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Research Article

Do Higher Levels of Resilience Buffer the Deleterious Impact of Chronic Illness on Disability in Later Life?

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Purpose of the Study: In examining the ability of resilience, or the ability to navigate adversity in a manner that protects well-being, to buffer the impact of chronic disease onset on disability in later life, the authors tested 2 hypotheses: (a) People with greater levels of resilience will have lower levels of disability and (b) resilience will moderate the association between the onset of a new chronic condition and subsequent disability.

Design and Methods: This study used a sample of 10,753 Americans between the ages of 51 and 98, derived from 3 waves of the Health and Retirement Study (2006–2010). Ordinary least squares regression was used to estimate the impact of resilience on changes in disability (measured as difficulty with activities of daily living [ADLs] and instrumental activities of daily living [IADLs]) over a 2-year period using a simplified resilience score.

Results: Resilience protects against increases in ADL and IADL limitations that are often associated with aging. Resilience mitigates a considerable amount of the deleterious consequences related to the onset of chronic illness and subsequent disability.

Implications: Our results support our hypotheses and are consistent with claims that high levels of resilience can protect against the negative impact of disability in later life.

Key words: Resilience, Chronic illness, Disability, Health and Retirement Study (HRS)

In the United States, an increasing number of older adults are suffering from chronic disease (Martin & Schoeni, 2014; McLaughlin, Connell, Heeringa, Li, & Roberts, 2010). Because chronic disease is a leading cause of disability (Lawrence & Jette, 1996; Verbrugge & Jette, 1994), it is not surprising that the prevalence of older Americans who are disabled is also on the rise (Seeman, Merkin, Crimmins, & Karlamangla, 2010). This is troubling because disabilities are associated with loss of work, increased medical expenditures, and a greater risk of mortality (Anderson, Wiener, Finkelstein, & Armour, 2011; Brault, 2012; Manton, 1988; Taylor, 2011). Thus, an important quest for research is to help identify mechanisms that may intervene in the process by which chronic conditions are translated into subsequent disability.

In considering how older adults manage health-related hardships and adversities, it is plausible to assume that

psychological resources such as resilience are at play. Resilience, or the capacity to navigate adversity in a manner that protects health, well-being, and life satisfaction (Manning, 2013; Reich, Zautra, & Hall, 2010; Ryff, 2003), has the potential to serve as an intervening mechanism in the processes through which chronic disease leads to subsequent disability (Clarke & George, 2005; Lawrence & Jette, 1996; Van Gool et al., 2005; Verbrugge & Jette, 1994). However, the potential of personal resilience as a factor mitigating the deleterious impact of chronic disease on disability has gone largely unstudied. The purpose of this study is to examine the impact of resilience on the relationship between the onset of new chronic conditions and subsequent changes in disability among older adults. Our conceptualization and operationalization of resilience is grounded in the work of Wagnild and colleagues (e.g., Wagnild & Collins, 2009; Wagnild & Young, 1993) and reflects our assumptions that personal resilience encompasses several components, such as well-being, mastery, self-efficacy, flexibility, inner strength, and optimism.

Background and Hypotheses

Alongside environmental factors, social support, and medical care, chronic health conditions is a prevailing factor driving disability in adults aged older than 50 (Stuck et al., 1999; Verbrugge, Lepkowski, & Imanaka, 1989; Zhao, Ford, Li, Crews, & Mokdad, 2009), with onset of new conditions often resulting in difficulty with activities of daily living (ADLs) and instrumental activities of daily living (IADLs) (Greenglass, Fiksenbaum, & Eaton, 2006; Himes, 2000; Kempen et al., 1999; Liang, Xu, Bennett, Ye, & Quiñones, 2010; Menec, 2003). While chronic conditions are associated with higher levels of ADL and IADL impairment, people with greater psychosocial resources (e.g., social support, physical activity, and locusts of control) tend to experience fewer ADL and IADL limitations (Lachman & Agrigoroaei, 2010). Little is known, however, about how resilience relates to ADL and IADL limitations.

Resilience appears to have an important role in shaping whether or not people recover from adversity and sustain healthy growth and functioning in later life (Lavretsky, 2012; Reich et al., 2010; Zraly & Nyirazinyoye, 2010). High levels of well-being (particularly in the way of having a sense of purpose and social supports) protect against elevated levels of inflammation, decrease the likelihood of disability and early mortality, and helps older people manage the negative impact of health changes (Friedman & Ryff, 2012; Macnee & Talsma, 1995). Factors such as mastery and self-efficacy are negatively correlated with increased ADL and IADL limitations (Kempen et al., 1999), proactive coping has a negative impact on disability (Greenglass et al., 2006), and self-efficacy is associated with increased disability (Sabol et al., 2011). Bivariate findings show that people with higher levels of resilience appear to suffer from fewer IADL limitations and have improved physical functioning (Hardy, Concato, & Gill, 2004; Lamond et al., 2008). Perhaps this is partially related to the fact that people who are more resilient also engage in more physical activity (Perna et al., 2012). Thus, our first hypothesis is as follows:

H_1: People with greater levels of resilience will have lower levels of disability.

Insights from the disablement process model (Lawrence & Jette, 1996; Verbrugge & Jette, 1994) highlight more nuanced ways in which resilience may relate to subsequent disability. In this model, chronic disease is the primary pathway through which people become disabled. According to the model, disease is thought to lead to biological impairments, which subsequently lead to "restrictions in basic physical and mental actions" (i.e., functional limitations), which subsequently lead to difficulty in doing activities of daily life (i.e., ADLs and IADLs), at which point people are considered to be disabled (Lawrence & Jette, 1996; Verbrugge & Jette, 1994). Thus, according to the model, what begins with chronic disease frequently progresses to full disability.

More important for the present research, however, is that the disablement process model focuses on how intraindividual factors (like psychological resources) are modifying factors in the association between chronic disease and subsequent disability (Clarke & George, 2005; Lawrence & Jette, 1996; Van Gool et al., 2005; Verbrugge & Jette, 1994). While some of these modifying factors may exacerbate the association between chronic disease and disability (e.g., lack of social support or social integration), others may provide an intervention that helps reduce the extent to which the experience of a new chronic condition may lead to subsequent disability (Egede, 2007; Moussavi et al., 2007; Schmitz, Wang, Malla, & Lesage, 2007).

Psychological attributes, like depression, have been shown to moderate the association between chronic conditions and subsequent disability. The influence of chronic conditions on disability is greater among those who also suffer from symptoms of depression (Schmitz et al., 2007; Scott et al., 2009). Similarly, the influence of chronic conditions on disability is greater among those who report higher levels of neuroticism (Jang, Haley, Mortimer, & Small, 2003). As such, it is apparent that in some cases, psychosocial attributes may exacerbate the association between chronic conditions and subsequent disability. Because resilience reflects a person's ability to cope effectively, both

physically and psychologically when faced with adversity (Wagnild & Collins, 2009), it is possible that psychosocial attributes like resilience may have a protective effect. Thus, based on insights from the disablement process model, our second hypothesis is as follows:

H_2: Resilience will moderate the association between the onset of a new chronic condition and subsequent disability.

Methods

Data Source and Sample

Data for this study come from the Health and Retirement Study (HRS), a longitudinal study of older Americans. When it began in 1992, the HRS sampled adults born between 1931 and 1941 (individuals aged 5161)—plus their spouses (regardless of the ages of the spouses)—with follow-up interviews every 2 years. Additional cohorts have been included since that time. In 1993, the HRS added a cohort born before 1923; in 1998, samples of those born between 1923 and 1930 and between 1942 and 1947 were included; and in 2004, samples of those born between 1948 and 1953 were included (HRS, 2008; Juster & Suzman, 1995; National Institute on Aging, 2007; RAND Center for the Study of Aging, 2008). The HRS oversamples Hispanics, Blacks, and Florida residents and collects detailed information on respondents' demographic, housing, household and family, economic, and health status characteristics; cognitive status; employment; and wealth.

For the purposes of this study, we used three waves (2006–2010) of the HRS. We limited our analyses to these three waves because key variables were only collected through the HRS Leave-Behind Questionnaire (LBQ). The LBQ is a psychosocial questionnaire, surveying half of HRS respondents in each wave with an alternating sample such that for every two-wave period, the entire HRS sample is surveyed. Piloted in 2004, it began in earnest in 2006.

Several steps were used to identify the analytic sample. The sample was restricted to respondents aged 51 and older at Time 1 (baseline) who have two consecutive waves of data, with the first including a measure of resilience. The questions for which the resilience index is derived come from the LBQ and are only available beginning in 2006 for the first half of HRS respondents and 2008 for the second half. As a result, for our sample, Time 1 data (baseline) included data associated with whichever wave an individual participated in the LBQ first (either 2006 or 2008), and Time 2 data were the wave following (either 2008 or 2010). Pooled together, the resulting analytic sample is comprised of 10,753 individuals with complete data for both waves.

Measures

Dependent Variables: Disability

There is a range of ways to assess level of disability among older adults. ADLs and IADLs are the most common national disability summary metrics (Martin & Schoeni, 2014). Some studies have suggested that they could be conceived as the most severe types of disabilities within a larger hierarchy of disablement (Spector, Katz, & Fulton, 1987). However, as described by Fried, Ettinger, Lind, Newman, and Gardin (1994), at least some IADLs and ADLs function as two different physiological groupings of disabilities, suggesting independent disability processes. As such, we chose to assess the effect of chronic conditions on ADL and IADL disability measures separately. Both ADL and IADL measures are composite measures provided in the RAND version of the data. The questions regarding ADL limitations were a count based on whether individuals are able to complete the following tasks: bathing, eating dressing, walking across a room, and getting in or out of bed. The total number of ADL limitations, then, ranged from 0 to 5. Similarly, IADL limitations were a count based on whether individuals are able to: use a telephone, take medication, handle money, go shopping, and prepare meals. The total number of IADL limitations, then, ranged from 0 to 5.

Primary Independent Variables: Resilience and Onset of New Chronic Conditions

Resilience

The HRS does not incorporate a detailed psychological investigation of resilience. Thus, we developed a simplified resilience score (SRS) designed to capture adjustment and management of adversity. This SRS is broadly guided by the Wagnild and Young Resilience Scale (RS) (1993). Five primary psychosocial domains informed development of our measure, paralleling the Wagnild and Young Scale: (a) perseverance or the ability to keep going despite major setbacks; (b) equanimity, which describes being able to adjust to change, often with humor; (c) meaningfulness or the realization that life has a purpose; (d) self-reliance or recognition of one's one inner strengths; and (e) existential aloneness or the realization that some experiences must be faced alone (Wagnild & Young, 1993; Zeng & Shen, 2010).

Several steps were used to develop our composite SRS. First, we identified variables in the HRS most closely associated with the Wagnild and Young scale, a total of 14 variables. After assessing changes in Cronbach's alpha with and without each measure, two measures were excluded. Internal consistency increased. Principle factor analysis was conducted on the remaining 12 items and yielded one

primary factor (with an eigenvalue of 4.25) and a secondary factor (with an eigenvalue of 1.44). To further test reliability, we conducted a split-halves reliability test (alternating halves assignment based on the order the items appeared in the data), and there was a .75 correlation between the two halves. Finally, assessments of inter-item correlation (a) yielded a Cronbach's alpha of .854, which would (b) decline if any of the 12 items were excluded. Thus, there is substantial evidence of reliability of the final measure, and that our simplified resilience scale is primarily measuring one underlying construct rather than several subscales (see Table 1).

After determining the reliability of our measures, two final steps were used to create our composite resiliency measure. First, because some items had a range of 1–7 and others had a range of 1–6, we created new measures of each of these items, which represented the respondents' position (e.g., 5) divided by the possible maximum responses. The result was a variable ranging from 0 to 1 but was standardized across measures. This choice allowed us to maintain maximal variation while not giving more weight to variables that had range of 1–7 (factor analysis and Cronbach's alpha were calculated for these rescaled variables and were virtually identical to those presented earlier). Second, respondents' final resilience scores were the simple sum of the 12 items, with a hypothetical range from 1.92 to 12 (the minimum is 1.92, because the lowest value someone could have on the items that were originally coded 1–7 was 0.1429 and a 0.16667 on the items that were originally coded 1–6 and [3*0.1429] + [9*0.16667] = 1.9287).

Table 1. Twelve-Item Simplified Resilience Score[a]

Resilience items
I feel it is impossible for me to reach the goals that I would like to strive for[b]
So far, I have gotten the important things I want in life
If something can go wrong for me, it will[b]
I am satisfied with my life
I feel that what happens in life is often determined by factors beyond my control[b]
I can do the things that I want to do
The future seems hopeless to me and I can't believe that things are changing for the better[b]
When I really want to do something, I usually find a way to succeed at it
In most ways, my life is close to ideal
I can do just about anything I set my mind to
There is really no way I can solve the problems I have[b]
I have a sense of direction and purpose in life

Notes: [a]Cronbach's alpha for all 12 items = .8543.
[b]Health and Retirement Study items were reverse coded to make them comparable to the Wagnild and Young items.

New Chronic Condition

We defined a *new chronic condition* as whether an individual experienced onset of one or more of the following five health conditions: heart; stroke; lung; emotional, nervous, or psychiatric problems; or cancer (Smith, 1999). Specifically, during each wave, individuals were asked whether they had each condition. An individual was determined to have experienced a new chronic condition if, at Time 1 (baseline), the individual did not have a condition, but at Time 2, the individual indicated having been diagnosed by a doctor with that condition in the last 2 years. A dichotomous variable was coded such that individuals who did not experience onset of any of the five conditions were coded "0" and individuals who experienced onset of one or more new conditions were coded "1"—in sensitivity analyses, we tested the analyses with a count variable, however because (a) extremely few people experienced the onset of more than one chronic condition and (b) the magnitude and significance of covariates was consisted across these models, we opted to present results from the more parsimonious model. Because the HRS does not identify how long someone has suffered from a chronic condition, in this study, we only focus on the onset of a new chronic condition.

Control Variables

Based on previous research, several control variables were used in the analyses. We controlled for *health status* at Time 1 (baseline), including four variables: baseline self-rated health, baseline depressive symptoms, and baseline disability with ADL and IADL as separate outcome variables. Self-rated health was based on a 5-point score ranging from "1" (excellent health) to "5" (poor health). Depressive symptoms were measured using a shortened version of the Center for Epidemiologic Studies-Depression (CES-D) scale (Radloff, 1977). The scale was comprised of eight dichotomous items related to symptoms during the past week, including: felt depressed, everything was an effort, sleep was restless, was happy (reverse coded), felt lonely, felt sad, could not get going, and enjoyed life (reverse coded). The resulting CES-D score was a count of total number of symptoms (ranging from 0 to 8). Time 1 (baseline) ADL and IADL limitations were measured in the same way as the outcome variables.

We also controlled for sociodemographic differences. *Age* was measured as the age in years of the respondent at Time 1 (baseline) (ranging from age 51 to 98). Race/ethnicity was measured with four indicator variables: White, Black, Hispanic, and other race. *Female* was a dichotomously coded indicator of gender. *Education* was measured in years (range from 0 to 17 years). *Income* was measured as total household income in dollars. *Wealth*

was measured as total wealth in dollars, including total housing and nonhousing wealth (excluding pensions) at Time 1 (baseline).

Social support and integration can impact the disablement process, in part as a factor shaping management of a new chronic condition. Two key factors in this process include marital status and employment status (Arcury et al., 2012). Thus, we control for both. *Married* was measured as "1" for those who were currently married and "0" for those who were not married. *Worker* was measured as a "1" for individuals who were employed.

Analysis Plan

To test our two hypotheses, ordinary least squares (OLS) regression was used to assess the impact of resilience and new chronic condition on changes in two types of disability—ADL and IADL limitations (Tables 2 and 3). Although we used data from multiple waves to construct the data file, each person had only one observation per variable in the final data file, so non-nested regression was appropriate.

Table 2. Descriptive Statistics

	Mean/ proportion	*SD*	Min.	Max.
Dependent variables				
ADL (Time 2)	0.29	0.84	0.0	5.0
IADL (Time 2)	0.26	0.80	0.0	5.0
Key independent variables				
Resilience[e]	9.19	1.77	1.9	12.0
New chronic condition[e]	0.11	—	0.0	1.0
Control variables				
Baseline health				
ADL limitations	0.22	0.68	0.0	5.0
IADL limitations	0.16	0.57	0.0	5.0
Depressive symptoms	1.30	1.87	0.0	8.0
Self-rated health	2.74	1.06	1.0	5.0
Sociodemographic background				
Age	68.55	9.45	51.0	98.0
White	0.80	—	0.0	1.0
Black	0.11	—	0.0	1.0
Other race	0.02	—	0.0	1.0
Hispanic	0.07	—	0.0	1.0
Female	0.59	—	0.0	1.0
Education years	12.86	2.93	0.0	17.0
Income	5.84	2.78	1.0	10.0
Wealth	5.89	2.79	1.0	10.0
Married	0.65	—	0.0	1.0
Working	0.29	—	0.0	1.0

Note: N = 10,753. ADL = activity of daily living; IADL = instrumental activity of daily living.

Results

Descriptive Results

Descriptive statistics are shown in Table 2. In this sample, the average person suffered from 0.29 of an ADL limitation and 0.26 of an IADL limitation at Time 2, up from 0.22 and 0.16 at Time 1 (baseline). This indicates that, on average, people experienced an increase in both ADL limitations and IADL limitations between waves. The average level of resilience in this sample was 9.19, and 11% of the sample experienced onset of a new chronic condition between Time 1 (baseline) and Time 2.

OLS Results

Table 3 shows the results from OLS regression models predicting ADL limitations at Time 2. In Model 1, ADL limitations were predicted with control variables. In this model, each year of age was associated with a small but significant increase in ADL limitations, Hispanics suffered from more ADL limitations than whites, and wealth was associated with a reduction in ADL limitations. Not surprisingly, each measure of poor health at Time 1 (baseline) was associated with increased ADL limitations. The measure of resilience was included in Model 2 and was negatively associated with ADL limitations at Time 2. This suggests, by itself, resilience protects against the increase in ADL limitations often associated with aging. In Model 3, the experience of a new chronic condition between Time 1(baseline) and Time 2 was included in the model and was associated with a greater number of current ADL limitations.

In Model 4, the product of the onset of a new chronic condition and resilience was included as an interaction term in the model. The interaction term was negatively associated with ADL limitations, suggesting that higher levels of resilience buffer the deleterious impact of a new chronic condition. Indeed, as shown in Figure 1, at the lowest levels of resilience the average predicted level of ADL limitations was 2.68 times greater for someone who experienced a new chronic condition between Time 1 (baseline) and Time 2 (0.98 compared with 0.36). At the highest levels of resilience, however, someone who experienced a new chronic condition had only 19% higher ADL limitations than someone who did not experience a new chronic condition between waves (0.29 compared with 0.24). This suggests high levels of resilience mitigate a considerable amount of the deleterious consequences of a new chronic condition.

Table 4 shows OLS regression results of models predicting Time 2 IADL limitations. IADL limitations are predicted with control variables in Model 1. In this model, IADL limitations increased with each year of age, those with more education suffered from fewer IADL limitations,

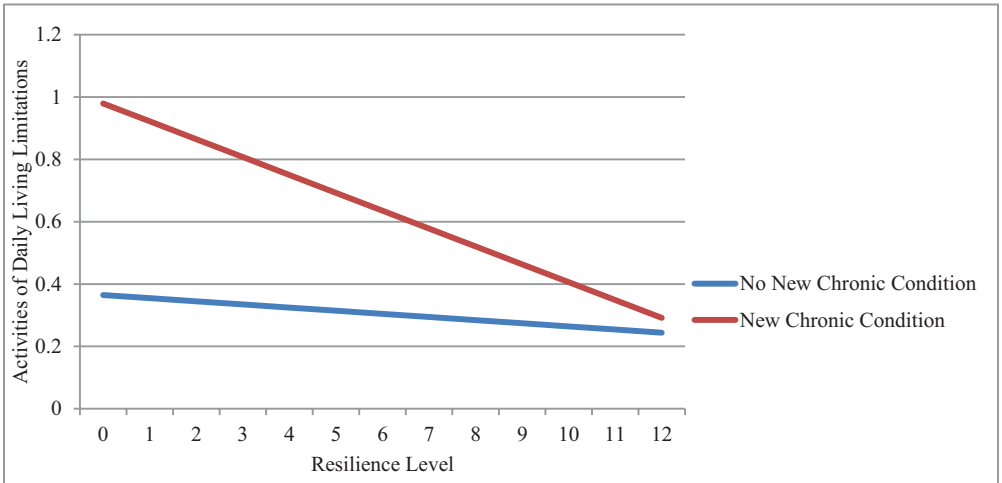
Table 3. OLS Regression Models Predicting Time 2 ADL Limitations

	Model 1	Model 2	Model 3	Model 4
	Baseline	Resilience	New chronic conditions	Resilience* new chronic conditions
Key independent variables				
Resilience		−0.017***	−0.016***	−0.010*
New chronic condition			0.196***	0.615***
New chronic conditions* resilience				−0.047***
Baseline health				
ADLs	0.533***	0.533***	0.533***	0.5320***
IADLs	0.210***	0.206***	0.209***	0.209***
CES-D	0.021***	0.016***	0.015***	0.015***
Self-rated health	0.063***	0.057***	0.054***	0.054***
Sociodemographic background				
Age	0.009***	0.009***	0.008***	0.008***
Black[a]	0.018	0.023	0.027	0.027
Other race[a]	−0.004	−0.005	−0.006	−0.005
Hispanic[a]	0.081**	0.087**	0.092***	0.091***
Female[b]	−0.035**	−0.032*	−0.031*	−0.031*
Education	−0.002	−0.002	−0.001	−0.001
Income	−0.001	0.000	0.000	0.000
Wealth	−0.011***	−0.010**	−0.009**	−0.009**
Married[c]	−0.040*	−0.041**	−0.042**	−0.042**
Worker[d]	−0.027	−0.028	−0.024	−0.023
Intercept	−0.505***	−0.347***	−0.347***	−0.403***
Model fit statistics				
ll (model)	−10808.68	−10800.97	−10754.72	−10745.34
df	15	16	17	18
Akaike information criterion	21647.36	21633.93	21543.44	21526.68

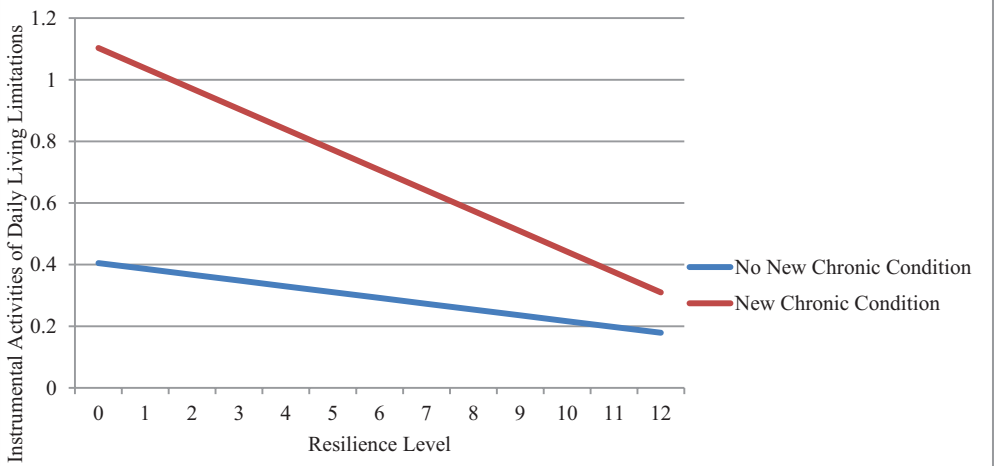
Notes: N = 10,753. ADL = activity of daily living; CES-D = Center for Epidemiologic Studies-Depression; IADL = instrumental activity of daily living; OLS = ordinary least squares.
[a]Non-Hispanic White.
[b]Male.
[c]Not married at baseline.
[d]Not working at baseline.
*p < .05. **p < .01. ***p < .001.

and IADL limitations were smaller among those with greater wealth. As was the case for the models predicting ADL limitations, each measure of poor health at Time 1 (baseline) was associated with increased IADL limitations. In Model 2, resilience was added to the previous model and was negatively associated with IADL limitations at Time 2. This suggests that people with higher levels of resilience accrue fewer additional IADL limitations between waves. In Model 3, the variable measuring whether a respondent experienced a new chronic condition between waves was added to the prior model. As was the case for the models predicting ADL limitations, respondents who experienced a new chronic condition between waves had increased IADL limitations between waves. Finally, in Model 4, the interaction between a new chronic condition and resilience was included in the model and was negatively associated with IADL limitations at Time 2. This suggests that having a larger reservoir of resilience to tap into helped reduce the translation of a new chronic condition into increased IADL limitations.

This relationship is shown as predicted values based on Model 4 in Figure 1, where at low levels of resilience, respondents who experienced a new chronic condition had, on average, 172% greater IADL limitations than those who did not experience a new chronic condition (1.10 compared with 0.40). Among respondents with the highest resilience, a new chronic condition was only associated with 73% higher IADL limitations relative to those who did not experience a new chronic condition (0.31 compared with 0.18). While both the relative and absolute differences were not as large for IADL limitations as they were for ADL limitations, resilience still appears to buffer a considerable amount of the negative consequences of a new chronic condition.



Model estimated Activities of Daily Living Limitations (from Table 2 Model 4), by resiliency level and health shock status. All other variables set to sample means.



Model estimated Instrumental Activities of Daily Living Limitations (from Table 3 Model 4), by resiliency level and health shock status. All other variables set to sample means.

Figure 1. Level of disability by resilience levels.

In addition to the results shown, we conducted sensitivity analyses to assess whether the interaction effect between a new chronic condition and resilience was functioning as a proxy for the interaction between the onset of a new chronic condition and CES-D. To that end, we replicated Model 4 from both Tables 3 and 4 but added the interaction between the onset of a new chronic condition and CES-D to the model (results not show but available upon request). The results indicated the effect of a new chronic condition on IADL onset was conditional on CES-D ($p < .05$), but not on ADL onset. Importantly, however, this additional interaction term did not account for the significant interaction term between the onset of a new chronic condition and resilience.

Discussion

In the current study, we used three waves (2006–2010) of the HRS to develop a pooled sample of individuals with two consecutive waves of data to examine the impact of Time 1 resilience on the association between experiencing a new diagnosis of chronic health condition and changes in disability between Time 1 and Time 2. Based on our new measure of resilience using data from the HRS LBQ, our results are consistent with claims that high levels of resilience can protect against the deleterious impacts of new chronic conditions in older adults. In particular, we found that having higher levels of resilience buffers the negative impacts of the onset of a new chronic condition on increases in ADL and IADL limitations in later life.

Table 4. OLS Regression Models Predicting Time 2 IADL Limitations

	Model 1	Model 2	Model 3	Model 4
	Baseline	Resilience	New chronic conditions	Resilience* new chronic conditions
Key independent variables				
Resilience		−0.027***	−0.025***	−0.019***
New chronic condition			0.234***	0.700***
New chronic conditions* resilience				−0.047***
Baseline health				
ADLs	0.092***	0.090***	0.090***	0.090***
IADLs	0.616***	0.610***	0.612***	0.613***
CES-D	0.011**	0.002	0.002	0.001
Self-rated health	0.047***	0.038***	0.034***	0.034***
Sociodemographic background				
Age	0.012***	0.012***	0.011***	0.011***
Black[a]	0.000	0.007	0.012	0.012
Other race[a]	−0.045	−0.046	−0.048	−0.047
Hispanic[a]	0.033	0.042	0.048	0.047
Female[b]	0.008	0.012	0.014	0.014
Education	−0.006*	−0.005*	−0.005	−0.005
Income	0.004	0.006	0.006	0.006
Wealth	−0.016***	−0.014***	−0.013***	−0.013***
Married[c]	−0.008	−0.009	−0.010	−0.010
Worker[d]	−0.031	−0.032	−0.027	−0.026
Intercept	−0.657***	−0.410***	−0.410***	−0.472***
Model fit statistics				
ll (model)	−10706.11	−10686.86	−10619.35	−10607.51
df	15	16	17	18
AIC	21442.23	21405.71	21272.70	21251.03

Notes: N = 10,753. ADL = activity of daily living; CES-D = Center for Epidemiologic Studies-Depression; IADL = instrumental activity of daily living; OLS = ordinary least squares.
[a]Non-Hispanic White.
[b]Male.
[c]Not married at baseline.
[d]Not working at baseline.
*p < .05. **p < .01. ***p < .001.

Our findings support both of our hypotheses and provide a novel, substantive advancement to our understanding of the disablement process. The results indicate that resilience is protective against ADL and IADL limitations, and that resilience modifies the relationship between the onset of a new chronic condition and subsequent disability. This suggests that among people who experience the onset of a new chronic condition, those with higher levels of resilience experience lower subsequent levels of disability. This finding is consistent with the disablement process model's focus on intraindividual resources as potential interventions between chronic conditions and subsequent disability (Clarke & George, 2005; Lawrence & Jette, 1996; Van Gool et al., 2005; Verbrugge & Jette, 1994).

While the primary contribution of this paper is in our finding that resilience moderates the deleterious impact of new chronic conditions on disability, an important secondary outcome of this research is the introduction of a measure of resilience—based on Wagnild and Young's (1993) RS—for future research using HRS data. One existing barrier to broader assessment of resilience in the aging and health realm is that there has been no measure of resilience available in the HRS. We conducted an exhaustive analysis of all scholarly articles during the last 5 years in *The Gerontologist* and *The Journals of Gerontology*: *Social Sciences* and *The Journals of Gerontology*: *Psychological Sciences*—we selected these journals because they represent the flagship journals of the Gerontological Society of America (GSA)—which revealed only 12 studies about issues associated with resilience, none that used HRS or other publicly available longitudinal data. In addition, while most of the 12 articles conceive of resilience in a similar way as laid out in the present study—as the capacity to recover from or adapt to challenging circumstances

(e.g., Masten, Best, & Garmezy, 1990)—the potential value of resilience in shaping aging-related changes was not examined. Of the studies on resilience, several articles were guided by resilience as a conceptual framework (e.g., Emlet et al., 2013; Frederickson-Goldsen et al., 2013; Kotter-Gruhn & Hess, 2012; Pitzer & Fingerman, 2010) or a resilience theoretical perspective (Emlet et al., 2011), while others were concerned with resilience as a physical outcome (Resnick et al., 2011; Shmotkin et al., 2013), or were equated with subjective quality of life (Hildon et al., 2010). Only one article used a resilience scale (the Connor-Davidson resilience scale), which was included only as a control variable (Wolinsky et al., 2013).

Although the SRS introduced in this study is applicable only in the HRS LBQ, it is our hope that such a measure will pave the way for more nuanced research about the role of resilience in the lives of older adults. Like measures of resilience in other data sources (Zeng & Shen, 2010), our measure of resilience is associated with lower levels of ADLs and IADLs in later life. This is important because advancing knowledge regarding how individuals navigate adversity and hardship in later life, particularly in response to sudden health events, will help clarify how resilience influences how successfully people adapt to changes associated with aging and specifically related to disability and chronic disease.

Our research is not without limitations. First, although we were able to highlight the moderating role of resilience and the onset of new chronic conditions on changes in ADL and IADL limitations, future work should explore how resilience might influence other health and well-being outcomes. Second, the current study is unable to determine exactly how resilience shapes recovery from new chronic conditions and disability. Determining a causal relationship is difficult due to the nature of our analyses; however, it is plausible that the observed effects of resilience may be underestimated. Third, although our composite SRS represents a reliable measure of resilience, it aggregates information across a limited number of domains of resilience. In addition, resilience has been measured using other indicators (e.g., the Connor-Davidson resilience scale), and using different indicators may yield different findings.

Despite the many benefits of this aggregation and its concordance with the well-established Wagnild and Young measure, we are unable to examine some of the meaningful nuanced domains of resilience. We utilized the best items available in the HRS data, and while very similar, some of the items do not map exactly onto the Wagnild and Young scale. Our findings do not identify whether there are particular aspects of resilience that are especially relevant to buffering against disability. Additionally, although previous studies do suggest that regardless of environmental context, older adults respond similarly to resilience scales (Resnick et al., 2010), the SRS reflects only personal resilience and does not include social aspects of the construct. Nevertheless, because of the rigor with which we assessed our SRS (i.e., changes in Cronbach's alpha, principle factor analysis yielding a single primary factor, and a .75 correlation between halve using a split-halves reliability test), we are confident our composite measure is tapping into one underlying construct, and we believe that construct to be quite similar to the Wagnild and Young Reliance Scale.

The Wagnild and Young Resilience Scale (1993) is one of many commonly used measures of resilience. Despite much consistency with the research findings on the impact of resilience for older adults using other measures (i.e., Connor-Davidson Resilience Scale or CD-RISC or the Ego Resilience Scale—Resnick et al., 2011), we recognize that other measures would also provide a useful framework for this study. We chose to base the development of our SRS on the Wagnild and Young scale due to its scientific merit (Wagnild & Collins, 2009; Wagnild & Young, 1993) and its focus on factors relevant to the disablement process (i.e., self-reliance, meaning, equanimity, existential aloneness, and perseverance/determination.) It is plausible, however, that other measures of resilience may show a different effect from the results we present here. Therefore, it would be helpful for future research to use other scales to help elucidate the broader impact of resilience on these relationships and help identify the relative importance of various subscales of resilience as moderators in the association between the onset of new chronic conditions and levels of disability.

Despite these limitations, this study has important theoretical, practical, and measurement implications. At a theoretical level, this study elucidates the potential value of psychosocial resources in shaping one's ability to be resilient against deleterious health events. The role of resilience in health in later life is more appropriately conceived as an intervention in the disablement process. Future research should examine the varying ways by which the level and amount of psychological resilience impacts health changes related to aging. From a more practical standpoint, our finding that resilience has the potential to serve as a buffer to negative health changes suggests we need to begin to identify ways to help older adults bolster their "resilience resources."

Recognizing that resilience is a learnable behavior (Mealer et al., 2012), it is likely that interventions can be created to aid in older adults in their ability to bolster resilience. Interventions that provide training in resilience enhancement techniques or utilize a resilience-building curriculum grounded in research and theory have the potential to aid older adults in the successful navigation of hardship

and adversity. One example of a treatment intervention used in a population of older adults living with chronic illness and subsequent disability is the use of a program that would enhance strengths, reduce stress, and provide tangible skills for negotiating adversity. Additionally, we need solid evaluation research to gauge the effectiveness of the programs and additional longitudinal studies exploring resilience as a life course process. Future research should explore ways by which people can tap into their existing reserves of resilience via access to social support mechanisms or mental health resources and investigate how we can create opportunities for individuals to enhance their resilience? Utilization of the SRS may open many more doors to begin exploring resilience in these and other contexts of aging. With the HRS, scholars are well situated to begin to identify the mechanisms necessary to maximize resilience in later life.

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