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Successful Aging as the Intersection of Individual Resources, Age, Environment, and Experiences of Well-being in Daily Activities

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Abstract

Objective: We conceptualize successful aging as a cumulative index of individual resources (the absence of disease and disability, high cognitive and physical functioning, social embeddedness) in the service of successful aging outcomes (global well-being, experienced well-being, and vital status), and conditioned by age, social structure, and environment.
Method: The study used baseline and follow-up data from the 2008–2014 waves of the Health and Retirement Study (*N* = 17,230; age = 51–101). Linear, multilevel, and logistic models compared individual resources at baseline as independent, cumulative, and binary predictors of outcomes 4 years later.
Results: Individual resources were unequally distributed across age group and social structures (education, wealth, race, gender) and had a cumulative effect on all successful aging outcomes. For experienced well-being, individual resources were most important at midlife and for groups with lower education. Person–environment congruence (social cohesion, city satisfaction) was associated with all successful aging outcomes and conditioned the effect of individual resources on experienced well-being.
Discussion: A cumulative index allows for gradations in resources that can be compensated for by external factors such as person–environment congruence. This index could guide policy and interventions to enhance resources in vulnerable subgroups and diminish inequalities in successful aging outcomes.

Keywords: Everyday activity participation—Experienced well-being—Health and Retirement Study—Person–environment congruence—Successful aging

Historically, aging successfully has been seen to involve growing older free from the burden of disease and functional limitations, while remaining cognitively robust and socially engaged (Rowe & Kahn, 1998). As others have argued before us (e.g., Martinson & Berridge, 2015; Riley, 1998), defining successful aging as maintained health, functioning, and social embeddedness ignores age, social structural, and environmental contexts. Aging involves both biophysiological processes that increase the risk of disease and physical limitations (e.g., Fried & Ferrucci, 2015;

Kennedy et al., 2014) as well as social transitions in roles and responsibilities that pattern opportunities to engage in society (e.g., Elder & George, 2016). Instead of markers of successful aging, Rowe and Kahn's components may be better characterized as individual resources—unequally distributed across age and social position—that are in service to successful aging outcomes. This perspective moves scholarship toward Successful Aging 2.0 in three important ways: First, it highlights the distribution of individual resources across age and social position and assists in

quantifying inequalities. Second, gradations of resources by age and social position highlight the needs of vulnerable populations. Third, attention to resources and their link to successful aging outcomes can inform interventions and policy solutions that foster compensatory external resources.

Successful Aging: Revisiting the Rowe and Kahn Model

We depart from the original 1998 Rowe and Kahn model by conceptualizing successful aging as the intersection of individual resources that are in service of successful aging outcomes within the context of age, environment, and social structures. Figure 1 illustrates this reconceptualization of the original Rowe and Kahn model.

Individual Resources for Successful Aging

Rowe and Kahn (1998) defined the components of successful aging as the absence of chronic disease and disability, high cognitive and physical functioning, and social embeddedness. Over several decades, researchers have examined these components, either singularly or in various combinations (Depp & Jeste, 2006). Following Rowe and Kahn, the authors typically adopt strict definitions of success that require all five components to be met (e.g., McLaughlin, Connell, Heeringa, Li, & Roberts, 2010). Building on earlier work (e.g., Garfein & Herzog, 1995), we consider these Rowe and Kahn components to be individual resources for successful aging and examine the benefits of constructing a cumulative index of resources. Analogous to the use of a cumulative score of biological risk, such as allostatic load (e.g., Seeman, Singer, Rowe, Horwitz, & McEwen, 1997), a cumulative index provides a multisystem view on individual resources. We offer the cumulative index as an alternative to earlier approaches where individual resources were characterized as independent of one another or as a system that fails when a single resource is absent. The cumulative index

Figure 1. Reconceptualization of the Rowe and Kahn model: Individual resources in service to successful aging outcomes within the context of environmental congruence, age, and social structure.

will illustrate differences in successful aging across gradations of resources, which are known to be unequally distributed in the population (Herd, Robert, & House, 2010).

Outcomes of Successful Aging

In our model, individual resources serve outcomes of successful aging by reducing barriers to behaviors that promote future health and well-being. We measure success as well-being and vital status, established successful aging outcomes (Depp & Jeste, 2006). Global well-being, often assessed as life satisfaction (Diener, Emmons, Larsen, & Griffin, 1985), is consistently linked to longer, healthier lives (Steptoe & Wardle, 2012) and increases moderately in older adulthood before declining in the years before death (Stone, Schwartz, Broderick, & Deaton, 2010).

Measures of experienced well-being (National Research Council, 2013) are anchored in routine activities of daily life and relevant to future health (Janke, Payne, & Puymbroeck, 2008; Menec, 2003). Experienced well-being is shaped by available resources and encompasses both doing activities and the quality of experiences during those activities. Reports of experiences during a day's activities provide a nuanced perspective on well-being that reflects the positive and negative qualities of life within the context that it is lived (Smith, Ryan, Queen, Becker, & Gonzalez, 2014). Drawing from research on experiences of well-being among individuals with disabilities (Freedman, Cornman, & Carr, 2014; Freedman, Stafford, Schwarz, Conrad, & Cornman, 2012), experiences of well-being may be more sensitive to declines in individual resources than measures of global well-being.

Aging Within Social Structures

Individual resources are unequally distributed across age group (middle-aged, young-old, and oldest-old adults) and social structures of education, wealth, gender, and race (Dannefer, 2003). We focus on the direct and moderating effects of age and educational attainment on successful aging outcomes. Individual resources change as individuals biologically age while moving through age-graded structures of education, work, and retirement (Elder & George, 2016). Lower socioeconomic and education status can limit access to resources and prolong exposure to stress, and then strain both health and global well-being (Herd et al., 2010; Pruchno & Wilson-Genderson, 2015). Consequently, older (Smith & Ryan, 2015) and less educated groups may rely more on individual resources of health, functioning, and social embeddedness to achieve successful aging outcomes.

Immediate Environment

The unequal distribution of individual resources highlights the importance of identifying potential external compensatory factors. Individuals age within the environments that
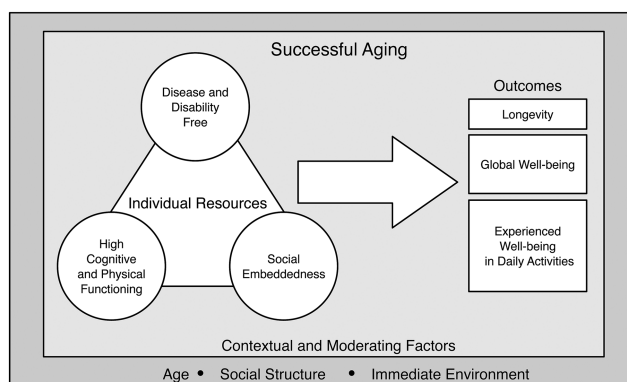
they live. Theories of person–environment fit (or congruence) propose that individual competencies, preferences, and needs manifest differently across environments (e.g., Lawton, 1983; Wahl, Iwarsson, & Oswald, 2012). An environment may be an asset or a hindrance based on its ability to meet personal needs and preferences. This becomes particularly salient as control over the environment decreases with age (e.g., Cagney et al., 2009). We examine the direct and compensatory effects of two indicators of person–environment congruence on successful aging outcomes. Perceived social cohesion indicates feeling secure, safe, and socially connected to one's residential area (Cagney et al., 2009) and has been linked to physical activity, health behaviors, chronic disease, and well-being (e.g., Kim, Hawes, & Smith, 2014). Satisfaction with one's current city encapsulates local identity, familiarity, and geographic stability (e.g., Oishi, 2014).

Current Study

This study re-examines the Rowe and Kahn components as a cumulative index of individual resources in the service of successful aging outcomes within the context of age, social structures, and person–environment congruence. First, we compare the effects of independent, cumulative, and binary "all or nothing" manifestations of individual resources in predicting global well-being, experienced well-being, and vital status 4 years later. Following theory and evidence that risks and resources are cumulative, we expect individual resources to have an additive effect on successful aging outcomes. Second, we examine the direct and moderating effects of age, education, and person–environment congruence. Building on evidence that vulnerable populations often lack external resources, individual resources should be most important for successful aging outcomes among older respondents with less education. As incongruence strains resources, person–environment congruence should support successful aging outcomes and compensate for diminished individual resources.

Method

The current study used data from the 2008 through 2014 waves of the Health and Retirement Study (HRS). The HRS, sponsored by the National Institute on Aging (NIA U01AG009740) and conducted by the University of Michigan, is a nationally representative biennial panel study of Americans aged 51 and older (see http://hrsonline.isr.umich.edu; Sonnega et al., 2014). Early release data from the 2014 wave may contain errors that will be corrected in the Final Public Release version of the data set.

In 2006, two random subsamples were established in the HRS where 50% of the panel completes an in-person interview and other 50% completes a telephone interview. Each subsample completes an in-person interview once every 4 years. Following the in-person interview, participants receive a paper self-administered psychosocial questionnaire (SAQ) to complete and return by mail. Global well-being, sociodemographic, health, social embeddedness, and cognition measures were collected in the main interview. Experienced well-being and person–environment congruence measures were collected in the SAQ. We combined the in-person interviews/SAQ subgroups from 2008 to 2010—the first waves to include measures of person–environment congruence—to create the baseline for this study. Response rates for the main interview/SAQ were 88.6/85 in 2008 and 88.6/74 in 2010. Follow-up occurred 4 years following baseline in 2012/2014, respectively. A new cohort (born 1954–1959), added in 2010, included an over sampling of minorities, resulting in the 2010/2014 sample being slightly younger and more likely to identify as Black or Hispanic/Other. Participants were compensated for all interviews and SAQs.

Participants

To minimize selection bias, each outcome was examined using the broadest sample of community residing self-reporting respondents. Subjective appraisals of global and experienced well-being precluded inclusion of proxy respondents. Inclusion criteria for analysis of each successful aging outcome were as follows: global well-being included 13,522 respondents who completed the interview at both baseline and follow-up (M_{age} = 66.20, SD = 9.57; 59% female; 69% White, 17% Black; 14% Hispanic/Other; 28% with some college); experienced well-being included 10,994 respondents who completed the interview at baseline, and the interview and SAQ at follow-up (M_{age} = 67.04, SD = 9.34; 61% female; 75% White, 13% Black; 11% Hispanic/Other; 29% with some college); vital status at follow-up included 17,230 respondents who completed the baseline interview (M_{age} = 67.61, SD = 10.44; 58% female; 69% White, 17% Black; 14% Hispanic/Other; 27% with some college). Differences across all demographics were significant (ps < .001).

Measures of Individual Resources for Successful Aging

Individual resources were assessed in 2008/2010. Similar to McLaughlin and colleagues (2010), the Rowe and Kahn components of (a) absence of major diseases; (b) absence of activity of daily living (ADL) limitations; (c) high physical functioning; (d) high cognitive functioning; and (e) social embeddedness were assessed for meeting criteria as follows: The absence of major disease met criteria if respondents reported no diagnoses of heart disease, lung disease, diabetes, cancer, or stroke, and four or fewer symptoms on the HRS abbreviated eight-item Center for Epidemiological Studies Depression scale (Steffick, 2000). Criteria for absence of ADL limitations required no reported difficulties in getting dressed, walking across a room, bathing or showering, eating, getting in and out of bed, and using the toilet. The high physical functioning criteria required no more than one reported difficulty

in walking several blocks, jogging one mile, walking one block, sitting for 2 hrs, getting up from a chair, climbing stairs, climbing one flight of stairs, stooping, reaching arms, pushing and pulling large objects, lifting weights, or picking up a dime. High cognitive functioning criteria required a score at or above the median (10) in a summed immediate and delayed word recall task (maximum = 20 words; Ofstedal, Fisher, & Herzog, 2005), a validated measure of episodic memory that is administered to the full HRS sample (McArdle, Fisher, & Kadlec, 2007). Criteria for social embeddedness required both (a) productive activities: working for pay, volunteering at least once in the past year, and/or caring for grandchildren or parents at least 100 hr per year and (b) social connection: being married, having friends in close proximity, and/or chat with neighbors at least once per week.

Each resource was scored as 1 or 0 for meeting or not meeting criteria. Individual resources were operationalized as (a) independent covariates; (b) a cumulative index of resources, which was measured as both discrete (range = 0–5; ref. = 5) and continuous (M = 2.68, SD = 1.44); and (c) a binary score of having all five (1) or fewer than five (0) resources.

Measures of Successful Aging Outcomes

Global well-being

The single life satisfaction item from the baseline and follow-up interviews "Please think about your life as a whole. How satisfied are you with it?" provided our measure of global well-being. Responses ranged from *completely satisfied* (1) to *not at all satisfied* (5) and were reversed so that a 5 indicated greater well-being; M = 3.86, SD = 0.87.

Experienced well-being

We derived two indicators of experienced well-being (ExWB; National Research Council, 2013) from a day reconstruction task included in the 2012/2014 SAQs: (a) activity participation and (b) experiences of well-being during the activity (Smith et al., 2014). Eight activities were targeted: watching TV; working/volunteering; walking/exercising; health-related activities (e.g., doctor visits or taking medication); traveling/commuting; socializing with friends, neighbors, or family (not counting spouse/partner); spending time at home alone (without anyone present); and running errands.

Activity participation

Respondents reported doing an activity yesterday by indicating "yes" to a question such as "Yesterday, did you watch TV?" To account for error due to skip patterns, only activities that were both (a) endorsed by the respondent and (b) non-missing on at least one adjective (see adjectives below) were included. Up to eight activities (M = 3.91) were nested within individuals in the analyses. Individual resources at baseline (e.g., physical functioning, social embeddedness) facilitate but do not guarantee follow-up reports of participation in routine activities yesterday.

See Supplementary Table 1 for intercorrelations of resources and activity participation.

Positive and negative experienced well-being

For each activity respondents did, they were asked to indicate their experiences during the activity by rating the intensity of three positive (happy, interested, content) and negative (frustrated, sad, bored) adjectives on a scale from 0 = *did not experience the feeling at all* to 6 = *feeling was extremely strong*. Mean positive and negative scores were calculated for each activity (M_{pos} = 3.59, SD = 1.43; M_{neg} = 0.64, SE = 0.92). Cronbach's alpha across activities was .87 (range: .81–.90) and .78 (range: .72–.83) for positive and negative ExWB, respectively.

Vital status

Vital status from the HRS tracker file was used to identify respondents who were either alive or presumed alive 4 years after baseline in the 2012/2014 follow-up waves.

Contextual Moderators and Covariates

Age and education

Three age groups were defined: middle aged (51–64, N = 7,220), young-old (65–79, N = 7,534), and oldest old (80+, N = 2,476). Education was categorized as (1) at least some college and (0) high school degree or less.

Person–environment congruence

Ratings of congruence with the environment were measured using two indicators in the 2008/2010 SAQ. Perceived Neighborhood Social Cohesion is a validated four-item scale (e.g., Cagney et al., 2009). Responses range from (0) feelings of social fragmentation (e.g., "I feel that I don't belong in this area") to (7) social cohesion (e.g., "I really feel part of this area") within a 20-min walk from home; M = 5.46, SD = 1.39. Interitem reliability was good (Cronbach's alpha = .86). Respondents also indicated city satisfaction as "Please think about your life and situation right now. How satisfied are you with the city or town you live in?" Responses ranged from completely *satisfied* (1) to *not at all satisfied* (5) and were reversed so that a 5 indicated greater satisfaction; M = 4.11, SD = 0.90.

Social structural covariates

Household wealth was an imputed composite household sum of all assets minus all debt (RAND: Pantoja et al., 2015). Sample quintiles were calculated to minimize bias from extreme values (ref. = highest quintile). Gender was coded as 1 = female, and race was categorized as White (ref.; n = 11,911); African American (n = 2,892); Hispanic/ other (n = 2,427).

Missing Data

In total, 112 (0.65%) respondents were excluded for incomplete cognition data, and 143 (1%) respondents who

completed baseline and follow-up were missing on life satisfaction and were excluded from the global well-being analysis. Among respondents who completed the follow-up SAQ, 56 (0.5%) had incomplete data on experienced well-being and were excluded from this analysis. Full information maximum likelihood was used to include the 3,113 (18%) respondents who did not complete measures of person–environment congruence in 2008/2010.

Of the 17,230 respondents who participated at baseline, 289 (1.75%) moved to a nursing home, and 1,029 (6.25%) were presumed alive but did not complete the second in-person interview. Multinomial logistic regression showed older respondents with fewer resources to be more likely to attrit. Absence at follow-up due to moving to a nursing home was associated with race and wealth.

Analytic Plan

Logistic regression was used to estimate the contribution of study covariates to the likelihood of meeting all Rowe and Kahn criteria. To address our first aim, we estimated the effect of individual resources—as independent covariates, a cumulative index, and a binary score—on successful aging outcomes global well-being, experienced well-being, and vital status, 4 years later. To meet our second aim, we tested the direct and moderating effects of age, education, and person–environment congruence. Moderators were tested separately. Continuous interaction variables were grand-mean centered.

Successful aging outcomes at follow-up were examined within the broadest possible sample of age eligible, community residing, nonproxy respondents. Global well-being (N = 13,522) was examined using linear regression. Experienced well-being (N = 10,994) included up to eight activities nested within individuals. Logistic and linear multilevel models, which accommodate variation in ExWB across activity types and adjust for between-person tendencies to do or enjoy activities, were used to examine activity participation and positive and negative ExWB, respectively. Activity type was included as an activity-varying covariate to account for differences in participation and quality of experiences across activities. Vital status at follow-up (N = 17,230) was modeled using logistic regression, which was appropriate given the short 4-year follow-up period, low occurrence of mortality (10%), and interest in being alive at follow-up rather than time to death. A sandwich estimator was employed to adjust standard errors for interdependence within households. We calculated the inverse probability of loss to follow-up to examine the bias of selective attrition. Results were robust to this adjustment. Unadjusted scores are reported in the following text and tables. Sensitivity analysis adjusted for global well-being at baseline. Activity participation was also regressed on individual resources where social embeddedness did not include working for pay, volunteering, and chatting with neighbors. Results were consistent with the reported results

and are presented in Supplementary Table 4. Analysis was conducted using Stata 13 and MPLUS 7.4.

Results

Descriptive characteristics of study covariates across age groups are presented in Table 1. The number of individual resources was lower, whereas person–environment congruence indicators were higher in the older age groups. Only a small proportion of respondents met all five Rowe and Kahn criteria. Across all age groups, absence of disease was the least common and absence of ADL limitations was the most common resource. Consistent with McLaughlin and colleagues (2010), logistic regression showed those who met all criteria tended to be younger and have greater socioeconomic resources (all ps < .001).

Individual Resources in Service to Successful Aging Outcomes

Analysis of the direct effects of individual resources on global well-being, experienced well-being, and vital status, at follow-up are shown in Figure 2. Having more Individual resources were associated with higher successful aging outcomes. The characterization of individual resources mattered. When modeled as independent of one another, the unique contributions of each individual resource were found to be minor. Some resources—such as cognitive ability on global well-being and freedom from disease on the likelihood of activity participation—failed to significantly predict unique variance. When operationalized as a cumulative index, successful aging outcomes progressively benefited with each additional resource that met criteria. Across all outcomes, little differentiation was observed in the effect of having four compared with five resources. The presence of all five resources was tested as both an index and binary score. The effect magnitude of an index score of 5 was consistently greater than a binary categorization of meeting five resources. After showing that resources were additive and the effect was largely linear, the cumulative index was carried forward to examine the direct and moderating effects of contextual factors.

Successful Aging Within Environmental and Social Structural Contexts

Table 2 displays the unique contributions of age, education, and person–environment congruence to successful aging outcomes. We observed the established age-graded pattern of global well-being, which was lowest among middle-aged and highest among oldest-old respondents, where the oldest old were also least likely to be alive at follow-up. Age-related differences in ExWB were more nuanced. First, although middle-aged respondents were most likely to do activities, they did not significantly differ from the young-old in positive ExWB and reported the

Table 1. Distribution of Study Covariates Across Age Groups

Covariates	Middle aged n = 7,220 M (SD)	Young-old n = 7,534 M (SD)	Oldest old n = 2,476 M (SD)
Female	59%	58%	60%
Race			
White	59%	74%	84%
Black	22%	15%	9%
Hispanic/other	20%	11%	7%
At least some college	33%	24%	21%
Wealth			
Less than $10,800	25%	14%	15%
$10,801–$95,000	22%	18%	19%
$95,001–$247,800	19%	21%	21%
247,801–$587,000	18%	22%	23%
$587,001+	17%	24%	23%
Meet R&K criteria	19%	7%	1%
Absence of disease	49%	34%	24%
Absence of ADL limitations	86%	83%	70%
High physical function	58%	45%	29%
High cognitive function	52%	37%	15%
Socially embedded	71%	57%	30%
Cumulative Index of Individual Resources	3.15 (1.41)	2.57 (1.34)	1.68 (1.22)
Social cohesion	5.23 (1.40)	5.57 (1.38)	5.69 (1.39)
City satisfaction	3.95 (0.95)	4.22 (0.84)	4.32 (0.79)
At 4-year follow-up			
Alive at follow-up	97%	90%	69%
Global well-being	3.78 (0.88)	3.93 (0.86)	3.97 (0.87)
N activities[a]	4.08 (1.66)	3.81 (1.65)	3.60 (1.59)
Watch television[a]	83%	86%	82%
Work/volunteer[a]	31%	17%	9%
Walk/exercise[a]	48%	45%	49%
Health activities[a]	33%	35%	35%
Travel/commute[a]	60%	49%	36%
Socialize[a]	58%	57%	59%
Time alone[a]	45%	43%	49%
Run errands[a]	47%	41%	29%
Positive experienced WB[a]	3.64 (1.40)	3.58 (1.45)	3.35 (1.52)
Negative experienced WB[a]	0.71 (0.96)	0.61 (0.90)	0.58 (0.85)

Note: WB = well-being. Middle age = 51–64; young-old = 65–79; oldest old = 80–96. High physical function = 1 or fewer functional limitations; high cognitive function = upper 50% of word recall; socially embedded = being both engaged in productive activities and socially connected. Meet R&K criteria = All five individual resources meet Rowe and Kahn criteria. Cumulative Index of Individual Resources = sum of individual resources that meet criteria. See Supplemental Table 5 for population estimates.
[a]Means estimated from sample (*N* = 10,994) that completed the Self-Administered Questionnaire in 2012/2014.

highest negative ExWB. The oldest-old were less likely to do activities and reported both lower positive and negative ExWB during activities, compared with their young-old counterparts. Social structural variables (education, gender, race, wealth) also differed in their patterning of global well-being and vital status compared with ExWB. Consistent with previous research, respondents with greater socioeconomic resources were, for the most part, more likely to be alive and report greater global well-being at follow-up. In contrast, for ExWB, education was associated with doing activities, but not the quality of those experiences, and ExWB showed little meaningful variation across gender or quintiles of household wealth. Indicators of person–environment congruence were uniquely associated with improved global and positive and negative ExWB, but not activity participation. City satisfaction was associated with a lower likelihood of being alive at follow-up.

We continued with testing variation in the contributions of individual resources to successful aging outcomes across age, education, and person–environment congruence.

These contextual factors were found to moderate the effect of individual resources on ExWB, but not global well-being and vital status. As shown in Figure 3A, the contribution of individual resources to negative ExWB was greatest for
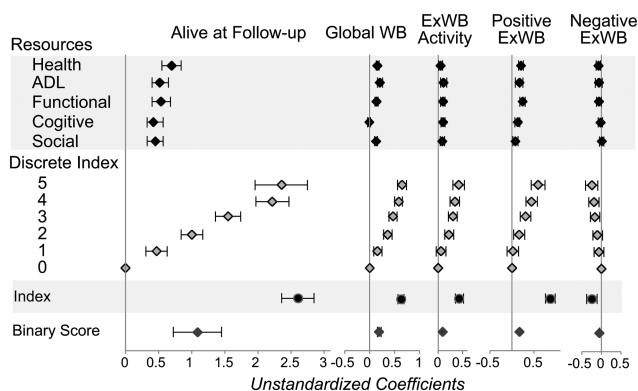
Note. Axes are scaled equally across successful aging outcomes.
Resources: independent contribution of each resource meeting criteria on successful aging outcome. Discrete Index: ref = 5 resources meet criteria. Index: cumulative index of indiviual resources where when n resources = 5. Binary Score: 5 resources meet criteria = 1, < 5 resources meet criteria = 0.

Figure 2. Forest plot of individual resources at baseline as independent, cumulative, and binary contributors to successful aging outcomes at 4-year follow-up.

middle-aged respondents ($b = -0.06$, $SE = 0.02$, $p < .001$). Additionally, individual resources were more strongly linked to activity participation among respondents with lower educational attainment (see Figure 3B); $b = -0.08$, $SE = 0.02$, $p < .001$. Evidence that person–environment congruence may compensate for fewer individual resources was mixed. As shown in Figure 4A, consistent with the compensation hypothesis, city satisfaction dampened the effect of individual resources on negative ExWB ($b = 0.02$, $SE = 0.01$, $p = .04$). Social cohesion (see Figure 4B), in contrast, strengthened the link between individual resources and positive ExWB ($b = 0.02$, $SE = .01$, $p < .03$). All interactions remained significant after adjusting for baseline global well-being, except the significance of city satisfaction × individual resources was further reduced ($p < .07$).

Discussion

In this study, we revisited the 1998 Rowe and Kahn model of successful aging as a collection of unequally distributed individual resources that serve successful aging outcomes within the context age, social structure, and the environment. We examined individual resources as independent, cumulative, and binary "all or nothing" contributors to successful
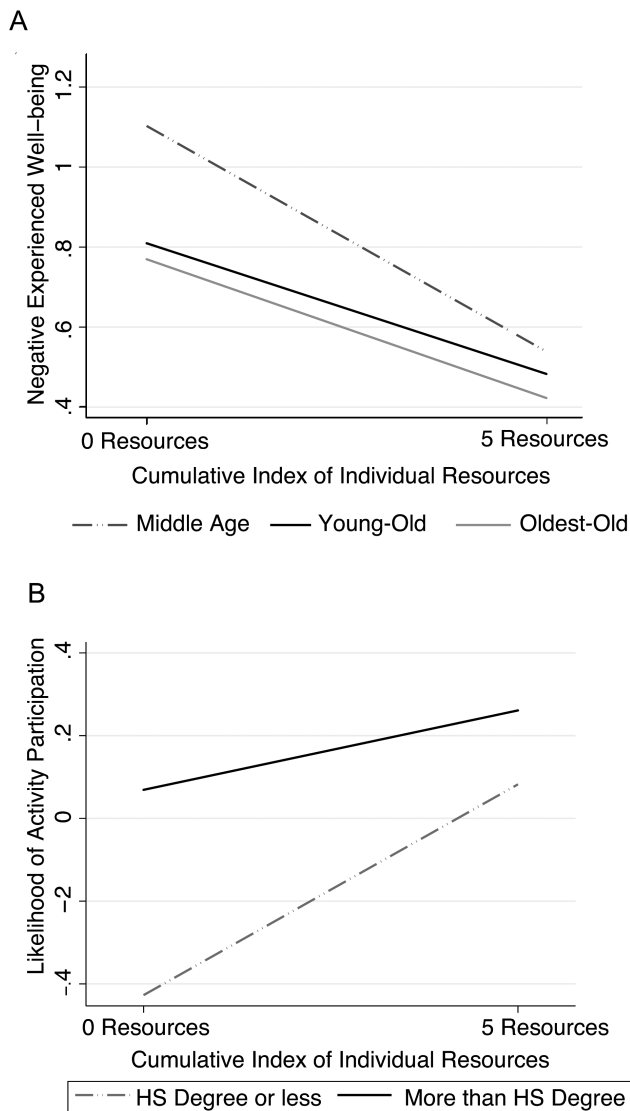
Table 2. Unique Contributions of Cumulative Index of Individual Resources and Study Covariates on Successful Aging Outcomes 4 Years Later

Covariates	Global well-being[a]		Activity participation[b]		Positive ExWB[c]		Negative ExWB[c]		Vital status[d]	
	N = 13,522		N = 10,994		N = 10,994		N = 10,993		N = 17,230	
	b	SE	b	SE	b	SE	b	SE	b	SE
Age										
Middle aged	−0.12***	0.02	0.10***	0.02	0.02	0.03	0.11***	0.02	0.90***	0.05
Oldest old	0.09***	0.03	−0.08*	0.04	−0.17***	0.05	−0.09**	0.03	−1.08***	0.06
Education	−0.05***	0.01	0.25***	0.02	0.01	0.03	0.00	0.02	−0.00	0.07
Female	−0.06***	0.01	0.04†	0.02	0.04	0.03	−0.01	0.02	0.56***	0.06
Race										
African American	0.06**	0.02	−0.04	0.03	0.34***	0.04	−0.08**	0.03	−0.02	0.08
Hispanic/Other	0.10***	0.02	−0.10**	0.03	0.02	0.05	−0.07*	0.03	0.63***	0.10
Wealth										
Less than $10,800	−0.14***	0.03	−0.08*	0.04	−0.16***	0.05	0.11	0.03	−0.57***	0.10
$10,801–$95,000	0.02	0.02	−0.04	0.03	−0.07	0.05	0.03	0.03	−0.32***	0.10
$95,001–$247,800	0.09***	0.02	−0.05	0.03	−0.04	0.04	0.04	0.03	−0.41***	0.09
$247,801–$587,000	0.14***	0.02	0.01	0.03	−0.04	0.04	−0.00	0.02	−0.12	0.10
$587,001+ (ref.)										
Cumulative Index of Individual Resources	0.11***	0.01	0.10***	0.01	0.15***	0.01	−0.12***	0.01	0.53***	0.02
Social cohesion	0.03***	0.01	0.02	0.01	0.10	0.01	−0.06***	0.01	0.04	0.02
City satisfaction	0.18***	0.01	−0.03†	0.01	0.18***	0.02	−0.06***	0.01	−0.09*	0.04

Note: ExWB = experienced well-being. Estimated unadjusted coefficients presented.
[a]Ordinary least square regression using sample that completed baseline (2008/2010) and follow-up (2012/2014) interviews. [b]Multilevel logistic regression using sample that completed baseline interview and experienced well-being measure at follow-up. [c]Multilevel linear regression using sample that completed baseline interview and experienced well-being measure at follow-up. [d]Logistic regression using sample that completed baseline interview.
†$p < .07$; *$p < .05$; **$p < .01$; ***$p < .001$.

A

B

Figure 3. Age (**A**) and education (**B**) moderate the effect of the Cumulative Index of Individual Resources at baseline on experienced well-being (ExWB) at 4-year follow-up.

A

B

Figure 4. Indicators of person–environment congruence—city satisfaction (**A**) and social cohesion (**B**) moderate the effect of the Cumulative Index of Individual Resources on negative and positive experienced well-being (ExWB) at 4-year follow-up.

aging and found their contributions to both established and novel successful aging outcomes to cumulate. Individual resources were most important for successful aging among middle-aged adults and individuals with lower educational attainment. This study also provided evidence that external factors—such as perceived congruence with the environment—can compensate for diminished resources.

A Cumulative Index of Individual Resources for Successful Aging

Essential to Successful Aging 2.0 is attention to variation in health, physical and cognitive function, and social embeddedness in a diverse and aging population. We built on prior research (e.g., McLaughlin et al., 2010; Garfein & Herzog, 1995; Strawbridge, Wallhagen & Cohen, 2002) and showed that, even at midlife, obtaining
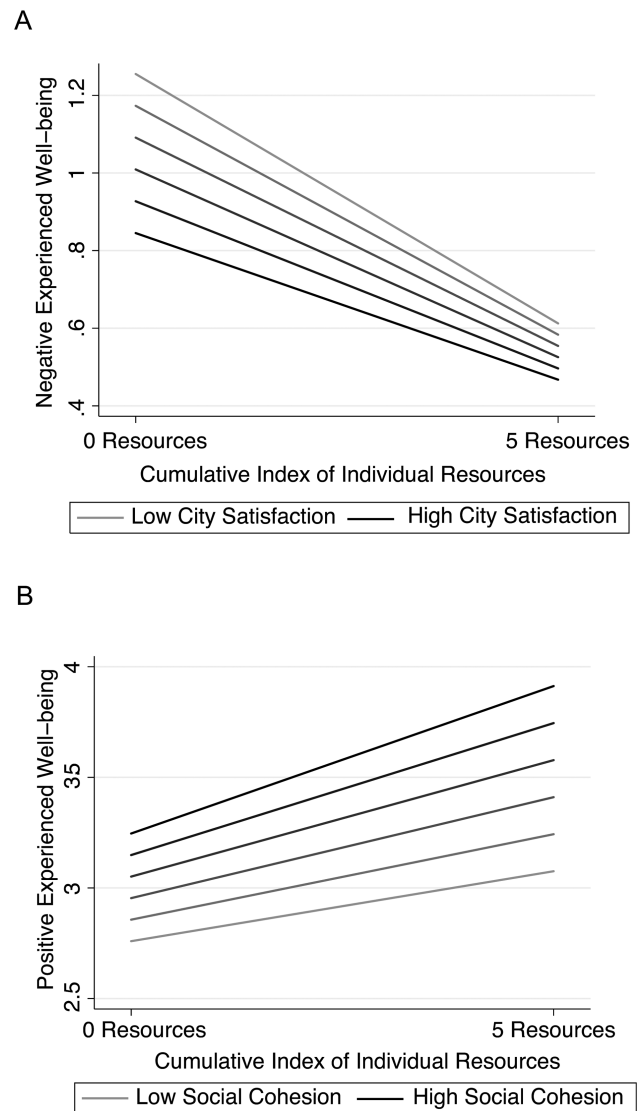
all Rowe and Kahn criteria is the exception, rather than the rule. Thinking of health, functionality, and social embeddedness as resources in service to, rather than definitions of, successful aging opens opportunities to address future cohorts' increasingly diverse needs (Olshansky, 2015). Across all outcomes, the cumulative index better characterized the contributions of individual resources to successful aging. Similar to models of multisystem biological risk (Seeman et al., 1997), our findings suggest that resources build on one another and the number, rather than type, of resources may be most important. How individual resources operate also has implications for policy and practice. Viewing resources as a binary "all or nothing score" violates monotonicity—as resources increase, the index should increase, but the binary score violates this rule. Viewing individual resources as independent

covariates is also problematic—especially from the standpoint of policy. This approach requires four parameter estimates that are sample specific, which complicates generalizations across studies. The cumulative index is monotonic and does not involve estimating multiple parameters. From a policy perspective, changing one resource from bad to good increases the cumulative index, but may not be captured in a binary score, which has implications for policy and program evaluations.

Successful Aging Within the Environment and Social Structural Contexts

Although we found individual resources to relate to global well-being, experienced well-being, and vital status in similar ways, our successful aging outcomes differed in their distributions across age and social structure. The most notable contrast was between global and experienced well-being, where unlike global well-being (e.g., Stone et al., 2010), experienced well-being did not show an age-graded increase. Instead, experienced well-being provided a nuanced age profile of daily experiences among middle-aged, young-old, and oldest-old adults. For example, compared with the young-old, experienced well-being at midlife was found to involve more activities and a similar level of positive well-being, but heightened level of negative well-being during those activities. Additionally, having fewer individual resources was most detrimental to negative experienced well-being at midlife, which may reflect the burden of off-time experiences in physical limitations and illnesses (Elder & George, 2016). Our findings suggest that it is the intensity of the negative, rather than dearth in positive experiences that may lead to lower appraisals of global well-being at midlife. Meanwhile, the oldest-old appeared the most content through the lens of global well-being. Experienced well-being, in contrast, showed oldest-old adults to engage in activities, albeit fewer than young-old adults, and report lower positive and negative well-being during those activities. Mundane activities are part of daily life (Menec, 2003), and experienced well-being may better capture the burdens of routine tasks in late life (Smith & Ryan, 2015) than global appraisals.

Education differentiated patterns of global well-being and the likelihood of activity participation, but not experiences of well-being during those activities. Consistent with previous research (Freedman et al., 2012), our findings suggest that subgroup differences in experienced well-being are not consistently driven by activity selection. Individual resources had little effect on activity participation among those with higher education. The ability to participate in routine activities—even with diminished individual resources—illustrates how early life course experiences can cumulate and aligns with theories of cumulative advantage and disadvantage (Dannefer, 2003).

Finally, person–environment congruence was implicated in both global well-being and experiences of well-being during activities, but not the likelihood of doing activities. Person–environment congruence does not appear to facilitate participation in routine activities, but rather enhances experiences during those activities, which could over time influence global perceptions of well-being (Menec, 2003). Although person–environment congruence supported future well-being, in contrast with previous research on objective characteristics of the environment (Aneshensel, Harig, & Wight, 2016), city satisfaction was associated with a lower likelihood of being alive at follow-up. In light of these conflicting findings, city satisfaction within the context of age, individual, and social structural resources should be further examined across longer follow-up periods.

Consistent with the proposition that experienced well-being is grounded in the context of daily life (Smith et al., 2014), we found the importance of individual resources for experienced, but not global, well-being to be conditioned by person–environment congruence. Person–environment congruence amplified the importance of individual resources for positive experienced well-being and played a compensatory role by alleviating negative experienced well-being among adults with diminished resources. Our findings support theories of person–environment fit (Lawton, 1983) and suggest that in addition to health, functional ability and social embeddedness, congruence within the environment is also important. In illustrating the importance of subjective experiences within the environment, our research justifies further inquiry into other compensatory factors to promote successful aging in vulnerable populations.

Limitations and Future Directions for Research

Our findings should be viewed within the context of the study's limitations. First, we recognize reciprocal relationships between health, activity participation, and well-being, and the limitations of positive selection in our longitudinal study. Conceptualizing health, functional and cognitive ability, and social embeddedness as resources is an important step toward understanding how other vulnerable populations, such as nursing home residents, compensate for diminished resources. There are also limitations in dichotomizing resources as either met or not met. We found individual resources as independent covariates to be insufficient in characterizing how resources support successful aging and suggest future research on data-driven person-centric approaches to identify relevant cut points. We also acknowledge the limitations of perceived measures of person–environment congruence and suggest that both perceived and objective perspectives are necessary to optimize environments to meet individuals' changing needs. Finally, this study focused on vital status at follow-up rather than time to death. Survival analysis, which accounts for censoring, will be important in the assessment of policy and interventions to strengthen individual resources to support successful aging.

Looking Forward to Successful Aging 2.0

Our findings propel research toward Successful Aging 2.0 by focusing on the intersection of individual resources for and outcomes of successful aging within age-related, environmental, and social structural contexts. We found that resources are unequally distributed, build on one another, and compensate for diminished resources. The measure of successful aging is also important. Interventions aimed at compensating for diminished resources should measure well-being within the context of daily activities. Policy should address opportunities to build and maintain individual resources across the life course and identify external environmental and social contexts to support those with diminished individual resources to age successfully.

Supplementary Material

Please visit the article online at http://psychsocgerontology.oxfordjournals.org/ to view supplementary material.

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References

Aneshensel, C. S., Harig, F., & Wight, R. G. (2016). Chapter 15: Aging, neighborhoods, and the built environment. In L. K. George & K. F. Ferraro (Eds.), *Handbook of aging and the social sciences* (8th ed., pp. 315–335). San Diego, CA: Academic Press.

Cagney, K. A., Glass, T. A., Skarupski, K. A., Barnes, L. L., Schwartz, B. S., & Mendes de Leon, C. F. (2009). Neighborhood-level cohesion and disorder: measurement and validation in two older adult urban populations. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **64**, 415–424. doi:10.1093/geronb/gbn041

Dannefer, D. (2003). Cumulative advantage/disadvantage and the life course: Cross-fertilizing age and social science theory. *Journal of Gerontology: Social Sciences*, **58**, 327–337. doi:10.1093/geronb/58.6.S327

Depp, C. A., & Jeste, D. V. (2006). Definitions and predictors of successful aging: A comprehensive review of larger quantitative studies. *The American Journal of Geriatric Psychiatry*, **14**, 6–20. doi:10.1097/01.JGP.0000192501.03069.bc

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, **49**, 71–75. doi:10.1207/s15327752jpa4901_13

Elder, G. H., & George, L. K. (2016). Age, cohorts, and the life course. In M. J. Shanahan, J. T. Mortimer, & M. K. Johnson (Eds.), *Handbook of the life course* (Vol. II, Ch. 3, pp. 59–86). New York, NY: Springer International Publishing. doi:10.1007/978-3-319-20880-0

Freedman, V. A., Cornman, J. C., & Carr, D. (2014). Is spousal caregiving associated with enhanced well-being? New evidence from the panel study of income dynamics. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **69**, 861–869. doi:10.1093/geronb/gbu004

Freedman, V. A., Stafford, F., Schwarz, N., Conrad, F., & Cornman, J. C. (2012). Disability, participation, and subjective wellbeing among older couples. *Social Science & Medicine*, **74**, 588–596. doi:10.1016/j.socscimed.2011.10.018

Fried, L. P., & Ferrucci, L. (2015). Etiological role of aging in chronic diseases: From epidemiological evidence to the new geroscience. In F. Sierra & R. Kohanski (Eds.), *Advances in geroscience* (pp. 37–51). New York, NY: Springer International Publishing. doi:10.1007/978-3-319-23246-1_2

Garfein, A. J., & Herzog, A. R. (1995). Robust aging among the young-old, old-old, and oldest-old. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **50**, 77–87. doi:10.1093/geronb/50B.2.S77

Health and Retirement Study. (*HRS Data Files; 2008, 2010, 2012, 2014) public use dataset* (produced and distributed by the University of Michigan with funding from the National Institute on Aging; grant number NIA U01AG009740). Ann Arbor: University of Michigan.

Herd, P., Robert, S. A., & House, J. S. (2010). Health disparities among older adults: Life course influences and policy solutions. In L. George (Ed.), *Handbook of aging and the social sciences* (7th ed., pp. 121–134). London, UK: Academic Press.

Janke, M. C., Payne, L. L., & Puymbroeck, M. V. (2008). The role of informal and formal leisure activities in the disablement process. *The International Journal of Aging and Human Development*, **67**, 231–257. doi:10.2190/AG.67.3.c

Kennedy, B. K., Berger, S. L., Brunet, A., Campisi, J., Cuervo, A. M., Epel, E. S., … Sierra, F. (2014). Geroscience: Linking aging to chronic disease. *Cell*, **159**, 709–713. doi:10.1016/j.cell.2014.10.039

Kim, E. S., Hawes, A. M., & Smith, J. (2014). Perceived neighbourhood social cohesion and myocardial infarction. *Journal of Epidemiology and Community Health*, **68**, 1020–1026. doi:10.1136/jech-2014-204009

Lawton, M. P. (1983). Environment and other determinants of well-being in older people. *The Gerontologist*, **23**, 349–357. doi:10.1093/geront/23.4.349

Martinson, M., & Berridge, C. (2015). Successful aging and its discontents: A systematic review of the social gerontology literature. *The Gerontologist*, **55**, 58–69. doi:10.1093/geront/gnu037

McArdle, J. J., Fisher, G. G., & Kadlec, K. M. (2007). Latent variable analyses of age trends of cognition in the Health and Retirement Study, 1992–2004. *Psychology and Aging*, **22**, 525–545. doi:10.1037/0882-7974.22.3.525

McLaughlin, S. J., Connell, C. M., Heeringa, S. G., Li, L. W., & Roberts, J. S. (2010). Successful aging in the United States: Prevalence estimates from a national sample of older adults. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **65**, 216–226. doi:10.1093/geronb/gbp101

Menec, V. H. (2003). The relation between everyday activities and successful aging: A 6-year longitudinal study. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **58**, 74–82. doi:10.1093/geronb/58.2.S74

National Research Council. (2013). *Subjective well-being: Measuring happiness, suffering, and other dimensions of experience*. Washington, DC: National Academies Press.

Ofstedal, M. B., Fisher, G., & Herzog, A. R. (2005). *Documentation of cognitive functioning measures in the Health and Retirement Study*. Ann Arbor: Survey Research Center, University of Michigan.

Oishi, S. (2014). Socioecological psychology. *Annual Review of Psychology*, **65**, 581–609. doi:10.1146/annurev-psych-030413-152156

Olshansky, S. J. (2015). The seven most important demographic events that will influence Medicare in the future. *Generations*, **39**, 149–156.

Pantoja, P., Campbell, N., Chan, C., Chien, S., Orla, H., Hurd, M.,…St. Clair, P. (2015). *RAND HRS Income and Wealth Imputations, Version O*. Santa Monica, CA: RAND Center for the Study of Aging.

Pruchno, R. A., & Wilson-Genderson, M. (2015). A longitudinal examination of the effects of early influences and midlife characteristics on successful aging. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **70**, 850–859. doi:10.1093/geronb/gbu046

Riley, M. W. (1998). Successful aging. *The Gerontologist*, **38**, 151. doi:10.1093/geront/38.2.151

Rowe, J. W., & Kahn, R. L. (1998). *Successful aging*. New York, NY: Pantheon/Random House.

Seeman, T. E., Singer, B. H., Rowe, J. W., Horwitz, R. I., & McEwen, B. S. (1997). Price of adaptation—Allostatic load and its health consequences. MacArthur studies of successful aging. *Archives of Internal Medicine*, **157**, 2259–2268. doi:10.1001/archinte.1997.00440400111013

Smith, J., & Ryan, L. H. (2015). Psychological vitality in the oldest-old. In K. W. Schaie & S. J. Willis (Eds.), *Handbook of the psychology of aging* (8th ed., Ch. 16, pp. 303–319). San Diego, CA: Academic Press.

Smith, J., Ryan, L. H., Queen, T. L., Becker, S., & Gonzalez, R. (2014). Snapshots of mixtures of affective experiences in a day: Findings from the Health and Retirement Study. *Journal of Population Ageing*, **7**, 55–79. doi:10.1007/s12062-014-9093-8

Sonnega, A., Faul, J. D., Ofstedal, M. B., Langa, K. M., Phillips, J. W., & Weir, D. R. (2014). Cohort profile: The Health and Retirement Study (HRS). *International Journal of Epidemiology*, **43**, 576–585. doi:10.1093/ije/dyu067

Steffick, D. E. (2000). *Documentation of affective functioning measures in the Health and Retirement Study*. Ann Arobr: Survey Research Center, University of Michigan.

Steptoe, A., & Wardle, J. (2012). Enjoying life and living longer. *Archives of Internal Medicine*, **172**, 273–275. doi:10.1001/archinternmed.2011.1028

Stone, A. A., Schwartz, J. E., Broderick, J. E., & Deaton, A. (2010). A snapshot of the age distribution of psychological well-being in the United States. *Proceedings of the National Academy of Sciences of the United States of America*, **107**, 9985–9990. doi:10.1073/pnas.1003744107

Strawbridge, W. J., Wallhagen, M. I., & Cohen, R. D. (2002). Successful aging and well-being self-rated compared with Rowe and Kahn. *The Gerontologist*, **42**, 727–733. doi:10.1093/geront/42.6.727

Wahl, H. W., Iwarsson, S., & Oswald, F. (2012). Aging well and the environment: toward an integrative model and research agenda for the future. *The Gerontologist*, **52**, 306–316. doi:10.1093/geront/gnr154