18%. Diagnosis was made by a clinical psychologist, according to the criteria outlined by Petersen (2004). These diagnosed cases also fulfilled the DSM-5 criteria of Mild Neurocognitive Disorder. A total of 101 participants followed through with assessments at the second time point; the remaining 61 were lost to follow up and assumed to be missing at random. There were no significant differences in age, gender, education or all outcome measures, including MMSE, CSRQ and HADS between participants who completed assessments at both time points and those lost in follow up ($p > 0.05$).

2.3. Statistical analysis

A cross-lagged panel analysis was carried out via structural equation modeling to examine the relationship between cognition and distress. In this model, age, gender and education were included as covariates at time 1. MMSE and CSRQ scores were loaded on to the 'Cognition' latent variable, and HADS-a and HADS-d scores were loaded on to the 'Distress' latent variable. Longitudinal invariance of these latent variables was assumed. Robust maximum likelihood was used for parameter estimation. These analyses were carried out with the R package lavaan (Rosseel, 2012). Model fit indices were determined by Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA) and standardized root mean square residual (SRMR). CFI and TLI values greater than 0.95 were considered a very good fit. RMSEA values of less than 0.05 were considered good (Browne and Cudeck, 1993). SRMR values less than 0.08 are indicative of an acceptable model (Hu and Bentler, 1999). Correlations between variables were examined using Pearson correlation coefficients. Statistical significance was set at $p < 0.05$.

3. Results

The descriptive statistics and bivariate Pearson correlations of the continuous variables are presented in Table 1. The mean MMSE scores appeared to be fairly stable across two time points. However, on individual level, older adults did show some meaningful changes in their own scores, with some exhibiting increases and others showing decreases over six months. We examined the change of each participant's MMSE scores across the two time points by subtracting each participant's MMSE T1 score from T2 score and calculated the variability of the score difference. It showed that the SD of the change in MMSE scores across all participants was 2.33. Given that change was positive for some and negative for others, the overall mean scores across all participants remained to be fairly flat. Cognitive change may therefore be masked. CSRQ scores, on the other hand, increased on average over time. Higher CSRQ scores were significantly associated with HADS. But MMSE was not correlated with CSRQ at both time points.

The fit indices indicated good fit for the proposed model as shown in Fig. 1 (CFI = 0.969; TLI = 0.955; RMSEA = 0.047; SRMR = 0.055). In general, the estimates of the cross-lagged model with education included as a covariate (see supplementary materials) were similar to the model without the education covariate. However, the inclusion of the additional education covariate significantly worsened the fit of the model ($\Delta\chi^2 = 56.19$, $\Delta df = 10$, $p < 0.001$). Furthermore, education did not significantly predict any of the baseline latent variables. Given these results, the better fitted and more parsimonious model (without

[1] The hearing subscale was not used as it was irrelevant to the objectives of the current study.