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Special Issue: Successful Aging

Successful Aging and Subjective Well-Being Among Oldest-Old Adults

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Purpose of the Study: This research integrates successful aging and developmental adaptation models to empirically define the direct and indirect effects of 2 distal (i.e., education and past life experiences) and 5 proximal influences (i.e., physical functioning, cognitive functioning, physical health impairment, social resources, and perceived economic status) on subjective well-being. The proximal influences involved predictors outlined in most extant models of successful aging (e.g., Rowe & Kahn, 1998 [Rowe, J. W., & Kahn, R. L. (1998). Successful aging. New York: Pantheon Books.]). Our model extends such models by including distal impact as well as interactions between distal and proximal impacts.
Design and Methods: Data were obtained from 234 centenarians and 72 octogenarians in the Georgia Centenarian Study. Structural equation modeling was conducted with Mplus 6.1.
Results: Results showed significant direct effects of physical health impairment and social resources on positive aspects of subjective well-being among oldest-old adults. We also found significant indirect effects of cognitive functioning and education on positive affect among oldest-old adults. Social resources mediated the relationship between cognitive functioning and positive affect; and cognitive functioning and social resources mediated the relationship between education and positive affect. In addition, physical health impairment mediated the relationship between cognitive functioning and positive affect; and

cognitive functioning and physical health impairment mediated the relationship between education and positive affect.

Implications: Integrating 2 different models (i.e., successful aging and developmental adaptation) provided a comprehensive view of adaptation from a developmental perspective.

Key words: Georgia Centenarian Study, Successful aging, Subjective well-being, Oldest-old adults, Developmental adaptation model

Since Rowe and Kahn (1997, 1998) suggested that successful aging includes three main components—low probability of disease and disease-related disability, high cognitive and physical functional capacity, and active engagement with life—considerable research has been conducted on its determinants, conceptualization, and application; furthermore, commentary and debate on successful aging have also been published (McLaughlin, Connell, Heeringa, Li, & Roberts, 2010). Several additional concerns relate to the components of successful aging; for example, Rowe and Kahn's (1997) model did not include subjective perceptions of well-being or meaning of life as determinants (Aldwin, Spiro, & Park, 2005; George, 2006; Lawton, 1999). In addition, in terms of life-span development, human development is a life-long process; and adaptation in the later years is linked to earlier parts of the life course (Crosnoe & Elder, 2002; Elder & Johnson, 2002). This suggests that earlier experience in the life span matters for later life. Rowe and Kahn's model, nevertheless, did not address losses, gains, and the balance between losses and gains in later life (Aldwin et al., 2005).

In a number of adult development models, earlier experiences in childhood and their long-term consequences in adjustment and functioning in later life have been emphasized (Block, 1993; Elder & Johnson, 2002; Settersten, 1999). Martin and Martin's (2002) developmental adaptation model provided a framework for synthesizing past experiences (i.e., distal influences) with available current resources and adaptational outcomes (i.e., proximal influences; Martin & Martin, 2002; Martin, Deshpande-Kamat, Poon, & Johnson, 2011). *Proximal influences* refer to current individual, social, or economic resources; whereas *distal influences* are defined as past personal experiences in cumulative life events or achievements (e.g., education) and historical events (Brown & Anderson, 1991; Martin & Martin, 2002; Wheaton, 1994). *Adaptation* refers to psychosocial adjustment to changing situations (Martin & Martin, 2002). For decades, many developmental scholars suggested the importance of investigating the association of early experiences and developmental trajectories in research on aging (e.g., Martin & Martin, 2002); nevertheless, multiple pathways and compensation mechanisms for successful aging still need to be explored, particularly how older adults can modify aging-related physiological changes or functional deterioration by compensating with psychological or social components (Young, Frick, & Phelan, 2009). A significant number of oldest-old adults, including centenarians who do not satisfy the definitions of Rowe and Kahn's successful aging model, still show high levels of psychological components (Cho, Martin, & Poon, 2012).

The overall objective of this study, therefore, was to evaluate an integrative model of individuals' past and current experiences with aging well that combines the successful aging model and the developmental adaptation model. Reasons for integrating both models include the following: First, Rowe and Kahn's model of successful aging does not include the proximal and distal influences as outlined in the developmental adaptation model. Individual resources highlighted in the developmental adaptation model correspond with low probability of disease and disease-related disability as well as high cognitive and physical functional capacity in Rowe and Kahn's model. Second, the active engagement component in Rowe and Kahn's model corresponds with one of the proximal influences and with past life experiences (i.e., social resources, past life experiences). Third, even though Rowe and Kahn (1997, 1998) suggested including three essential components for optimal aging, the focus of their model did not include developmental perspectives on aging. This weakness might be turned into strength by combining with the developmental adaptation model, which provides a view of the aging process from a broader developmental perspective (Martin & Martin, 2002).

As shown in Figure 1, the purpose of this study was to expand the concept of aging to a spectrum of past and current individual life influences by examining successful developmental adaptation among oldest-old adults. The three components outlined in Rowe and Kahn's model of successful aging (i.e., low probability of disease and disease-related disability, high cognitive and physical functional capacity, and active engagement with life) has been proposed as a predictor of subjective well-being (i.e., Bradburn's [1969] positive affect), viewed as a developmental outcome. Perceived economic status has been included as another predictor of positive affect. In addition, education and past life experiences have been proposed as direct

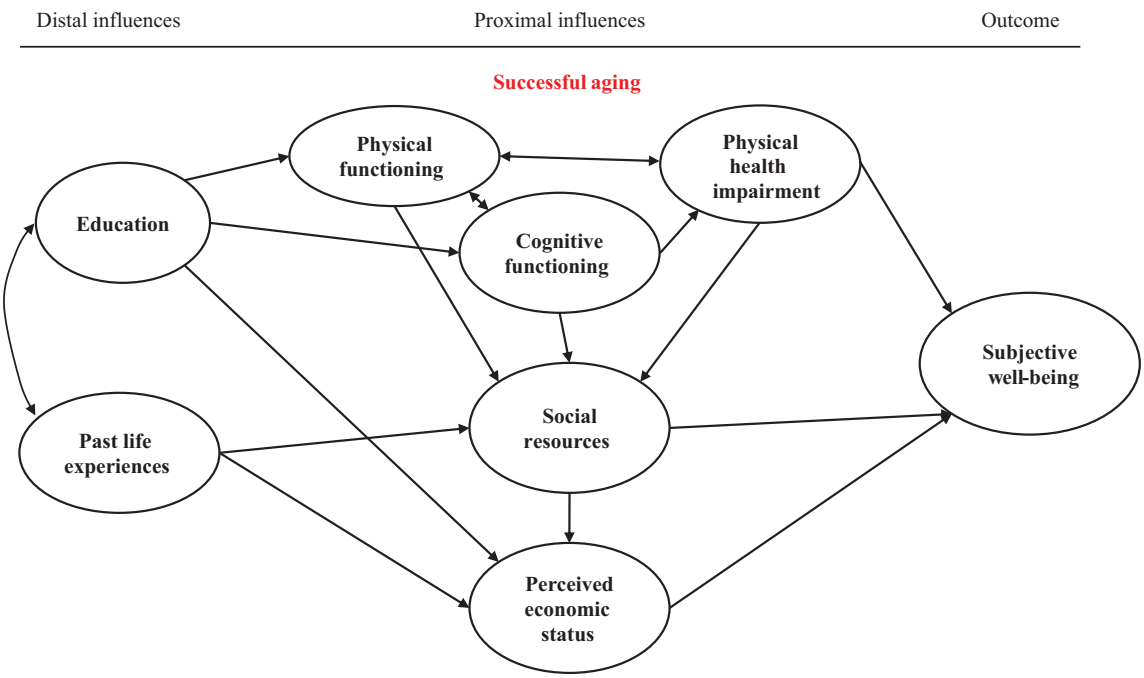

Figure 1. Hypothesized model: Relationships among distal influences, proximal influences, and outcome.

predictors of successful aging components and indirect predictors of a developmental outcome (see Figure 1).

Methods

Participants

As discussed in our previous work (Cho, Martin, MacDonald, Margrett, & Poon, 2011), the sampling frame of the Georgia Centenarian Study (GCS, Phase III; Poon et al., 2007) comprised two strategies. The first strategy was to obtain information about all skilled nursing facilities and personal care homes and to identify all individuals 98 years and older residing in those facilities covering a 44 county area in northern Georgia. Additional participants were identified through voter registration lists. Based on these two strategies, a sample of centenarians was generated resembling the 2000 U.S. Census (Poon et al., 2007). In addition, octogenarians (age 80–89) were recruited based on the proportion of institutionalized octogenarians according to the 2000 census. The sample of recruited centenarians and octogenarians included 375 older adults (287 centenarians and 88 octogenarians) and their proxy informants. Collected during four sequential sessions, information regarding resources and adaptation of centenarians and octogenarians from the older adults and their proxies was the focus of this study.

Except for the centenarians' scores on mental status, all data were provided by proxies. The selection of proxies was determined by a number of criteria. First, spouses or adult children were considered as proxies. If more than one child was available, centenarians would nominate a child who they felt knew most about them. If no children were available, grandchildren or siblings were considered as proxies. Finally, other relatives or care providers were included as proxies if no grandchildren or siblings were available. Most centenarian proxies were children, whereas octogenarian proxies were children and spouses.

Among the 375 participants and their proxy informants, 54 proxy informants (45 centenarians and 9 octogenarians) were excluded because they did not provide data needed for this study. An additional 15 proxies (8 centenarians and 7 octogenarians) were also excluded because of their own low mental status scores (i.e., Mini-Mental Status Examination [MMSE] lower than 23). Therefore, 306 participants' information (234 centenarians and 72 octogenarians) were used in this study. No significant differences in demographic characteristics were found between included and excluded groups.

The majority of centenarians (82.5%) and octogenarians (69.4%) included in this study were women. Over two thirds of octogenarians (86.6%) lived in their own homes, whereas less than half the centenarians (45.5%) lived in their own homes. Predictably, most participants were widowed (86.3% of centenarians and 53.7% of octogenarians). More octogenarians were educated beyond a high school diploma than centenarians (40.4% of centenarians and 59.6% of octogenarians). More octogenarians (86.1%) had high levels of cognition status (MMSE ≥ 23) than centenarians (32.7%). Most centenarian proxies were children (75.5%), whereas children (50.7%) and spouses (32.4%) constituted the majority of proxies among octogenarians.

Table 1. Summary of Demographic Characteristics

Demographic characteristics	Octogenarians (n = 72)		Centenarians (n = 234)		χ^2
	n	%	n	%	
Gender					5.72*
Women	50	69.4	193	82.5	
Men	22	30.6	41	17.5	
Type of residence					35.52***
Private home/apartment	58	86.6	97	45.5	
Personal care (assisted living)	1	1.5	41	19.2	
Nursing home	8	11.9	75	35.2	
Ethnicity					2.02
White/Caucasian	61	84.7	179	76.5	
Black/African American	11	15.3	55	23.5	
Education					22.58**
0–4 years	1	1.5	11	4.9	
5–8 years	2	3.0	53	23.8	
Some high school	6	9.0	26	11.7	
High school diploma	18	26.9	43	19.3	
Trade school or vocational degree	8	11.9	28	12.6	
Some college	9	13.4	22	9.9	
College degree	13	19.4	19	8.5	
Graduate degree	10	14.9	21	9.4	
Marital status					54.15***
Never married	1	1.5	9	4.3	
Married	26	38.8	10	4.7	
Widowed	36	53.7	182	86.3	
Divorced	4	6.0	9	4.3	
Separated	0	0.0	1	0.5	
Cognitive status					63.59***
Low (MMSE ≤ 17)	9	12.5	112	48.3	
Mid (18 ≤ MMSE ≤ 22)	1	1.4	44	19.0	
High (MMSE ≥ 23)	62	86.1	76	32.7	
Proxy					63.35**
Children	36	50.7	173	75.5	
Spouses	23	32.4	5	2.2	
Grandchildren	1	1.4	23	10.0	
Siblings	2	2.8	6	2.6	
Others	9	12.7	22	9.6	

Notes: MMSE = Mini-Mental Status Examination.
*p < .05. **p < .01. ***p < .001.

A summary of demographic characteristics of the remaining sample of 306 participants is shown in Table 1.

Using Information From Proxies

Obtaining information from oldest-old adults is not always easy or feasible because of sensory and functional limitations. In order to overcome the limitation in obtaining information from oldest-old adults, a number of studies have shown that using information from proxy informants can be helpful as a reliable source for certain domains, such as activities of daily living, medical history, and instrumental activities of daily living (IADLs; Loewenstein et al., 2001; Martin, MacDonald, Margrett, Siegler, & Poon, 2013; Watkins, Guariglia, Kaye, & Janowsky, 2001; Weinberger et al., 1992), and that a significant relationship exists between self- and physicians' reports or between self- and proxies' reports (Bassett, Magaziner, & Hebel, 1990).

Several recent studies suggested that proxy ratings are possibly comparable in describing psychological variables, even though some researchers have cautioned that proxy scores cannot be used as substitutes but should be deemed supplemental information (e.g., Kane et al., 2005). A meta-analysis conducted by Schneider and Schimmack (2009) showed that higher agreement was more likely to be obtained for positive than negative traits, for older than

younger age, and for multiple than single-item measures. Furthermore, Han, Burns, Weed, Hatchett, and Kurokowa (2009) reported that peer ratings showed higher reliability than self-ratings by testing measurement equivalence of two ratings in a coping inventory. This indicates that informant data can be proved as a valid source and may contribute to a better understanding of psychological aspects among oldest-old adults (Martin et al., 2013). Given the reviews from existing literature, using informant data may be the only reliable source of information for many centenarians. Therefore, the current study used information provided by proxies in the analysis. The report sources for each measurement are described in the following section.

Measures

Subjective Well-Being

In this study, subjective well-being was examined with positive affect, based on the Bradburn Affect Balance Scale (Bradburn, 1969). Four positive affect items ($\alpha = 0.76$) were used. Proxies were asked to rate positive emotion of oldest-old adults with items such as pleased, excited, going one's own way, and feeling on top of the world during the past two weeks. Ratings were given on a 4-point Likert scale: 1 = *not at all*; 2 = *once*; 3 = *several times*; 4 = *often*. Higher scores for positive affect indicated high levels of subjective well-being.

Physical Functioning

Seven items on each of two commonly used dimensions, IADLs and physical activities of daily living (PADLs), constituted the self-care capacity assessment (Fillenbaum, 1988) with coefficients $\alpha = 0.92$ and $\alpha = 0.88$, respectively. Proxies of centenarians and octogenarians provided the information. In addition, internal consistency of all 14 items was $\alpha = 0.94$. IADL questions covered the ability to use the telephone, travel to places beyond walking distance, go shopping, prepare meals, do housework, take medicine, and handle one's own money. PADL questions covered the ability to eat, dress, take care of appearance, walk, get in and out of bed, take a bath, and have trouble getting to the bathroom. All 14 items were scaled so that 2 = *without help* (e.g., can clean floors, etc.); 1 = *with some help* (e.g., can prepare some things but unable to cook full meals by oneself); or 0 = *completely unable to perform the task* (e.g., cannot prepare any meals). Physical functioning was scaled so that higher scores indicated higher levels of self-care capacity. Three indicators were extracted through exploratory factor analysis: dressing, taking care of appearance, and getting in and out of bed.

Physical Health Impairment

Physical health impairment was assessed subjectively and objectively. The subjective assessment of current health status from proxy reports comprised two questions. First, proxies were asked to rate the participant's overall health at the present time—excellent, good, fair, or poor. Responses were scaled from 0 = *poor* to 3 = *excellent*. Second, all proxies were also asked the extent to which the health troubles of the participants stand in the way of their doing the things they want to do. Responses were scaled from 0 = *a great deal* to 2 = *not at all*. Health problems, the objective aspects of physical health, included 20 health conditions such as problems with hearing, vision, sense of smell, sense of taste, and dizziness as indicated by the most reliable report from centenarians/octogenarians, proxies, medical charts, or care facility professionals. Responses were scaled 0 = *no* and 1 = *yes*. The number of these problems was counted (ranges from 0 to 20), and higher scores indicated more health problems.

Cognitive Functioning

Mental status was examined with the MMSE (Folstein, Folstein, & McHugh, 1975) and administered by trained interviewers. The MMSE, commonly used to evaluate cognitive impairment, comprises five sections: orientation, registration, attention and calculation, recall, and language. In the original study reliability was 0.98 for older adults, and concurrent validity with the Wechsler Adult Intelligence Scale was 0.78 (Folstein et al., 1975). Centenarians' and octogenarians' performance ranged from 0 to 30, and the 30 items yielded a reliability of $\alpha = 0.87$ for this study. A higher score on the MMSE indicated better mental status.

Social Resources

Social resources were measured with three questions (Fillenbaum, 1988): number of people with whom the participant is socially engaged, frequency of talking with others, and frequency of interaction with others who do not live with the participant. Responses to the three questions were provided by proxies. In the original study, the reliability coefficient was $\alpha = 0.56$ (Fillenbaum, 1988), and reliability for this study was $\alpha = 0.61$. Social resources were scaled so that higher scores indicated higher levels of social resources.

Perceived Economic Status

Perception of economic status from proxy reports was assessed with items on the economic resources scale from the Duke Older Americans Resources and Services Procedures (Fillenbaum, 1988). Proxies assessed the economic resources of the oldest-old adults with questions such as the following: Are his or her assets and financial resources sufficient to meet emergencies? How well does the amount of money he or she has take care of his or her needs—very well, fairly

well, or poorly? Does he or she usually have enough to buy those little "extras," that is, small luxuries? The three items yielded a reliability of α = 0.82. Higher scores indicated perceptions of high economic status.

Education

Proxies answered one question about past schooling of octogenarians and centenarians. The participants selected one of eight categories: 1 = 0–4 years, 2 = 5–8 years, 3 = high school incomplete, 4 = high school completed, 5 = post high school, business or trade school, 6 = 1–3 years college, 7 = 4 years college completed, and 8 = postgraduate school.

Past Life Experiences

Past life experiences were defined by a series of cognitive engagement tasks used in the Victoria Aging Study (Hultsch, Hertzog, Small, & Dixon, 1999) and included seven dichotomous items dealing with such activities as learning a foreign language, volunteering, traveling, preparing income tax, and public speaking. Responses to the seven items were provided by proxies. Exploratory factor analysis identified three factors. The one labeled "social productive activities" included learning a foreign language, public speaking, and volunteering. The second was labeled "managing of personal assets" and included preparing income tax and balancing one's checkbook. The third was labeled "learning experiences" and included going back to school and participating in a job-training program. The internal consistency scores for the obtained three factors were somewhat low, (Cronbach's α ranging from 0.40 to 0.55), probably because a limited number of items were included and because engaging in one activity does not necessarily imply engagement in other activities (Cho, Martin, & Poon, 2013). These three factors corresponded to one of the determinants of successful aging: active engagement with life.

Analyses

Structural Equation Modeling

Structural equation modeling (SEM) was used to evaluate four steps: (a) examining the measurement model (Model 1) through a confirmatory factor analysis, (b) including covariates (age, gender, ethnicity, and residence; Model 2), (c) investigating a modified fully recursive model (Model 3), and (d) examining the hypothesized structural model (Model 4). Mplus 6.1 (Muthén & Muthén, 2004) was used to conduct confirmatory factor analysis and SEM. When the confirmatory factor analysis was conducted, one single indicator (i.e., education) and seven latent variables comprised one outcome variable (positive affect), five successful aging determinants (physical health impairment, perceived economic status, physical functioning, cognitive functioning, and social resources), and one distal variable (past life experiences). When Model 3 was examined, the correlation between cognitive functioning (MMSE score) and the second indicator of social resources (i.e., number of times to talk to someone) was .66. This caused a high correlation between two different latent constructs, cognitive functioning and social resources. Eliminating the second indicator of social resources (i.e., frequency of talking with others) distinguished the two different latent constructs and provided an acceptable fit. Furthermore, the path from past life experiences to cognitive functioning was not significant due to a high correlation between past life experiences and education. Removing the path provided an acceptable fit. Thus, the third model was named the modified fully recursive model.

Significant direct and indirect pathways were assessed by examining the beta coefficients in the hypothesized model through latent variable SEM. Specifically, bootstrap procedures were conducted to assess indirect effects of successful aging components (physical health impairment, perceived economic status, physical functioning, cognitive functioning, and social resources) on positive affect and indirect effects of distal influences (education and past life experience) through successful aging components on positive affect. The full-information maximum likelihood (FIML) procedure was used for missing values in the confirmatory factor analysis and SEM analysis because FIML maximizes the fit of the model to the data using all information (Raykov, 2005). In addition, fit indices of interest included the χ^2 fit, comparative fit index (CFI), Tucker and Lewis' non-normed fit index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMSR).

Results

This study was designed to examine what components of successful aging model and distal influences are associated with positive affect among oldest-old adults through SEM. Factor loadings from the confirmatory factor analysis ranged from .39 to .99 (Table 2).

The fit of the measurement model through confirmatory factor analysis (Model 1) was satisfactory: χ^2 (df = 162) = 258.94, p < .001, CFI = .96; TLI = .95; RMSEA = .04, and SRMSR = .06 (Table 3). Model 2, which includes covariates (age, gender, ethnicity, and residence; covariate model), was tested. The fit of the model was acceptable: χ^2 (df = 176) = 352.18, p < .001, CFI = .95; TLI = .93; RMSEA = .05, and SRMSR = .05 (Table 3). Specifically, the covariate model showed significant direct effects of age group on education (β = –.16, p < .01), physical functioning (β = –.19, p < .001), and cognitive functioning

Table 2. Factor Loadings for Confirmatory Factor Analysis for Positive Affect Model

Measure and variable	Factor loading	Standard error	Uniqueness	Standardized factor loading
Education				
Single indicator	1.00			1.00
Past life experiences				
Social productive activities	1.00	—	.62	.60
Management of personal assets	.56	.08	.33	.50
Learning experiences	.52	.09	.40	.44
Cognitive functioning				
MMSE summary score	1.00	—	10.53[a]	.93
Physical functioning				
Dressing	1.00	—	.09	.91
Taking care of appearance	.96	.05	.16	.84
Getting in and out of bed	.99	.05	.12	.88
Physical health impairment				
Overall physical health	−.52	.12	.34	−.67
Comparative health	−.55	.14	.31	−.71
Number of health problems	1.00	—	6.76	.36
Social resources				
Number of people to know	.51	.07	.61	.52
Number of times to talk	1.00	—	.59	.77
Number of times to spend tome	.41	.07	.74	.40
Perceived economic status				
Sufficient financial resources	.63	.04	.05	.87
Meet needs	1.00	—	.16	.84
Capacity to buy small luxuries	.50	.04	.09	.72
Positive affect				
Pleased	1.00	—	.45	.77
Excited/interested	.85	.08	.51	.70
Goes one's way	.69	.10	.96	.50
On top of the world	.89	.09	.66	.67

Notes: MMSE = Mini-Mental Status Examination.
[a]Unstandardized errors for cognitive functioning on the basis of sample variance estimate and internal consistency estimate (e.g., reliability): δ_x = VAR (cognitive functioning) (1–ρ). Based on this formulation, the unstandardized errors for cognitive functioning were fixed at 10.53.

Table 3. Fit Indices of Positive Affect Model

Model	χ^2	*df*	χ^2 diff	RMSEA	SRMSR	CFI	TLI
1. Measurement model	258.94	162		.04	.06	.96	.95
2. Covariate model (included covariates)	352.18	176		.05	.05	.95	.93
3. Modified fully recursive model	298.00	192		.04	.05	.96	.94
4. Structural model	334.29	204		.05	.06	.95	.93
Difference between Model 3 and Model 4			40.5***				

Notes: CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMSR = standardized root mean square residual; TLI = Tucker and Lewis' non-normed fit index. ***$p < .001$.

(β = −.26, $p < .001$). The results suggest that centenarians had lower levels of education, physical functioning, and cognitive functioning than octogenarians. Then, a modified fully recursive model (Model 3) was tested because of a high correlation between cognitive functioning and social resources. Eliminating the second indicator of social resources distinguished the two different latent constructs. The modified fully recursive model (Model 3) had an acceptable fit: χ^2 (*df* = 192) = 298.00, $p < .001$, CFI = .96; TLI = .94; RMSEA = .04, and SRMSR = .05 (Table 3). Model 4, the structural model, was also examined and showed a satisfactory fit: χ^2 (*df* = 204) = 334.29, $p < .001$, CFI = .95; TLI = .93; RMSEA = .05, and SRMSR = .06 (Table 3).

Our purpose in this study was to test the specified hypothesized model even though Model 3 was a better fitting model in comparison to Model 4: $\chi^{2\text{diff (13)}} = 40.5$, $p < .001$. After re-specifying hypothesized paths, path

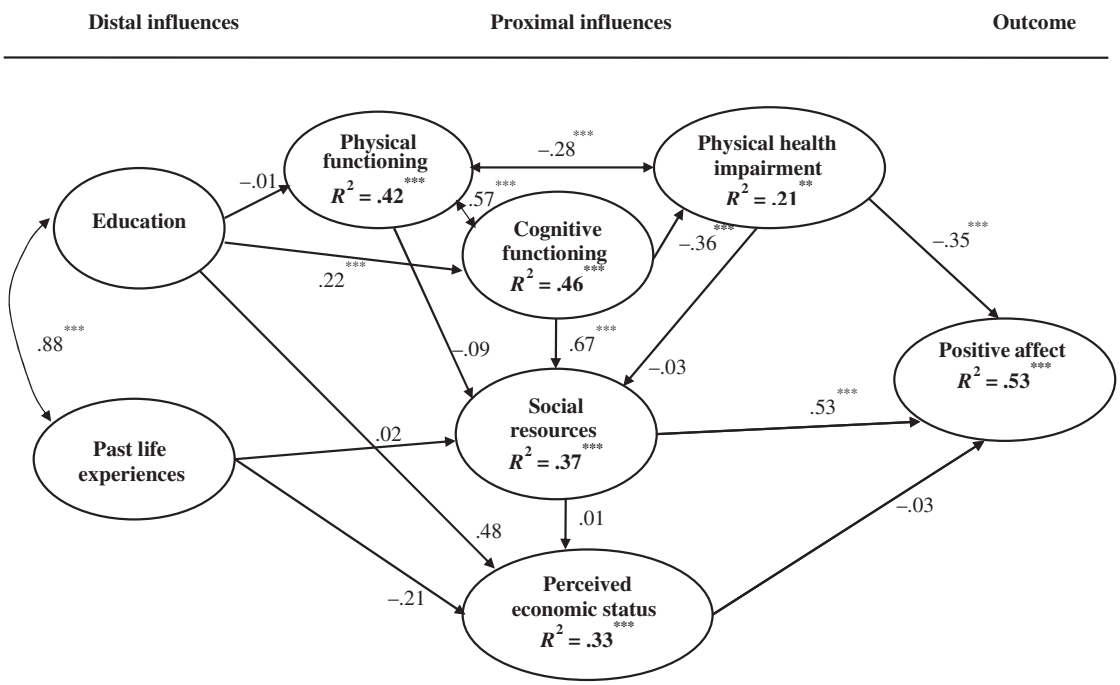

Figure 2. Structural model of positive affect.
Notes. Path coefficients are standardized parameter estimates. Four covariates (age, gender, ethnicity, and residence) were included in testing the effect on all endogenous variables.
*p < .05. **p < .01. ***p < .001.

coefficients of the structural model (Model 4) were evaluated (Figure 2), and several pathways were significant. First, physical health impairment and social resources had a direct effect on positive affect: β = –.35, p < .001 for physical health impairment and β = .53, p < .001 for social resources. In other words, lower levels of physical health impairment and high levels of social resources were associated with higher levels of positive affect. Second, education had a positive direct influence on cognitive functioning: β = .22, p < .001, suggesting that more education predicted high levels of cognitive functioning. Thus, more education was associated with higher levels of cognitive functioning. Third, cognitive functioning had a positive effect on higher levels of social resources: β = .67, p < .001, and on physical health impairment: β = –.36, p < .001. Thus, higher levels of cognitive functioning were associated with more social resources and lower levels of physical health impairment. However, past life experiences and perceived economic status did not show any significant direct effects on other constructs. Fifty-three percent of the variance in positive affect was explained.

As shown in Figure 2, the indirect effects of the components of successful aging on positive affect and the indirect effects of the distal influences through successful aging components on positive affect were examined. For example, possible indirect effects, such as an indirect effect of past life experiences on positive affect (past life experiences → perceived economic status → positive affect) and an indirect effect of education on positive affect (education → cognitive functioning → social resources → positive affect, education → perceived economic status → positive affect, or education → physical functioning → social resources → positive affect), were examined. The hypothesized structural model was tested 500 times with the bootstrap procedure. Results showed four significant indirect effects on positive affect: the path from cognitive functioning through physical health impairment to positive affect (β = .13, p < .05), the path from cognitive functioning through social resources to positive affect (β = .36, p < .001), the path from education through cognitive functioning and physical health impairment to positive affect (β = .03, p < .05), and the path from education through cognitive functioning and social resources to positive affect (β = .08, p < .01; Table 4).

Discussion

This study provides an understanding of how Rowe and Kahn's (1997, 1998) successful aging model and Martin and Martin's (2002) developmental adaptation model can be applied to oldest-old adults and how distal and proximal influences (e.g., successful aging components) are related to the positive aspect of subjective well-being among oldest-old adults. Results suggest significant direct effects of social resources and physical health impairment on positive affect and noteworthy indirect effects of cognitive functioning and education on positive affect among oldest-old adults.

Table 4. Bootstrap Analysis of Indirect Effects

Indirect effect	Unstandardized estimates	Standard error	*t*-value	Standardized estimates	Confidence interval (95%)
COG → HEAL → PA	.01	.01	2.21	.13	(.00, .02)
COG → SS → PA	.04	.01	3.48	.36	(.02, .05)
EDU → COG → HEAL → PA	.01	.01	2.05	.03	(.00, .02)
EDU → COG → SS → PA	.03	.01	2.54	.08	(.01, .05)

Note. COG = cognitive functioning; HEAL = physical health impairment; PA = positive affect; PHY = physical functioning; SS = social resources.

In terms of direct effects, high levels of social resources and low levels of physical health impairment were associated with high levels of positive affect. Concerning indirect effects, social resources mediated the relationship between cognitive functioning and positive affect as well as the relationship between education and positive affect. In addition, physical health impairment mediated the relationship between cognitive functioning and positive affect as well as the relationship between education and positive affect.

Distal and Proximal Influences on Subjective Well-Being Among Oldest-Old Adults

The finding of this study is notable in that both proximal influences and distal influences are significant predictors for positive affect among oldest-old adults. First, physical health impairment and cognitive functioning play important roles in the positive aspect of subjective well-being. In line with previous research showing decline of cognitive functioning and deterioration of physical health at advanced ages leading to lower levels of psychological status (Young et al., 2009), a significant association between physical health impairment and emotional status reemphasized the importance of physical health and cognition on psychological status in advanced old age. This result may be inconsistent with the dynamic equilibrium model (Headey & Wearing, 1992), indicating that the construct of well-being may be stable over time. Specifically, age-related declines or loss (e.g., decrease in cognitive and physical functioning) may not have a major adverse effect on well-being because very old adults have gone through a life-long process of losses and gains (Mroczek & Kolarz, 1998).

Second, social resources had a pivotal influence on positive affect among oldest-old adults. High levels of social resources were significantly related to high levels of positive affect. Furthermore, social resources played an important mediation role in the relationships between cognition and positive affect and education and positive affect. The higher the levels of education or cognition, the more frequent and intense social interactions, which in turn contributed to higher levels of positive affect. One possible explanation may relate to socioemotional selectivity theory, suggesting that persons in very late life establish and interact in social relationships that offer high levels of emotional benefits (Carstensen, Isaacowitz, & Charles, 1999). Based on this theory, research on aging suggests that socializing, especially selective socializing, is of importance in older samples (Carstensen et al., 1999; Lang, 2001; Lansford, Sherman, & Antonucci, 1998). For instance, older adults prefer interaction with friends whose interests are similar (Brown, 1981; Li, Ji, & Chen, 2014; Usui, 1984). Experiences in declining number of friends and family, physiological changes, and functional deterioration may make older adults, especially in extremely old age, focus on intensity of relationships with their acquaintances. This might be obvious for older adults with higher levels of cognitive functioning. Older adults with higher cognitive functioning may find it stimulating to be around and to have more interaction with friends and family. Consequently, the interaction with friends and family and the long-term relationship may support positive experiences in subjective well-being among oldest-old adults. Therefore, the importance of social resources or close relationships with others is consistent with this theory and previous aging research.

Third, this study demonstrates the indirect effect of education on positive affect in very late life. Most successful aging studies have focused on significant proximal predictors for successful aging, such as physical and cognitive functioning, physical health, or social resources. Several studies have shown a positive relationship between education and positive affect among younger age groups (e.g., Headey & Wearing, 1992). Recently, Alley, Suthers, and Crimmins (2007) highlighted the role of education, not only in long-term cognitive performance but also in old-age cognitive trajectories. Nevertheless, the association between education and affect is relatively unknown among oldest-old adults; therefore, focusing on education as a distal influence in this study is noteworthy, suggesting the importance of distal influences on successful aging. As the developmental adaptation model highlights that early life experiences play a critical role in current experiences and successful adaptation (Martin & Martin, 2002), the findings of this study show the cumulative effect of education in the past on positive affect and address the importance of past life experiences in life-long processes.

Even though several significant factors are associated with positive affect, a couple of other factors show no significant relation to positive affect among oldest-old adults. First is the perceived economic status variable. Previous researchers have

suggested that income and assets are significant factors in subjective well-being (e.g., George, 1992; La Barbera & Gürhan, 1997). In addition, financial status or economic resources have been held to be directly related to obtaining services for basic needs in later life (Slivinske, Fitch, & Morawski, 1996). Even though previous studies have demonstrated the importance of economic status or financial resources in later life, no significant relationship between perceived economic status and positive affect is evident in this study. One plausible explanation is that financial resources are not so important to oldest-old adults. Most oldest-old adults, especially centenarians, rely on family, community, or societal support, such as Social Security benefits, Medicare, and Medicaid (Goetting, Martin, Poon, & Johnson, 1996); therefore, oldest-old adults may pay little attention to their day-to-day financial resources, and as a consequence financial resources did not influence their psychological status. The second variable that was not predictive of positive affect is past life experiences. Although the importance of cumulative life experiences for mental health has been suggested in several previous studies (Davies, Avison, & McAlpine, 1997; Martin, 1995; Martin & Smyer, 1990; Meyers & Battistoni, 2003; Rindfuss, 1991), past life experiences present no significant direct or indirect effect on other factors in this study. One possible reason is that measurement of past life experiences is closely related to learning experiences, so even though past life experiences were included as a distal influence with education and contributed to some proportion of variance of perceived economic status (R^2 = .33), the scales for past life experiences may overlap with education. Another explanation may be that different people have many different experiences, a fact that may not be captured with an index of cumulative experiences; therefore, assessing the importance of particular events would perhaps be more meaningful than a global index of past life experiences.

Limitations and Implications

Although findings from this study produced several relevant outcomes in understanding successful aging and well-being in very late life, several limitations affect the generalization of the results of this study. First, the sample of this study derived from only one geographic area of the United States. Other oldest-old adults in different regions may present different patterns of successful aging and developmental adaptation. Second, most of the variables were obtained from proxy ratings. Numerous researchers have demonstrated that proxy informants are reliable and substitutable for self-rated reports (Ball, Russell, Seymour, Primrose, & Garratt, 2001; Bassett et al., 1990; MacDonald, Martin, Margrett, & Poon, 2010), but disagreement about perspective on psychological aspects that may result in differences from using self-ratings of oldest-old adults must be considered. Namely, proxy reports might be more objective and realistic compared with self-ratings (e.g., health information, economic status), whereas older adults may view life as more or less positive. This suggests that although older adults' capacities in daily activities, physical performance, and cognitive function may not be optimal as they once were, oldest-old adults may have more positive feelings about current life (Yi & Vaupel, 2002). Third, although past life experiences as a distal influence were assessed with previous experiences when oldest-old adults were young, all indicators were examined with a cross-sectional design; therefore, causal inferences about the relationship between distal influences, proximal influences, and developmental outcome cannot be made. Furthermore, the internal consistencies of the subscales of past life experiences (i.e., social productive activities, management of personal assets, and learning experiences) were low. As addressed in our recent study (Cho et al., 2013), the subscales do not have to be closely correlated to each other under the same subcategory. For example, with regard to the learning experiences, some people might experience either returning to school or participating in a job-training program; others might be involved in both activities. Future research, however, should use more reliable measurements. Finally, another measurement issue is that we used the MMSE score to measure cognitive functioning. A common criticism of the MMSE score is a testing bias among those who are illiterate, who have had minimal schooling (≤8 years), or who are 80 years of age or older (Crum, Anthony, Bassett, & Folstein, 1993). About 20% of participants in this study correspond to one of the three categories. Future research may use adjusted MMSE scores to minimize Type I error.

Despite these limitations, the results of this study have numerous implications for gerontologists and practitioners. Researchers and practitioners should consider many different factors for successful aging. For example, three variables (i.e., gender, ethnicity, and residence) served as covariates in this study (i.e., Model 2). Several significant effects of these covariates on several latent constructs were found even though we did not show specific results. In particular, residence, whether participants lived in a nursing home or not, showed significant effects on all constructs (i.e., past life experiences, education, physical functioning, cognitive functioning, physical health impairment, social resources, perceived economic status, and positive affect). Future studies may compare the model across residential settings.

Conclusion

This study reveals noteworthy insight into Rowe and Kahn's successful aging model and the psychological status of oldest-old adults. Integrating two different models (i.e., successful aging and developmental adaptation) provided a comprehensive view of the aging process and successful developmental adaptation from a developmental perspective. Furthermore, this study provides a better

understanding of successful aging, reflecting not only current problems (e.g., cognitive or physical functioning) but also distal aspects of development in aging-related research. Future researchers should consider multiple pathways and compensation mechanisms that modify aging-related changes for successful aging (Young et al., 2009), especially for individuals in extremely old age (Gondo, 2012).

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