Archives of Gerontology and Geriatrics 79 (2018) 137–144

Contents lists available at ScienceDirect

Archives of Gerontology and Geriatrics

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

Self-rated health and depressive symptoms in older adults: A growth mixture modeling approach

Joseph W. Jones[a,*], Thomas Ledermann[b], Elizabeth B. Fauth[c]

[a] Department of Psychology, Utah State University, United States
[b] Department of Family and Child Sciences, Florida State University, United States
[c] Department of Human Development and Family Sciences, Utah State University, United States

ARTICLE INFO

Keywords:
Self-rated health
Depressive symptoms
Ageing
Growth mixture models

ABSTRACT

Objective: Self-Rated Health (SRH) and depressive symptoms are important indicators of global quality of life in older adults. Prior research suggests associations between SRH and depressive symptoms. The current study assessed latent groups in levels and trajectories of these two subjective health indicators and how the latent groups relate to each other.

Methods: Participants from the Australian Longitudinal Study of Aging (N = 2,087, ages 65+) were assessed over six waves of data collection, spanning eight years.

Results: Growth Mixture Models were run for SRH and depressive symptoms, each yielded three latent groups with similar patterns: for both SRH and depressive symptoms two groups differing in their level with worsening status over time, and a third stable, but poorer functioning group. Analysis of the assignment of the latent groups revealed a consistent pattern for the majority, but some people were high in depression and high in SRH and some were low in depression and low in SRH.

Conclusions: SRH and depressive symptoms yielded both three latent groups whose combination supported the expected assignment for the majority and an unexpected assignment for some people. This may be a result of a protective factor existing for one variable but not the other.

1. Introduction

Self-Rated Health (SRH) has been found to be associated with many health outcomes. For example, lower SRH co-occurs with diagnoses like heart disease and diabetes (Ruo et al., 2006; Wu et al., 2013), and is correlated with increased risk for mortality (Ford, Spallek, & Dobson, 2008; Murata, Kondo, Tamakoshi, Yatsuya, & Toyoshima, 2006) and poorer quality of life for older individuals (Ocampo, 2010). Similarly, increased depressive symptoms (DS) are associated with health outcomes, including chronic disease, dementia (Vink, Aartsen, & Schoevers, 2008), cardiovascular diseases (Mausbach, Patterson, Rabinowitz, Grant, & Schulz, 2007; Van der Kooy et al., 2007) and mortality (Cuijpers & Smit, 2002). An estimated 15% of older adults have clinically significant DS (Funnell, 2010). The current study examines the longitudinal course of SRH and DS, and the relationship between SRH and DS trajectories.

Studies addressing change in both SRH and DS yielded mixed results. One study indicated that SRH is stable in older adults (Cotter & Lachman, 2010), but another reported increased SRH (Dening et al., 1998). In contrast, Schulz et al. (2006) found decreases in SRH over a five-year period. Given the mixed results, it is difficult to make a clear assessment of how SRH changes in older age. Contrariwise, age-group differences and late-life changes in DS demonstrate more consistent patterns. Cross-sectional designs show higher DS in persons aged 60+ (Yang, 2007). Longitudinal growth curves show increasing DS with advancing age (Hong, Hasche, & Bowland, 2009; Huang et al., 2011), however such changes may not be "age-related" (driven by the passage of time), insomuch as they are driven by decreased physical health and late-life mortality processes (Fauth, Ram, Gerstorf, & Malmberg, 2014).

Inconsistent findings of change in SRH may be a result of latent subgroups in the population. Lee, Huang, Lee, Chen, and Lin, (2012) assessed SRH over 14 years in individuals aged 60+ and discovered five subclasses: *Persistently Poor* (21. 4%), *Moderate to Poor* (29.5%), *Steadily Moderate* (17.1%), *Good to Poor* (20.4%) and *Persistently Good* (11.6%). Ayyagari et al. (2012) studied SRH in middle-aged individuals and found four similar latent groups, excluding *Persistently Poor*. Lastly, Liang et al. (2005) found four latent groups in SRH for individuals aged 60 + . These results also excluded a *Persistently Poor* group, and

* Corresponding author.
E-mail address: joseph.jones@aggiemail.usu.edu (J.W. Jones).

https://doi.org/10.1016/j.archger.2018.08.012
Received 12 October 2017; Received in revised form 16 July 2018; Accepted 28 August 2018
Available online 29 August 2018
0167-4943/ Published by Elsevier B.V.

included a *Recovery* group, where individuals improved from very poor ratings of health.

Latent class analysis is more common in studies of late life DS, albeit sometimes applied only to clinically significant or non-normative samples, such as in studies assessing response to treatment of major depression, or response to traumatic events. Muthén, Brown, Leuchter, and Hunter, (2008) found latent groups in response to treatment of depression where one group showed only initial improvements and another group showed lasting effects of the treatment. Hou, Law, Yin, and Fu, (2010) and deRoon-Cassini, Mancini, Rusch, and Bonanno, (2010) identified four groups with distinct depressive trajectories in response to a cancer diagnosis and a traumatic injury, respectively: *Chronic Distress* (7–10%), *Delayed Distress* (10–17%), *Recovery* (13–16%), and *Resilient* (60–67%). Similar patterns were found in studies assessing general latent trajectories in DS (Kuchibhatla & Fillenbaum, 2012; Lincoln & Takeuchi, 2010): stable trajectories of low (68–76% of the sample) and high (5%) DS, a group with decreasing DS (10–15%), and a group with increasing DS (8–11%).

1.1. The current study

The aim of the present study is twofold. First we assess latent groups in SRH and DS via Generalized Mixed Models (GMM). Change over time is often modeled via single-group growth curves, assuming a homogenous population in which everyone varies around one slope and level. GMM relaxes the assumption that individuals are drawn from a single population, and instead assumes population heterogeneity and multiple latent groups.

Our second aim is to examine associations between latent groups. Prior analyses not based on latent groups show that SRH and DS have low-to-moderate cross-sectional associations (r = -0.24; Alpass & Neville, 2003). Likewise, higher baseline DS is associated with lower baseline SRH and declines in SRH (Han, 2002; Mulsant, Ganguli, & Seaberg, 1997). Decreasing SRH is associated with increasing DS (Tsai, Yeh, & Tsai, 2005). We hypothesize that latent group membership characterized by high SRH groups will correspond to latent groups defined with low DS, and vice versa.

To accomplish these goals, we used data from the Australian Longitudinal Study of Aging (ALSA; Andrews & Myers, 2000, 2003). This dataset provides a unique perspective as Australia has a large proportion on older adults and one of the longest life expectancies in the world (Cubit & Meyer, 2011). In addition, more than 90% of the older adults live within the community as Australia policy aims to sustain autonomy and independence of their elderly (Feist, Parker, Howard, & Hugo, 2010).

2. Method

Data were obtained from the first six waves (spanning 8 years) of the ALSA (Andrews & Myers, 2000, 2003), which assesses age-related changes in health and well-being of individuals aged 65+, including psychosocial, biomedical, lifestyle, and environmental factors (see Andrews, Clark, & Luszcz, 2002, and Luszcz et al., 2014, for a detailed study description). Wave one included 2087 individuals (49.4% female,) with an average age of 78 years (SD = 6.69) and 31.2% of individuals who completed all six waves.

2.1. Measures

SRH was measured at each wave: "How would you rate your overall health at this time?" (Andrews & Myers, 2000, 2003). Responses were a five-point scale from "poor" (1) to "excellent" (5) where higher scores indicate better health. DS was measured at Waves 1, 3, and 6 via the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). This 20-item scale assesses symptom frequency over the past week, with responses ranging from 0 ("never") to 3 ("almost always"). Higher sum scores (possible range 0–60) indicates that higher DS. Cronbach's α ranged from 0.811 to 0.846 for the three data points. Additional demographic variables were used to assess for possible associations with latent group membership. Gender, age, income, education, and weight were selected as exploratory outcomes to identify possible associations for both SRH and DS group assignment.

2.2. Statistical analyses

First, initial linear growth curve analyses were conducted separately for SRH and DS identifying average level at Wave-1 (intercept) and average rate of linear change (slope), as well as variance and covariance. In addition, gender was used as a group factor and age, income, and educational attainment were added as time-invariant covariates to assess factors that may shape trajectories and level.

Next, GMM were run for SRH and DS separately. In line with previous studies (Dekker et al., 2007; Kuchibhatla, Fillenbaum, Hybels, & Blazer, 2012), an unconditional model was fitted for both SRH and DS, where latent trajectories are assessed without covariates (such as age, income, educational attainment) included as predictors. In contrast to single-group growth curve modeling, GMM allows for the analysis of multiple latent groups (subpopulations) differing in trajectories (slopes) or levels and so for heterogeneity in the general population. When working with large populations, the existence of subpopulations is likely. If the sample were homogenous, then GMM would yield evidence for one class only. However, if heterogeneity exists in the population, then the analysis of latent groups will yield evidence for multiple subpopulations, which will improve the fit of the model.

The means and variances of the growth components and the covariances and residual variances were allowed to vary across groups. Full Information Maximum Likelihood (FIML) estimation and Mplus (Muthén & Muthén, 2012) was used to estimate the model. Given six waves of observations with SRH, we tested for a quadratic slope component in this model.

Step-wise model comparisons was used to determine the optimal number of latent groups. After the single group model was estimated, a two-group model was estimated, and if this model converged, it was compared with the previous model. Then a three-group model (if it converged) was compared to the two-group model, and so on, until convergence was not reached or classification of group membership did not improve model fit or substantive group meaning. Models were compared using the Akaike Information Criteria (AIC), the Bayesian Information Criteria (BIC), Sample Adjusted BIC, and entropy. In addition, the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMRT) and Adjusted Lo-Mendell-Rubin likelihood ratio test (ALMRT) were used to compare class sizes to the smaller class models. This procedure was run separately for each variable. Using the best fitting model, group membership was obtained based on the probabilities provided by the GMM of an individual being in a specific latent group. Finally, the relationship between the latent group memberships for SRH and DS were evaluated via ANOVA, ordinal correlations, and chi-square analyses to determine differences and proportions of group membership for each possible combination.

3. Results

3.1. Preliminary analyses

Descriptive statistics for SRH and DS are presented in Table 1. Correlations of repeated assessments ranged from 0.413 to 0.555 for SRH and from 0.436 to 0.561 for DS. Correlations between SRH and DS within a wave ranged from -.436 to -.473.

Single-group linear growth curve models for SRH and DS showed a good model fit (RMSEA = 0.031 and CFI = 0.989 for SRH and RMSEA = 0.057 and CFI = .981 for DS). Slope parameters were statistically different from zero ($p < .01$), indicating a significant increase