Psychosocial Well-Being Associated With Activity of Daily Living Stages Among Community-Dwelling Older Adults

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Abstract

Objectives: Activity of daily living (ADL) stages demonstrated ordered associations with risk of chronic conditions, hospitalization, nursing home use, and mortality among community-living elderly. This article explores the association of stages with psychosocial well-being. We hypothesized that higher ADL stages (greater ADL limitation) are associated with more restricted social networks, less perceived social support, greater social isolation, and poorer mental health. **Methods:** Cross-sectional data from the National Social Life, Health, and Aging Project (*N* = 3,002) were analyzed in regression models and latent factor models. **Results:** Although ADL stages had a nearly monotonic relationship with most mental health measures (e.g., Center for Epidemiologic Studies Depression Scale [CES-D]), only the complete limitation stage (Stage IV) showed significant disadvantage in the majority of social network measures. **Discussion:** The study may aid clinicians and policy makers to better understand the social and mental health needs of older adults at different ADL stages and provide well-planned social and mental health care.

Introduction

The U.S. Census estimates that nearly 20% of Americans live with a disability (U.S. Census Bureau, 2012). Recent data show that 28% of community-dwelling Medicare beneficiaries aged 65 years and older reported at least one limitation in activities of daily living (ADLs) (U.S. Department of Health and Human Services, 2013). People with disabilities face social disadvantages, health disparities and inequitable health care (Iezzoni, 2011). Using an innovative activity limitation staging system—ADL stages—Stineman and colleagues detected nearly monotonic increase in the risk of chronic conditions (Stineman et al., 2011), underuse of recommended care (Na et al., 2017), hospitalization (Na et al., 2016), use of nursing home (Stineman et al., 2012) and long-term care (Kurichi et al., 2016), and mortality (Hennessy et al., 2015; Stineman et al., 2012) with higher ADL stages (approximate to more severe disability) among older adults. ADL stages characterize impaired function in self-care tasks, including eating, toileting, dressing, bathing, moving in/out of chair/bed, and walking (Stineman et al., 2014). Stages capture the extent and type of activity limitations, with each stage defined by preserved ability to perform specific activities. In this hierarchy, stages 0 to IV represent no, mild, moderate,

severe, and complete activity limitation (Table 1). Lower stages usually represent inability of performing difficult tasks; at higher stages, even performing easy tasks has become difficult. People in stage 0 can do all six tasks without difficulty, and people in stage IV have difficulty doing all six tasks. Stage III is a nonfitting stage by design and is reserved for people with unusual patterns of limitation reporting typically easy tasks as difficult but one or more less easy tasks as easy. Detailed methodology for derivation and ascertainment of stages is documented elsewhere (Stineman et al., 2014). ADL stages were developed as data aggregation measures to identify and ultimately reduce health disparities in populations with disabilities.

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Table 1. Classification of ADL Stages.

Limitation stages	ADL stages
0 = no limitation	Able to eat, toilet, dress, bathe/shower, get in/out of bed/chairs, and walk without difficulty.
I = mild limitation	Able to eat, toilet, dress, bathe/shower without difficulty. May have some difficulty getting in/out of bed/chairs and/or walking.
II = moderate limitation	Able to eat and toilet without difficulty. May have some difficulty dressing, bathing/showering, getting in/out of bed/chairs and/or walking.
III = severe limitation	Difficulty with eating and/or toileting, but not with all ADLs.
IV = complete limitation	All ADLs are difficult.

Note. ADL = activity of daily living.

This innovative stage system has not previously been applied to the social and mental health domains among older adults. Because health is complete physical, mental, and social well-being, and not merely the absence of disease (World Health Organization, 2006), we decided to examine the overall psychosocial well-being of older adults at different ADL stages. Persons with disabilities previously reported having received less emotional and social support, and experienced more psychological distress (HealthyPeople.gov 2020, 2015). A better understanding of the psychosocial variations relevant to ADL stages would help clinicians and policy makers estimate social and mental health needs in addition to known clinical care needs of older adults at different ADL stages, thus potentially improving their overall quality of life.

Physical Disability and Social Well-Being

Social well-being in this article centers on the objective and perceived integration. Social relationships embedded in social networks endow a sense of communality and role expectations (Brissette, Cohen, & Seeman, 2000). Behavioral expectations generated from social roles guide individuals' behaviors and provide them a purpose in life (Thoits, 1983), an increased feeling of self-worth and better control of environments (Cohen, 1988), all of which contribute to psychological well-being and health.

In older age, individuals may experience a shift of focus from personal networks to broader social participation and community embeddedness. According to the socioemotional selectivity theory (SST), when time in life is perceived as limited (as older adults often do), individuals prioritize the emotional aspects of situations, prefer emotion-focused over problem-focused coping strategies, and seek emotionally satisfying relationships (Löckenhoff & Carstensen, 2004). Longitudinal evidence shows that individuals started to reduce their social contacts well before old age, but their emotional closeness with relatives and close friends increased throughout adulthood (Carstensen, 1992). Older adults in general maintain a smaller network comprised of

close relationships due to selective optimization, and discard peripheral relationships to conserve energy and time (Charles & Carstensen, 2010), and assures meaningful and supportive experiences (Shmotkin, 1998).

The protective effect of social relationships in the disablement process has been documented in previous longitudinal studies. More diverse social relationships and active social participation reduce the onset of mobility-related disability among adults aged 75 years and older (Avlund, Lund, Holstein, & Due, 2004). Mendes de Leon, Gold, Glass, Kaplan, & George (2001) found that overall network size (relatives and friends combined) and contacts with friends reduced the risk of ADL disability. Relative networks were found to be protective against mobility disability in those aged 70 years and older (Giles, Metcalf, Glonek, Luszcz, & Andrews, 2004), delay ADL disability onset among adults aged 65 years and older (Zunzunegui et al., 2005), and prevented decline of physical functioning among elderly aged 55 to 85 years with chronic diseases (Bisschop et al., 2003). Reduced functional impairment with a greater number of family and friend ties and social participation may be an outcome of social support garnered from these ties, as emotional support ameliorates ADL disability after controlling for confounders (Mendes de Leon, Gold, Glass, Kaplan, & George, 2001). Negative association of disability with social participation was also supported by cross-sectional studies (Levasseur et al., 2011).

HealthyPeople 2020 specifies social participation and social support among important approaches to addressing the inequitable distribution of resources among individuals with and without disabilities (HealthyPeople.gov 2020, 2015). Understanding disability status and associated social well-being will help policy makers and service providers identify subpopulations with resource limitations and plan for assistance programs.

Physical Disability and Mental Well-Being

Disability research supports the notion that disability is concomitant with decline in mental health. Depression in later life is associated with higher risk of death, suicide,

and decreased physical, cognitive, and social functioning, all of which are risk factors of mortality (Blazer, 2003). High levels of depressive symptoms were often reported among older adults with functional impairment (Yang, 2006; Zarit, Femia, Gatz, & Johansson, 1999). A meta-analysis of physical disability and depression in the community setting found an association between depression and limitation in ADLs and IADLs, controlling for age, education, physical performance, and medical conditions (Lenze et al., 2001). Often comorbid with depression, anxiety was strongly associated with disability (Beekman et al., 2000; Brenes et al., 2008; Sareen et al., 2006) and predicted worsening disability over time (Astrom, 1996; Brenes et al., 2008).

Global measures of psychological well-being were also unfavorably associated with disability. The level of happiness decreased with severity of disability but was independent of the type of physical disability (Uppal, 2006). Women with disabilities reported significantly lower self-esteem and greater social isolation than the women without disabilities (Nosek, Hughes, Swedlund, Taylor, & Swank, 2003).

As an aggregate measure of disability, ADL stages specify the self-care skills an individual has preserved for successful community living, while expressing the magnitude and nature of tasks the individual has difficulty performing (Stineman et al., 2014). Although ADL stages displayed dose–response relationships with multiple adverse clinical outcomes, they have not been tested in the psychosocial domain. Thus, our study is needed to further expand the utility of ADL stages. As the purpose of this study is to describe the social situation surrounding and the mental health of older adults at different stages of disability to better inform social and mental health care, we focus on the cross-sectional relationship between disability and psychosocial well-being, rather than disability as a precedent of decline in well-being. We hypothesized that higher ADL stages (greater ADL limitation) are associated with more restricted social networks, lower levels of perceived social support, less social participation, and poorer mental health.

Method

Study Sample

We used 2005-2006 data in The National Social Life, Health, and Aging Project (NSHAP) collected by the National Opinion Research Center (NORC; Smith et al., 2009). NSHAP includes an in-home survey questionnaire, biomeasure collection, and a self-administered postinterview questionnaire (Smith et al., 2009). This multipurpose study explores sociological, psychological, and biological health factors among community-dwelling older adults aged 57 to 85 years (Payne, Hedberg, Kozloski, Dale, & McClintock, 2014). Survey content ranges from demographic characteristics, social networks and activities, physical and mental health, medications,

sexual and intimate partnerships, and patient–doctor communication (Smith et al., 2009). The overall weighted response rate was 75.5%. The NSHAP sample is a multistage area probability sample. The survey sample weights account for differential probabilities of selection with poststratification adjustments for nonresponse and incorporate clustering and stratification sampling design (Cornwell, Schumm, Laumann, & Graber, 2009; O'Muircheartaigh, Eckman, & Smith, 2009).

This study was approved by the University of Pennsylvania Institutional Review Board.

ADL Stages

Respondents were asked whether they had difficulty performing six ADLs: eating, toileting, bathing, dressing, moving in/out of chair/bed, and walking across a room. Responses were dichotomized as no difficulty versus at least some difficulty. Each respondent was assigned to one of five ADL stages, representing no, mild, moderate, severe, and complete activity limitation (Table 1). Stage III is a nonfitting stage by design to capture the unusual patterns of limitation profiles.

Social Networks

NSHAP adopted an egocentric module that asked each respondent (ego) to identify a set of persons (alters) as confidants and to describe the relationships between the ego and each confidant (Cornwell et al., 2009). Four rosters, A, B, C, and D, were collected. Respondents listed people with whom they discussed "important matters" on Roster A. When respondents who had a spouse or romantic partner did not include that person in Roster A, that individual was then recorded in Roster B. Roster C included an additional individual (not on Roster A or B) very important to the respondent. Roster D listed remaining household members not captured in Roster A, B, or C. For each alter in Rosters A to C, network connectedness relevant to health was documented: relationship type, frequency of contact with ego, frequency of contact with other alters, closeness with respondent, and likelihood to discuss health with respondent.

Rosters A to C were used to generate confidant network measures. Confidant network size referred to number of unique alters on Rosters A to C. Network composition measured the number of unique role relationships between the ego and all alters, including spouse, ex-spouse, romantic/sexual partner, parent, parent-in-law, child, stepchild, sibling, other relative, other in-law, friend, neighbor, coworker or boss, minister/priest/other clergy, psychiatrist/ psychologist/ counselor/therapist, caseworker/ social worker, housekeeper/ home health care provider, or other. Closeness of the tie was measured with a 4-point Likert-type scale (*not very close*, *somewhat close*, *very close*, and *extremely close*). Network density refers to the proportion of network ties who know each other (Cornwell, Laumann, & Schumm,

2008). High-density networks are comprised of close-knit social ties, among whom information exchange, care coordination, and social support are more likely to happen. If two alters had never spoken to each other, they were assumed not to know each other. For each pair of network members, frequency of interactions was measured by a 9-point Likert-type scale (*have never spoken to each other*, *less than once a year*, *once a year*, *a couple of times a year*, *once a month*, *once every two weeks*, *once a week*, *several times a week*, *every day*). Likelihood of health talk was assessed by a 3-point Likert-type question (*very likely*, *somewhat likely*, *not likely*). In addition to the confidant network, the survey also asked general questions about number of family members the respondent felt close to and number of friends the respondent had. Both were adopted in our study as measures of network size.

Perceived Social Support

Perceived social support was measured separately as support from family and support from friends. Respondents were asked, "How often can respondent open up to (a) family, (b) friends?" "How often can respondent rely on (a) family, (b) friends?" "How often does (a) family, (b) friends make too many demands?" and "How often does (a) family, (b) friends criticize?" Outcomes were transformed into dichotomous responses to minimize empty cell size. For positive support (open up and rely on family and friends), "often" was coded as yes, and "some of the time" and "hardly ever/never" were coded as no; for negative support (demand, criticize), "hardly ever/never" was coded as no, and "some of the time" and "often" were coded as yes.

Perceived Social Isolation

The latent construct of perceived isolation was assessed with three 3-point Likert-type questions: lack companionship, feel left out, and feel isolated (Table 2). The confirmatory factor analysis (CFA) model was just identified.

Social Participation

Social participation was measured by frequency of three social activities in the past year: volunteer work, attendance at meetings of organized groups, and socializing with friends or relatives (Table 2). The CFA model was a just-identified model.

Mental Well-Being Measures

To assess the level of depression, we used the Center for Epidemiologic Studies Depression Scale (CES-D). The CES-D was originally conceptualized as a four-factor structure, representing depressed affect, absence of positive affect, somatic activity, and interpersonal challenges (Radloff, 1977). We applied the four-factor structure to the 11 items included in NSHAP (CES-D 11) (Carleton et al., 2013). The Perceived Stress Scale (PSS) was used to assess psychological stress. The PSS asks respondents to rate how stressful their life was over the past month. Multiple studies supported the two dimensions (positive and negative) of the PSS (Lee, Chung, Suh, & Jung, 2015; Reis, Hino, & Anez, 2010), which were adopted in our study. The original 14-item Hospital Anxiety and Depression Scale (HADS) usually has two or three latent factors (Barth & Martin, 2005; Bjelland, Dahl, Haug, & Neckelmann, 2002). NSHAP included seven items, which were endorsed in some studies as loaded on one factor, namely, anxiety (Bjelland et al., 2002).Thus, we used the one-factor solution. Ratings of all items on these measures utilized 4-point Likert-type response: rarely or none of the time, some of the time, occasionally, and most of the time.

Table 2 displays all latent constructs of mental health measures and CFA model fit. Four latent factors were derived for the CES-D 11 based on previous research: depressed affect, positive affect, somatic symptoms, and interpersonal tension. Two latent factors were used for PSS 4: negative and positive dimensions. A single-factor solution was applied for HADS 7. Model fit indices for all CFA models were decent.

Three global measures of psychological well-being were each transformed from a 5-point ordinal Likert-type scale to a dichotomous variable. General happiness was coded as unhappy (unhappy usually, unhappy sometimes) versus happy (pretty happy, very happy, extremely happy), self-esteem as low (I have very-high self-esteem: not very true, somewhat untrue, neither true or untrue) versus high (somewhat true, very true), and self-rated mental health poor (poor, fair) versus good (good, very good, excellent).

Statistical Analysis

Responses were reversely coded if necessary to reflect the construct, such that a higher score represented a higher level of the construct. For a dichotomous outcome, logistic regression was used to evaluate the association. When an outcome was continuous, a multiple regression model was used. Latent factors were all treated as continuous. Because sociodemographics and chronic diseases may confound the association of functional status with psychosocial well-being measures, all regression models were first adjusted for stages only, and then further adjusted for age (57-64 years, 65-74 years, 75-85 years), sex, education (less than high school, high school, some college/vocational school, bachelor's), ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other), number of comorbidities (heart failure, heart attack, arthritis, emphysema or chronic obstructive pulmonary disease [COPD], asthma,

Table 2. Measurement of Latent Factors.

Latent constructs	Survey questions	Response scale	CFA model fit
Perceived isolation	Three Likert-type questions to assess: lack of companionship, feeling left out, and feeling isolated.	1 = hardly ever/never, 2 = some of the time, 3 = often.	Just identified
Social participation	Three Likert-type questions to assess social activities in the past year: volunteer work, attendance at meetings of organized groups, socializing with friends or relatives.	0 = never, 1= less than once a year, 2 = about once or twice a year, 3 = several times a year, 4 = about once a month, 5 = every week, 6 = several times a week.	Just identified
CES-D[a] (11 latent factors)			
• depressed affect	Felt depressed; felt everything was an effort; felt lonely; felt sad.	1 = rarely or none of the time, 2 = some of the time, 3 = occasionally, and 4 = most of the time.	$\chi^2(38, N = 3002) = 187.88, p = .000,$ CFI = 0.96, RMSEA = 0.04, 90% CI = [0.03, 0.04], SRMR = 0.03
• positive affect	Enjoyed life; was happy.		
• somatic symptoms	Did not feel liking eating; sleep was restless; could not get going.		
• interpersonal tension	People were unfriendly; felt people disliked me.		
PSS[b] (four latent factors)			
• negative dimension	Unable to control important things; difficulties are piling up.	1= rarely or none of the time, 2 = some of the time, 3 = occasionally, and 4 = most of the time.	$\chi^2(1, N = 2797) = 1.22,$ $p = .27$, CFI = 1.00, RMSEA = 0.01, 90% CI = [0.00, 0.05], SRMR = 0.004.
• positive dimension	Confident about my ability; things are going my way.		
HADS[c] (seven latent factors)			
• anxiety	Felt tense or wound up; something awful about to happen; worrying thoughts went through mind; could sit at ease and feel relaxed; butterflies in my stomach; felt restless; sudden feeling of panic.	1= rarely or none of the time, 2= some of the time, 3 = occasionally, and 4 = most of the time.	$\chi^2(14, N = 2799) = 183.32, p < .001,$ CFI = 0.91, RMSEA = 0.07, 90% CI = [0.06, 0.07], SRMR = 0.04.

Note. CFA = confirmatory factor analysis; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR= standardized root mean square residual.
[a]CES-D: Center for Epidemiologic Studies Depression Scale. Each dimension (positive affect, negative effect, somatic symptoms, and interpersonal tensions) is a latent factor with mean of 0.
[b]HADS: Hospital Anxiety and Depression Scale. The anxiety dimension is a latent factor with mean of 0.
[c]PSS: Perceived Stress Scale. Positive and negative dimensions are each a latent factor with mean of 0.

stroke, hypertension, diabetes, Alzheimer's or dementia, and cancer), eyesight (good vs. poor), and hearing (good vs. poor). The variables of household assets and income had around 38% and 20% of missing data; thus, they were not included in the models. All models included poststratification weights to account for differential probabilities of selection and nonresponse, and took into account the clustering and stratification of the sample design. Data were analyzed in SAS 9.4 (SAS Institute, Cary, NC) and Mplus Version 6 (Muthén & Muthén, 1998-2011). Estimator of maximum likelihood with robust standard errors (MLR) was used in Mplus to accommodate nonnormal continuous outcomes.

Results

Sample Characteristics

The NSHAP Wave I sample (2005-2006) was comprised of 3,005 community-dwelling older adults aged 57 to 85 years, including 3,002 respondents whose ADL stages

could be derived. Table 3 displays the weighted percent of the sample across ADL stages 0 to IV: 75%, 4%, 9%, 11%, and 1%, respectively. Also shown in Table 3 is the sample distribution of sociodemographics and health characteristics by ADL stages. In general, older age (75-85 years) is more likely to be at higher ADL stages. Individuals who were female, had lower education, had poor hearing and poor eye sight in general tended to be at higher ADL stages. The number of chronic conditions also increased with higher stages.

Social Well-Being by ADL Stages

Table 4 displays the social well-being across stages in unadjusted models. At the confidant network level, regression coefficients and standard errors suggested that older adults at stage IV compared to stage 0 had significantly smaller network size, fewer distinct roles within the network, higher average frequency of contact with network members, and a greater proportion of relatives in the network. Stage IV individuals reported having

Table 3. Sociodemographic and Health Characteristics of the Sample by ADL Stage (N = 3,002).

Variable	Class	ADL stage					p value
		Stage 0	Stage I	Stage II	Stage III	Stage IV	
Total		2,184 (75%)	138 (4%)	288 (9%)	354 (11%)	38 (1%)	
Age group (years)	57-64	793 (78.4)	44 (3.9)	76 (7.0)	93 (9.6)	14 (1.2)	<.0001
	65-74	811 (77.0)	49 (3.7)	108 (9.1)	111 (9.6)	12 (0.7)	
	75-85	580 (66.2)	45 (4.6)	104 (11.5)	150 (16.6)	12 (1.2)	
Gender	Male	1,113 (78.4)	47 (3.0)	155 (9.6)	120 (8.0)	16 (1.0)	<.0001
	Female	1,071 (71.7)	91 (5.0)	133 (8.0)	234 (14.3)	22 (1.0)	
Ethnicity	Non-Hispanic White	1,566 (75.6)	95 (4.1)	211 (9.0)	221 (10.7)	16 (0.7)	.1742
	Non-Hispanic Black	343 (73.2)	26 (4.0)	45 (7.5)	73 (13.3)	12 (2.1)	
	Hispanics	215 (71.1)	16 (4.4)	21 (7.4)	49 (14.6)	9 (2.6)	
	Other	60 (73.1)	1 (1.0)	11 (11.4)	11 (12.5)	1 (2.0)	
Education	Less than high school	429 (64.3)	45 (5.9)	78 (9.8)	127 (17.7)	20 (2.3)	<.0001
	High school	577 (73.3)	35 (4.3)	87 (10.3)	85 (11.2)	8 (0.8)	
	Some college	639 (76.9)	45 (4.4)	74 (8.5)	89 (9.4)	8 (0.8)	
	Bachelor's	539 (82.5)	13 (1.7)	49 (6.6)	53 (8.7)	2 (0.5)	
Hearing	poor	421 (67.9)	39 (4.8)	69 (9.4)	120 (17.0)	10 (0.9)	<.0001
	good	1,762 (76.8)	99 (3.8)	218 (8.6)	233 (9.8)	28 (1.0)	
Eyesight	poor	292 (54.2)	37 (6.3)	70 (12.5)	124 (24.9)	18 (2.1)	<.0001
	good	1,889 (78.7)	101 (3.6)	217 (8.1)	229 (8.8)	20 (0.8)	
Number of chronic conditions[a]		1.61 (0.03)	2.40 (0.16)	2.62 (0.10)	2.72 (0.12)	2.74 (0.26)	<.0001

Note. Raw number and weighted row percentage in the parentheses. ADL = activity of daily living.
[a]Chronic conditions include heart failure, heart attack, arthritis, emphysema or chronic obstructive pulmonary diesease (COPD), asthma, stroke, hypertension, diabetes, Alzheimer's or dementia, and cancer. Cells show weighted mean with standard errors in the parentheses.

fewer friends in general. In terms of social support, logistic regression outcomes revealed that older adults at stage IV were less likely to open up to friends (odds ratio [OR] = 0.22) or rely on friends (OR = 0.35) compared to stage 0. Perceived isolation tended to increase by stage (Stages II and IV showed nearly significant statistics at $p = .06$). Social participation showed a nearly monotonic decrease with stage (except for Stage II). We found stages I to III more or less comparable to stage 0 on most social well-being measures.

As shown in Table 5, after adjusting for age group, gender, ethnicity, education, number of comorbidities, eyesight, and hearing, older adults at stage IV compared to stage 0 still had smaller confidant networks, simpler role composition of confidant networks, and fewer friends. They were still less likely to open up to friends. Stages III and IV had significantly less social participation in the adjusted model.

Mental Well-Being by ADL Stages

Table 6 displays unadjusted association of mental health states with ADL stages. Higher ADL stages were associated with worse mental health on most measures. Nearly monotonic increase across stages was found for CES-D positive and negative affect, and somatic symptoms, PSS negative and positive dimensions, self-rated mental health, and general happiness. Regression coefficients here represented mean difference between stage 0 and

each of the other stage; thus, higher stages showed greater mean differences from stage 0. For instance, regression coefficients (mean difference) of CES-D negative affect across stages I to IV compared to stage 0 were 0.31, 0.24, 0.41, 0.85; similarly, regression coefficients (mean difference) of CES-D somatic symptoms on stages I to IV compared to stage 0 were 0.24, 0.23, 0.35, 0.78. In several nearly monotonic patterns (e.g., CES-D depressed affect, PSS positive, self-rated mental health), stage I fared worse than stage II, which may suggest that the onset of ADL disability had a marked negative impact on older adults.

As shown in Table 7, after controlling for covariates, although the disparity in magnitude of higher stages compared to stage 0 attenuated slightly, the nearly monotonic patterns still held for CES-D negative affect, positive affect, and somatic symptoms, and PSS negative dimension. Other measures, such as PSS positive dimension, self-rated mental health, and general happiness highlighted the worst mental health outcomes for stage IV.

Discussion

Study Findings and Implications

Based on a national sample of older adults, our study first identified sociodemographic characteristics among community-dwelling older adults aged 57 to 75 years at different stages of disability. Higher disability stages

Table 4. Unadjusted Association of ADL Stages With Social Well-Being Measures.

Social well-being	Intercept or factor mean	Stages of ADL[a]			
		Stage I	Stage II	Stage III	Stage IV
Confidant network, Stages I-IV show OLS regression coefficient and standard errors, β (SE)					
Network size	4.24 (0.05)***	−0.17 (0.14)	−0.13 (0.12)	−0.04 (0.12)	−0.91 (0.30)**
Role composition	2.94 (0.04)***	−0.08 (0.12)	−0.07 (0.09)	−0.09 (0.08)	−0.65 (0.21)**
Average frequency of contact	6.75 (0.03)***	0.05 (0.07)	0.14 (0.05)**	0.02 (0.06)	0.43 (0.14)**
Density of network	0.84 (0.01)***	−0.01 (0.02)	0.03 (0.02)	0.01 (0.02)	0.07 (0.04)
Proportion of relatives	0.71 (0.01)***	−0.01 (0.03)	0.01 (0.02)	−0.005 (0.02)	0.13 (0.05)**
Closeness	6.43 (0.11)***	0.000 (0.06)	−0.01 (0.03)	−0.02 (0.03)	−0.03 (0.08)
Health talk	5.85 (0.12)***	0.09 (0.03)**	−0.03 (0.03)	0.02 (0.02)	0.11 (0.11)
Family and friend networks, Stages I-IV show OLS regression coefficients and standard errors, β (SE)					
Number of close relatives	2.88 (0.03)***	−0.18 (0.12)	0.04 (0.08)	0.18 (0.07)**	0.04 (0.15)
Number of friends	3.36 (0.04)***	−0.33 (0.11)**	−0.14 (0.09)	−0.13 (0.09)	−0.80 (0.22)***
Perceived support,[b] Stages I-V show OR and 95% CIs from logistic regression models					
Open up to family		1.11 [0.76, 1.62]	1.07 [0.79, 1.45]	0.99 [0.72, 1.36]	1.92 [0.86, 4.33]
Open up to friends		1.04 [0.66, 1.67]	0.92 [0.63, 1.35]	0.89 [0.68, 1.17]	0.22 [0.06, 0.90]*
Rely on family		0.87 [0.57, 1.34]	0.91 [0.69, 1.19]	0.77 [0.55, 1.06]	0.59 [0.25, 1.41]
Rely on friends		1.03 [0.63, 1.68]	0.65 [0.47, 0.89]**	0.73 [0.53, 1.00]*	0.35 [0.13, 0.93]*
Family make too many demands		1.05 [0.64, 1.73]	1.02 [0.75, 1.39]	1.37 [0.90, 2.10]	0.65 [0.29, 1.52]
Friends make too many demands		0.60 [0.28, 1.31]	1.08 [0.67, 1.74]	1.68 [0.89, 3.14]	0.77 [0.22, 2.74]
Family criticize		1.10 [0.71, 1.69]	1.02 [0.70, 1.48]	1.56 [1.14, 2.15]**	1.08 [0.50, 2.33]
Friends criticize		1.09 [0.56, 2.12]	1.35 [0.88, 2.08]	1.13 [0.69, 1.84]	0.91 [0.28, 2.99]
Latent factors,[c] Stages I-IV show path coefficients and SE, β (SE), from latent factor model					
Perceived isolation	0	0.08 (0.06)	0.08 (0.04)	0.13 (0.04)***	0.19 (0.10)
Social participation	0	−0.45 (0.17)**	−0.33 (0.14)*	−0.66 (0.14)***	−1.60 (0.29)***

Note. ADL = activity of daily living; OLS = ordinary least squares; OR = odds ratio; CI = confidence interval.
[a]The reference category is Stage 0 (no activity limitation).
[b]Logistic regression OR for Stage 0 (reference stage) is 1.
[c]Latent factor mean is 0.
*$p < .05$. **$p < .01$. ***$p < .001$.

were associated with certain social disadvantages and health disparities, such as older age, female gender, lower education, poor hearing, poor eyesight, and greater comorbidity. The distribution of ADL stages in our sample was consistent with previous findings based on nationally representative samples of older adults, including the Medicare Current Beneficiary Survey (MCBS; Hennessy et al., 2015; Na et al., 2016) and Second Longitudinal Study of Aging (LSOA; Stineman et al., 2012). Similar to these previous studies, our sample is a sample of community-living older adults, with a very small percentage of sampled individuals at ADL stage IV (1%). It is reasonable to say that many older adults at higher stages (especially at stage IV) who did not have enough support at home were placed in nursing homes, thus being excluded from the survey.

The study found that ADL stage IV was associated with disparities in multiple social network measures including smaller confidant network size, simpler network role composition, and fewer friends, even after adjusting for potential confounders of sociodemographics

and health characteristics. Although previous research discovered the generally negative cross-sectional associations of social networks and social participation with disability (Michael, Colditz, Coakley, & Kawachi, 1999), our study shows the extent of social deficits associated with disability stages among older adults, and it turns out the associations are pronounced at higher stages, especially stage IV.

Although elders with complete activity limitation (stage IV) had less diverse networks in terms of its role composition, their networks were not necessarily denser than lower stages. In other words, network members were equally likely to know each other across disability stages. However, knowing each other is different from frequent contact with each other. A post hoc analysis found that if density is calculated based on whether network members talk to each other once a month or more often, stage IV elders would have a denser network (β = 0.19, $p = .002$). When older adults have denser networks, these confidants can act like connected informal caregivers and may alternate to provide support and substitute

Table 5. Adjusted Association of ADL Stages With Social Well-Being Measures.

Social well-being	Intercept or factor mean	Stages of ADL[a]			
		Stage I	Stage II	Stage III	Stage IV
Confidant network, Stages I-IV show OLS regression coefficient and robust standard errors, β (*SE*)					
Network size	3.50 (0.13)***	−0.16 (0.15)	−0.06 (0.10)	−0.02 (0.10)	−0.67 (0.28)*
Role composition	2.50 (0.09)***	−0.05 (0.10)	−0.02 (0.07)	−0.05 (0.06)	−0.51 (0.19)**
Average frequency of contact	6.78 (0.07)***	−0.02 (0.08)	0.10 (0.05)	−0.03 (0.05)	0.26 (0.15)
Density of network	0.86 (0.02)***	−0.01 (0.02)	0.02 (0.02)	0.01 (0.01)	0.06 (0.04)
Proportion of relatives	0.77 (0.03)***	−0.01 (0.03)	−0.002 (0.02)	−0.02 (0.02)	0.10 (0.05)
Closeness	3.06 (0.04)***	−0.01 (0.05)	0.01 (0.03)	−0.01 (0.03)	−0.04 (0.09)
Health talk	2.48 (0.04)***	0.07 (0.04)	−0.03 (0.03)	0.01 (0.03)	0.08 (0.08)
Family and friend networks, Stages I-IV show OLS regression coefficient and robust standard errors, β (*SE*)					
Number of close relatives	2.57 (0.09)***	−0.20 (0.10)*	0.03 (0.07)	0.15 (0.07)*	0.003 (0.20)
Number of friends	2.94 (0.11)***	−0.24 (0.12)*	−0.11 (0.09)	−0.01 (0.08)	−0.58 (0.24)*
Perceived support,[b] Stages I-V show OR and 95% CIs from logistic regression models					
Open up to family		0.97 [0.65, 1.44]	1.07 [0.78, 1.48]	0.87 [0.60, 1.26]	1.83 [0.80, 4.17]
Open up to friends		0.99 [0.61, 1.62]	0.99 [0.64, 1.53]	0.85 [0.63, 1.15]	0.22 [0.05, 0.94]*
Rely on family		0.82 [0.53, 1.27]	0.93 [0.70, 1.23]	0.75 [0.53, 1.05]	0.64 [0.27, 1.53]
Rely on friends		1.04 [0.60, 1.81]	0.70 [0.49, 1.01]	0.78 [0.56, 1.08]	0.41 [0.15, 1.09]
Family make too many demands		1.02 [0.61, 1.70]	1.07[0.74, 1.53]	1.37 [0.84, 2.25]	0.59 [0.27, 1.33]
Friends make too many demands		0.62 [0.27, 1.43]	1.11 [0.68, 1.80]	1.72 [0.85, 3.50]	0.79 [0.23, 2.77]
Family criticize		0.97 [0.64, 1.47]	0.98 [0.66, 1.44]	1.25 [0.90, 1.72]	0.83 [0.38, 1.84]
Friends criticize		1.18 [0.58, 2.37]	1.41 [0.87, 2.27]	1.22 [0.77, 1.94]	0.83 [0.28, 2.48]
Latent factors,[c] Stages I-IV show path coefficients and robust standard errors from latent factor models					
Perceived isolation	0	0.03 (0.06)	0.05 (0.04)	0.04 (0.04)	0.09 (0.11)
Social participation	0	−0.27 (0.17)	−0.20 (0.13)	−0.46 (0.14)***	−1.16 (0.32)***

Note. ADL = activity of daily living; OLS = ordinary least squares; OR = odds ratio; CI = confidence interval.
[a]Reference category is Stage 0.
[b]Logistic regression odds ratio for Stage 0 (reference stage) is 1.
[c]Latent factor mean is set to 0 by default.
*p < .05. **p < .01. ***p < .001.

for each other in an emergency. These smaller but dense networks comprised of mostly kin can be more advantageous and efficient than loose large networks to provide care for a frail elderly person. These findings fall in line with SST, which specifies that perceived time limitations prioritize more emotionally satisfying goals (e.g., close relationships) rather than future-oriented goals (e.g., information-gathering) (Löckenhoff & Carstensen, 2004). SST suggests that expanded social networks suit future-oriented goals best, whereas emotional goals benefit most from small social networks comprised of close relational partners. In this case, older adults at stage IV may perceive most time constraint on their life; thus, they may prefer to maintain smaller networks with close social contacts. On the contrary, the vulnerable populations (e.g., those with disabilities) may also experience social isolation, an obstacle to forming adequate networks.

In terms of perceived support, older adults at stages II to IV were less likely to open up to friends compared to stage 0 before covariates adjustment. After adjusting for covariates, only elders at stage IV showed less likelihood to open up to friends. However perceived support from family members did not vary across stages with or without covariates adjustment. On the contrary, respondents at all five stages reported comparable levels of negative support (criticism and demands) from family members and friends. This suggests that when disability gets severe (especially at stage IV), positive support from friends will diminish, but family support remains the same. Negative support seems irrelevant to severity of disability. A previous study found an independent association of social support with functional disability (Travis, Lyness, Shields, King, & Cox, 2004). Our study distinguishes the source (friends and family) and salience (positive and negative) of support and is able to separate the multiple-layered effect of the support construct. The results of a similar level of perceived support across multiple dimensions for older adults at different ADL stages partially supports the SST in that even individuals at stage IV may have more restricted networks, the relationship quality was not significantly different

Table 6. Unadjusted Association of Mental Health Measures With ADL Stages.

Mental well-being	Factor mean	Stages of ADL[a]			
		Stage I	Stage II	Stage III	Stage IV
Latent factor measures, path coefficient and robust standard errors, β (SE)					
CES-D[b]					
Depressed affect	0	0.31 (0.07)***	0.24 (0.05)***	0.41 (0.05)***	0.85 (0.13)***
Positive affect	0	−0.19 (0.07)**	−0.23 (0.06)***	−0.23 (0.06)***	−0.59 (0.19)**
Somatic symptoms	0	0.24 (0.05)***	0.23 (0.04)***	0.35 (0.04)***	0.78 (0.12)***
Interpersonal tensions	0	0.09 (0.05)	0.08 (0.04)*	0.21 (0.05)***	0.16 (0.12)
HADS[c]					
Anxiety	0	0.14 (0.06)*	0.09 (0.04)*	0.22 (0.05)***	0.21 (0.10)*
PSS[d]					
Negative	0	0.09 (0.06)	0.14 (0.04)**	0.23 (0.05)***	0.64 (0.18)***
Positive	0	−0.21 (0.06)**	−0.15 (0.04)***	−0.21 (0.06)***	−0.63 (0.11)***
Global measures, OR (95% CI)					
Self-rated poor mental health		2.13 [1.22, 3.72]**	2.04 [1.44, 2.91]***	3.99 [2.70, 5.88]***	15.29 [6.82, 34.30]***
General happiness		0.47 [0.31, 0.70]***	0.32 [0.20, 0.52]***	0.55 [0.35, 0.86]**	0.13 [0.05, 0.31]***
Self-esteem		0.45 [0.33, 0.61]**	0.68 [0.50, 0.93]*	0.68 [0.46, 1.00]*	0.44 [0.16, 1.17]

Note. ADL = activity of daily living; OR = odds ratio; CI = confidence interval.
[a]Reference category is Stage 0. Latent factor estimates for each stage are regression coefficients with robust standard errors in parentheses. Estimates for global measures are OR and 95% CI.
[b]CES-D: Center for Epidemiologic Studies Depression Scale. Each dimension (positive affect, negative effect, somatic symptoms, and interpersonal tensions) is a latent factor with mean of 0.
[c]HADS: Hospital Anxiety and Depression Scale. The anxiety dimension is a latent factor with mean of 0.
[d]PSS: Perceived Stress Scale. Positive and negative dimensions are each a latent factor with mean of 0.
*p < .05. **p < .01. ***p < .001.

from that of their less disabled counterparts, which suggests that older adults maintain meaningful and supportive relationships even if they only have a small confidant network (as those at stage IV).

Disability previously demonstrated associations with loneliness among community-dwelling older people (Golden et al., 2009). In our study, perceived isolation tends to increase with higher ADL stages in the unadjusted model, but not in the adjusted model.

Stage IV behaves like a threshold that significantly inhibits one's ability to maintain a sizable network, to have diverse network members, and to have more friends. On other measures, the unadjusted associations with stages have revealed a gradient. Greater ADL disability accompanies more intense feeling of isolation. After adjusting for potential confounders, the effects of stage on many social well-being outcomes were attenuated. However, stage is still a useful tool to predict social well-being in the absence of other covariates measures.

In the domain of mental well-being, our results were in general consistent with previous findings that disability has positive cross-sectional associations with psychological problems (Eide & Røysamb, 2002), depression and anxiety (Brenes et al., 2008; Lenze et al., 2001). Although there was a steep drop of mental well-being at stage I compared to its adjacent stages on several measures, the level of mental well-being across stages reflects a continuum to some extent. ADL stages

have nearly monotonic relationships with decline in mental health in both adjusted and unadjusted models, including increased depressed affect and decreased positive affect on the CES-D, increased somatic symptoms, and increased PSS negative and positive effects. Global measure of mental health also decreased with higher ADL stages, especially in the unadjusted model. When the relationship does not strictly follow a gradient, even after adjusting for potential confounders, it is often due to slightly worse mental outcome at stage I (e.g., CES-D depressed affect), compared to Stage II. Such contrast may suggest greater depression at the onset of ADL disability. Previous studies identified physical disability as a risk factor for late-life depression and vice versa (Lenze et al., 2001). Longitudinal evidence is needed to portray the trajectory of depression with measures of increased disability, such as ADL stages. On other mental health measures, stage III, the nonfitting stage, is the one that does not fit in the hierarchy, including CES-D positive affect and general happiness. It is noteworthy that self-esteem and interpersonal tension dimensions of CES-D do not seem to be systematically affected by ADL stages, especially after controlling for confounders. Self-esteem bottoms out at stage I, but picks up at higher stages. Although the association of disability with lower self-esteem and greater social isolation was reported (Nosek et al., 2003), a meta-analysis revealed that minor physical disabilities seem to have a greater

Table 7. Adjusted Association of Stages With Mental Health Measures.

Mental health	Factor mean	Stages of ADL[a]			
		Stage I	Stage II	Stage III	Stage IV
Latent factor measures, path coefficient and robust standard errors β (*SE*)					
CES-D[b]					
Depressed affect	0	0.20 (0.07)**	0.16 (0.05)**	0.26 (0.05)***	0.70 (0.15)***
Positive affect	0	−0.12 (0.07)	−0.16 (0.06)**	−0.12 (0.06)*	−0.47 (0.18)*
Somatic symptoms	0	0.16 (0.05)**	0.16 (0.04)***	0.24 (0.04)***	0.69 (0.13)***
Interpersonal tensions	0	0.05 (0.05)	0.04 (0.04)	0.15 (0.05)**	0.06 (0.11)
HADS[c]					
Anxiety	0	0.07 (0.05)	0.06 (0.04)	0.13 (0.05)**	0.11 (0.09)
PSS[d]					
Negative	0	0.03 (0.06)	0.11 (0.04)*	0.16 (0.05)**	0.54 (0.18)**
Positive	0	−0.13 (0.06)*	−0.10 (0.04)**	−0.10 (0.06)	−0.52 (0.11)***
Global measures, OR (95% CI)					
Self-rated poor mental health		1.26 [0.73, 2.22]	1.37 [0.91, 1.98]	2.00 [1.31,3.05]**	10.62 [4.81, 23.45]***
General happiness		0.70 [0.47, 1.04]	0.44 [0.25, 0.76]**	0.99 [0.61, 1.59]	0.20 [0.08, 0.51]**
Self-esteem		0.51 [0.38, 0.70]***	0.72 [0.51, 1.01]	0.77 [0.51, 1.15]	0.45 [0.17, 1.20]

Note. OR = odds ratio; CI = confidence interval.
[a]Reference category is Stage 0. Estimates for each stage were regression coefficients with standard errors in parentheses. Estimates for global measures are OR and 95% CI.
[b]CES-D: Center for Epidemiologic Studies Depression Scale. Each dimension (positive affect, negative effect, somatic symptoms, and interpersonal tensions) is a latent factor with mean of 0.
[c]HADS: Hospital Anxiety and Depression Scale. The anxiety dimension is a latent factor with mean of 0.
[d]PSS: Perceived Stress Scale. Positive and negative dimensions are each a latent factor with mean of 0.
*p < .05. **p < .01. ***p < .001.

impact on general self-esteem than major disabilities do in the younger population (Miyahara & Piek, 2006). The authors hypothesized different explanations that may shed light on our findings. One explanation is that individuals with greater disability receive more empathy, mitigating the damage to their self-esteem. Second, older adults at higher stages likely have lived with ADL disability longer than those at stage I, allowing the more disabled persons the necessary time to accommodate to their disability and develop better skills to manage challenges and cope with daily circumstances.

Strength and Limitations

Conventional measures of disability treat activity limitation as continuous, dichotomous, or counts, obscuring the specific types of limitation. This study adopts an innovative ADL stage system which has been demonstrated to be associated with clinical outcomes among older adults, such as chronic diseases, general health status, hospitalization, and mortality. Our study is the first to expand the utility of ADL stages by applying them to the psychosocial domains. Latent factors were used to model the different social and mental health dimensions associated with disability, thus controlling for measurement errors. The study has several limitations. It does not aim to address the causality question. Past research

revealed that activity limitation predicted psychological state and activity participation over time, but the reciprocal relationships were not found (Eide & Røysamb, 2002). Other studies recommended early interventions to prevent disability onset or deterioration. Future studies may explore the temporal linkages between ADL stages and psychosocial well-being. Our analysis was based on data collected in 2005 and 2006. Future research may use more recent data to validate psychosocial outcomes associated with ADL stages. The NSHAP asked participants to list up to seven confidant network members. The lack of variation of confidant network characteristics across stages 0 to III may be due to the upper bound of the size of confidant networks. Our results apply only to community-dwelling older adults, and it is not known if they generalize to the seniors in nursing homes. Due to the discrepancy in the sample size of respondents at different stages, especially the extremely small sample size at stage IV, we were not able to explore different dimensions of mental health with multiple-group analysis, which would have increased the power of estimates. One should also be cautious to interpret the lack of significant effect for higher ADL stages on certain outcome measures due to the sample size deficiency. Because of a high percentage of missing data on income variables, household or personal income was not adjusted for in our models.

In conclusion, this cross-sectional study suggests that ADL stages account for heterogeneity in older adults' psychosocial health, especially their mental health status. Our study suggests health and social policy approaches: support to ameliorate older adults' disability stages may also contribute to improved social life and mental health of older adults. Preventing functional decline may help maintain regular social participation, and maintaining independence in mobility (Stage 0) seems crucial to mental well-being. Psychosocial support should be allocated to individuals at higher ADL stages because of their greater mental health needs. The findings from this study emphasize the salience of care coordination to provide complete medical, rehabilitative, psychological, and social care.

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