Socioeconomic Differences in Trajectories of Cognitive Functioning and Psychological Distress in Taiwanese Older Adults

Cognitive impairment and depression are among the most prevalent mental health problems in older people. Across studies using diverse samples and research methods, a cross-sectional association between psychological distress and poor cognitive functioning among older adults has been consistently documented (Baune et al 2006; Christensen et al 2009; Ganguli et al. 2006; Lichtenberg et al. 1995; Vinkers et al. 2004; Yaffe et al. 1999). Longitudinal studies investigating the temporal relationship between distress and cognitive decline (Ganguli et al. 2006; Perrino et al 2008; Vinkers et al. 2004; Yaffe et al. 1999) have produced mixed support for this association. As to our knowledge, however, there has been no study to explore the interrelationship between changes in symptoms of depression and cognitive functioning in older people. As the temporal relationship between cognitive functioning and depressive symptoms in old age remains unclear, the investigation of the interrelationship between these two changes will provide crucial information for determining their temporal relation.

Researchers have identified many important socioeconomic status (SES) characteristics related to cognitive disability and psychological distress of older people. Studies of SES on cognitive disability show that higher levels of education attainment have been demonstrated to be protective against cognitive decline (Ardila et al. 2000; Ofstedal et al. 1999; Wight et al. 2003; 2006). Studies of SES on psychological distress indicate that older adults with higher levels of depressive symptoms are fewer years of schooling (Lantz et al. 2005), low income (Lantz et al. 2005; Lynch et al. 1997), and are more likely to be unemployed (Thomas et al. 2005; 2007). Stress research has explained the interplay between these ubiquitous late-life stressors and the association between SES and psychological distress (Pearlin 1999). The stress process framework indicates that differential exposure to distress conditions, coupled with stressful life events, explains a good deal of the variation in the relationship between SES and depressive symptoms among Western adults samples (Turner & Lloyd 1999; Turner & Marino 1994; Turner, Wheaton & Lloyd 1995). Substantially less is known of how these processes influence cognitive function and the salience of social factors to the development of mental health problems in non-Western societies.

The present study intends to increase our understanding of the decline of cognitive functioning and the increase of psychological distress in late life by examining data from the Taiwan Longitudinal Study on Aging (TLSA; Taiwan Health Department, 1989-2007), a nationally representative sample of older adults surveyed prospectively on cognitive functioning, health status and social conditions. The purpose of this analysis is to document

variations in change in cognitive functioning and psychological distress over time and addresses three related questions: First, do older adults with lower SES have a faster decline in the cognitive functioning than their counterparts? Second, do the socially disadvantaged also have a faster increase in psychological distress? Third, is there a differentiating effect of SES on the decline of cognitive functioning and the increase of distress at the end of the lifecourse, when taking stressful life events into consideration? Our analysis uses multi-group growth curve modeling, which is a powerful method for simultaneously modeling differences between and within individuals in change over time while taking into account the effects of key risk factors.

Method

Sample

The data for this analysis are from the Taiwan Longitudinal Study on Aging (TLSA), a nationally representative sample. The baseline cohort was first interviewed in 1989 and included 4,049 participants: 57% men and 43% women ages 60 to 96. Cognitive functioning measures were not added to the survey until 1993, however. Therefore, this analysis is focused on data collected in 1993, 1996, 1999, 2003 and 2007. The analytic sample is further restricted to the adult respondents with complete self reported data on cognitive functioning and psychological distress. These selections yielded an analytic sample of 2,897 older adults in 1993, 2,370 in 1996, 2032 in 1999, 1,447 in 2003, and 978 in 2007.

Measures

Two outcome variables in this study are cognitive functioning and psychological distress. Five items measuring cognitive functioning are used consistently across TLSA waves and these items are part of a short portable mental status questionnaire (SPMSQ; Pfeiffer 1975). The measure used for all analyses was based on a count of correct answers, possibly ranging from 0 to 5. Psychological distress is measured by the 10-item short form of the Center of Epidemiological Studies-Depression scale (CES-D; Radloff 1977). Higher scores represent higher levels of depressive symptoms. Previous research demonstrated two distinct domains in this scale: negative affect and lack of positive affect (Chiao et al., 2009; Edwards et al 2010; Lee et al., 2009).

The major explanatory variable is socioeconomic status (education, household income, and mid-life work status). Education consists of four categories (illiterate, incomplete primary education, completed primary education, and high school or above). Household monthly income is categorized into quartile levels. Work status represents mid-life social position that is categorized into unemployed, assisting family, full- or part-time work. In particular to full-time work, we will specify the job with or without pension. Along with individual SES,

their stressful life events are also considered. The number of stressful life events is counted by several stressful personal events that include death of a spouse, death of a child, moving and insufficient financial expense.

In addition, several covariates are assessed as potential confounding factors. These variables measured in 1993 include gender, ethnicity, family living arrangement, number of social activities participated, presence of chronic disease, health behaviors, and mobility limitations.

Analysis

We employ growth curve modeling to study the influence of the SES characteristics on the outcome trajectories in cognitive functioning and psychological distress, when taking stressful life events into account. The growth curve model includes two repeated outcome measures and this model is estimated by maximum likelihood using the latent variable structural equation modeling program M*plus* (Muthen & Muthen, 1998-2006). In the model, cognitive functioning and psychological distress are separately modeled and correlated (see Figure 1). The SES variables will be included as covariates that will examine interindividual differences in growth trajectories. Modeling changes in cognitive functioning and psychological distress will allow different function forms as linear, quadratic, or piecewise growth due to various patterns reported for each outcome in the literature. SES will thus be possible to have differential effects on growth factors between cognitive functioning and psychological distress models. A multi-group analysis will stratify SES and test differences in model structure across the SES strata.

Descriptive Results

Table 1 provides sample descriptive statistics by wave. The results indicates that cognitive functioning decreases from 4.34 (SD=1.09) in 1989 to 3.91 (SD=1.27) in 2007 Levels of depressive symptoms on negative affect domain increase from 3.93 (SD=4.96) in 1993 to 4.11 (SD=4.93) in 2007, whereas levels of depressive symptoms on lack of positive affect domain decrease from 2.81 (SD=2.49) to 1.79 (SD=2.06) in 2007. The preliminary analyses on variance-covariance suggest a significant variation within and between individuals in cognitive functioning and depressive symptoms. Further investigations will continue modeling outcome trajectories and incorporating the influence of SES characteristics as covariates into models.

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Figure **1**. Path diagram for latent growth curve model

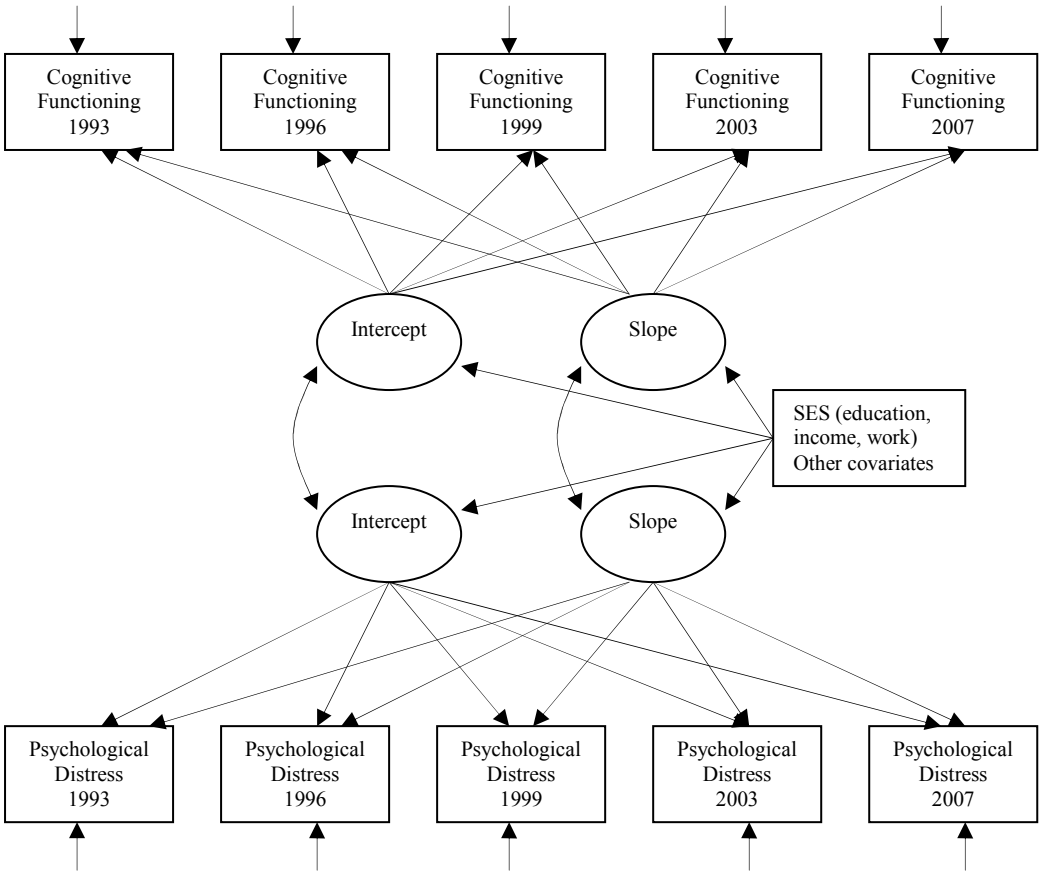

Table **1.** TLSA sample characteristics, 1993-2007

	1993 Sample N=2897 % or M (SD)	1996 Sample N=2370 % or M (SD)	1999 Sample N=2032 % or M (SD)	2003 Sample N=1447 % or M (SD)	2007 Sample N=978 % or M (SD)
Age	71.04 (5.65)	73.29 (5.10)	75.84 (4.85)	78.80 (4.06)	82.25 (3.73)
Sex					
Female	42.94	43.80	44.49	45.34	46.93
Male	57.06	56.20	55.51	54.66	53.07
Ethnicity					
Fukianese	61.65	61.10	59.94	58.12	57.67
Hakka	15.67	15.91	15.45	14.86	14.72
Mainlander	22.68	23.00	24.61	27.02	27.61
Education					
Illiterate	39.75	37.93	36.48	33.86	31.99
Incomplete primary education	15.49	15.23	15.66	15.48	14.98
Completed primary education	25.51	26.33	26.19	27.09	26.99
High school graduate and above	19.25	20.51	21.66	23.57	26.04
Work status					
Unemployed	40.80	39.01	38.62	43.43	57.77
Assisting family	17.88	23.20	26.72	22.61	17.28
Employed	16.81	10.19	6.52	3.94	2.35
Retired	24.51	27.60	28.15	30.01	22.60
Marital status					
Married	64.56	59.62	55.86	50.59	45.71
Widowed	30.89	35.40	39.57	45.34	51.12
Separated/divorced/never married	4.55	4.98	4.58	4.08	3.17
Cognitive functioning (0-5)	4.34 (1.09)	4.39 (1.03)	4.32 (1.08)	4.11 (1.16)	3.91 (1.27)
Psychological distress (CES-D)					
Negative Affect (0-24)	3.93 (4.96)	4.26 (5.24)	4.27 (5.34)	3.79 (4.94)	4.11 (4.93)
Lack of Positive Affect (0-6)	2.81 (2.49)	2.28 (2.42)	2.12 (2.24)	2.07 (2.24)	1.79 (2.06)