Hayward, R.D., & Krause, N. (2013). Trajectories of late-life change in God-mediated control. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 68(1),* 49–58, doi:10.1093/geronb/gbs054. Advance Access publication August 3, 2012

Trajectories of Late-Life Change in God-Mediated Control

R. David Hayward and Neal Krause

University of Michigan, Ann Arbor.

Objective. To track within-individual change during late life in the sense of personal control and God-mediated control (the belief that one can work collaboratively with God to achieve one's goals and exercise control over life events) and to evaluate the hypothesis that this element of religion is related to declining personal control.

Method. A longitudinal survey representative of older White and Black adults in the United States tracked changes in personal and God-mediated control in four waves over the course of 7 years.

Results. Growth curve analysis found that the pattern of change differed by race. White adults had less sense of God-mediated control at younger ages, which increased among those who were highly religious but decreased among those who were less religious. Black adults had higher God-mediated control, which increased over time among those with low personal control.

Discussion. These results indicate that God-mediated control generally increases during older adulthood, but that its relationships with personal control and religious commitment are complex and differ between Black and White adults.

Key Words: Growth curve analysis—Religion—Sense of control.

MOST gerontologists would agree that aging is characterized by a shift in the balance between gains and losses: As people grow older, the ratio between the two becomes less favorable (Baltes & Smith, 1999). Late-life losses may occur in a number of domains, including physical health and cognitive functioning (Federal Interagency Forum on Aging Related Statistics, 2010). Losses may also occur with respect to social psychological constructs, including those related to positive self-perception. In particular, late-life losses in feelings of personal control have been well documented, with a number of studies suggesting a pattern of accelerating decline across the span of older adulthood (Lachman, Rosnick, & Röcke, 2009; Lachman & Weaver, 1998; Mirowsky, 1995, 1997; Wolinsky & Stump, 1996; Wolinsky, Wyrwich, Babu, Kroenke, & Tierney, 2003). These losses have serious implications for mental and physical health (Lachman, Neupert, & Agrigoroaei, 2011), but so far there has been little research into ways in which older adults may compensate for them. Increasing religiousness, and in particular an increasing sense of God-mediated control (Berrenberg, 1987; Krause, 2005), may play an important role in this regard and is the focus of the present study.

Although the construct of control has been measured and defined in a number of ways, embedded in each approach is the notion that individuals with a strong sense of control believe that the changes in their social worlds are responsive to and contingent upon their own choices, efforts, and actions (Ross & Sastry, 1999). In contrast, people with a weak sense of control believe the events in their lives are shaped by forces outside their influence and that they are unable to regulate the things that happen to them. This sense of personal control is a theoretically important element of successful aging (Rowe & Kahn, 1998), and a large empirical literature links it with better mental and physical health in late life in a number of domains (see Lachman et al., 2011 for a review). Research in this area has largely focused on factors that promote this late-life decline. A range of potentially important mechanisms has been identified, including poor health (Wolinsky & Stump, 1996), worsening cognitive impairment (Shaw & Krause, 2001), and diminished subjective life expectancy (Mirowsky, 1997). Although identifying the sources of late-life losses in control is a vitally important area of research, it provides an incomplete picture of the dynamics of change as they occur in older adulthood. As Baltes and Smith (1999) point out, older people are quite adept at adjusting to late-life losses because they actively strive to find ways to compensate for the challenges they face.

The ability to make these adaptations is a central component of successful aging (Baltes & Smith, 2003). In doing so, older adults may enlist a variety of strategies of secondary control, which aim to compensate for a diminished sense of personal control by making internal adjustments in their focus or expectations regarding the self (Heckhausen & Schulz, 1995). Although definitions of secondary control vary (Morling & Evered, 2006;

Received December 12, 2011; Accepted May 2, 2012
Decision Editor: Bob G. Knight, PhD

Skinner, 2007), both cognitive and social adjustments may be used to help mitigate the impact of losses in personal control on the self-concept (Skinner, 1996). For example, physical limitations that make it difficult to continue to maintain a house may be partially met using cognitive reframing strategies, like devaluing physical ability in favor of intellectual or emotional abilities. Social strategies, such as enlisting help from family members, may also serve to partially address these needs; if one cannot be in control oneself, this type of proxy control can substitute the feeling that someone close is in control. Comparatively little attention has been given to the role of religion in the context of these late-life changes in the sense of control. Numerous investigators maintain that people become more deeply involved in religion as they grow older (see Krause, 2008, for a review of this literature). Because religious beliefs often encompass views about the role of divine agency in controlling the events of one's life, late-life increases in religiousness may help to provide alternative perceptions of control that help to offset a declining sense of personal control. Given that religion is a complex multidimensional phenomenon (National Institute on Aging/Fetzer Institute, 1999), the specific facet that is most relevant in this regard may at first seem unclear. Fortunately, a number of researchers have been studying the construct of control within the context of religion.

Religion may provide elements of both cognitive reappraisal and proxy control, entailing both a set of existential beliefs about one's place in the world, and a set of real or perceived social connections with a religious community and with God. More specifically, particularly in the context of the Judeo–Christian tradition, perceptions of control may be influenced by beliefs about God's role in determining the outcome of events in one's life. This form of religious secondary control has been conceptualized in varying ways by researchers, but these can generally be classified into two approaches. The first focuses on the construct of "divine control," the perception that God has unilateral control over events (Schieman, Pudrovska, & Milkie, 2005; Welton, Adkins, Ingle, & Dixon, 1996). The second focuses on the construct of "God-mediated control," or the belief that God can be called upon to act collaboratively with the individual (Krause, 2005; Pargament, Koenig, & Perez, 2000). These conceptualizations are not mutually exclusive, but reflect different ways that people may perceive the role of God in controlling life events, which may differ among individuals and situations.

This study takes the second approach to conceptualizing God-mediated control, focusing on the perception of God as collaborative. In theoretical terms, this has been described as a form of secondary control (Krause, 2008, p. 51). Secondary control entails accepting the limitations of one's personal control in certain situations and making adjustments that allow for a feeling of generally being in control in spite of those limitations (Morling & Evered, 2006). In this case, perceptions of control may be maintained by providing greater expectations of success, based on the belief that even if one's own abilities are not enough to accomplish a task, God will be working toward the same goal. More subtly, perceptions of God-mediated control could serve to cognitively reframe failures of primary control by implying that, because God has a plan that will ultimately work in one's best interests, each apparently negative outcome actually serves a positive purpose in achieving a superordinate goal. Influence may occur in the opposite direction as well; growing belief in God's influence may in turn erode an independent sense of personal control. The analyses that follow test the hypothesis that older adults partially compensate for a loss of personal control by enhancing their beliefs in God-mediated control.

Three specific hypotheses can be derived from this general aim. First, a good deal of the research on decline in personal control is based on cross-sectional data (Mirowsky, 1995; Shaw & Krause, 2001); however, it is assumed that this is part of a process that unfolds within individuals over time. The present study uses an individual growth curve approach that focuses on trajectories of beliefs related to personal and God-mediated control in four waves of data that span 7 years. It is hypothesized that the sense of personal control will tend to decline with age during late life, whereas the sense of God-mediated control will tend to increase. Recent research from the perspective of divine control supports the notion that low personal control and high religious control are related, although this notion is based on cross-sectional data (Schieman, 2008).

Second, significant individual variation is expected in the extent of these late-life changes in God-mediated control. We suspect that religious commitment may play an especially important role in this process. For more than 50 years, researchers have known that individuals do not always internalize or subscribe to religious teachings even though they affiliate with a faith tradition (Allport, 1950). Instead, they affiliate with a congregation for social benefits and other more-worldly gains. To the extent this is true, we propose that only those individuals who are more deeply committed to religion will seek out feelings of God-mediated control and potentially derive compensatory benefits from it.

Third, in addition to exploring individual variations in the function of God-mediated control, we also anticipate that significant differences will emerge at the group level—especially with respect to race. More specifically, we hypothesize that older Black adults will be more likely than older White adults to turn to beliefs of God-mediated control to compensate for a loss of personal control. There are several reasons why this may be so. To begin with, research indicates that older Black adults perceive lower levels of personal control than older White adults (Shaw & Krause, 2001). In addition, one of the most consistent findings in the social and psychological study of religion suggests that Black older adults are more deeply involved in religion than

White older adults (Taylor, Chatters, & Levin, 2004). This combination of increased vulnerability and greater cultural salience of religion may make God-mediated control a more prevalent way of dealing with declining sense of personal control for Black adults than for White adults. There is general support for this cultural perspective in the finding that use of religious coping has different implications for the sense of personal control for White and Asian American young adults (Sasaki & Kim, 2011). More directly germane to the present study is research regarding divine control, finding that this type of control is higher among Black older adults, compared with White older adults (Schieman, Pudrovska, Pearlin, & Ellison, 2006). This study suggests that in addition to culture, social-structural factors may play a role in these group differences, finding that the stronger sense of divine control among Black adults may be partly due to socioeconomic barriers to other forms of control. Based on these previous findings, the present study assesses the role of race in the relationship between religiousness, personal control, and God-mediated control, with the expectation that they are more strongly linked among Black adults than among White adults.

Method

Sample

Data came from the first four waves of an ongoing longitudinal survey of religion and aging among older adults in the United States. A random sample of older adults, at least 66 years of age in 2001, was drawn from the beneficiary list of the Centers for Medicare and Medicaid Services (excluding residents of Alaska and Hawaii). Screening was conducted to restrict the sample to Black adults and White adults, whose religious affiliation fell into one of the following categories: currently Christian, formerly Christian but currently practicing no religion, or never affiliated with any religion. These restrictions were applied to allow for (a) oversampling of Black adults and (b) the inclusion of measures of religiousness and spirituality which had been developed in Christian samples and for which no parallel measures validated in samples with other religious backgrounds existed (see Krause, 2002a, for a more detailed description of the sample composition and sampling procedures).

Data collection was conducted by Harris Interactive (New York) and consisted of in-person interviews conducted in the homes of the respondents. The baseline survey (Wave 1) was conducted in 2001 and included a total of 1,500 completed interviews, with 752 Black and 748 White respondents. The overall response rate at Wave 1 was 62%. Wave 2 was conducted in 2004 and resulted in 1,024 complete interviews, with a reinterview rate of 80% after excluding respondents who had died or had become ineligible in the interim. Wave 3 followed in 2007 (N = 969, 75% reinterview rate), and Wave 4 in 2008 (N = 718, 88% reinterview rate). Ages ranged from 66 to 101 at Wave 1, 69 to 98 at Wave 2, 71 to 99 at Wave 3, and 73 to 100 at Wave 4.

Measures

The key constructs in this study are God-mediated control, personal control, and personal religious commitment. Details regarding construction and validation of these measures have been reported by Krause (Krause, 2002b). Each of these constructs was measured with a multiple-item scale (see Table 1 for all items and responses). All the scale measures were administered at each of the four survey waves. The God-mediated control scale consisted of 3 items (Cronbach's α = .941), producing a score between 3 and 12, with higher scores indicating a stronger sense of God-mediated control. Personal control was measured with a 4-item scale (Cronbach's α = .852), producing a score between 4 and 16, with higher scores indicating a stronger sense of personal control. Religious commitment was measured with a 3-item scale (Cronbach's α = .939), producing a score between 3 and 12, with higher scores indicating greater personal importance of religion. Race is dichotomized as Black or White (see sample description earlier). Previous studies have found differences in perceptions of control based on gender (Ross & Mirowsky, 2002) and educational attainment (Wolinsky & Stump, 1996), and thus both are included as controls in the present study (education is measured in years). These demographic measures were treated as time-invariate factors based on values reported during Wave 1. God-mediated control, personal control, and religious commitment were treated as time-varying factors.

Imputation of Missing Data

Listwise deletion would have eliminated approximately 17% of all wave-by-wave observations, excluding 8% of participants completely, and excluding a further 26% in at least one wave. Therefore, multiple imputation was used to

Table 1. Scale Measure Items and Responses

A. God-mediated control
A.1. I rely on God to help me control my life.
A.2. I can succeed with God's help.
A.3. All things are possible when I work together with God.
B. Personal control
B.1. I have a lot of influence over most things that happen in my life.
B.2. I can do just about anything I really set my mind to.
B.3. When I make plans, I'm almost certain to make them work.
B.4. When I encounter problems, I don't give up until I solve them.
C. Religious Commitment
C.1. My faith shapes how I think and act each and every day.
C.2. I try hard to carry my religious beliefs over into all my other dealings in life.
C.3. My religious beliefs are what lie behind my whole approach to life.

Note: For all items, responses (scores): strongly disagree (1), disagree (2), agree (3), and strongly agree (4).

replace missing values in all cases where a participant had completed the survey for a given wave, but had missing data due to nonresponse on individual items. For scale measures, imputation was conducted for the aggregate score, rather than at the item level. Multiple imputation using the Markov Chain Monte Carlo (MCMC) method was conducted with the SAS 9.2 PROC MI function, based on an imputation model that included time-invariate variables along with all time-varying measures at each wave. The MCMC method uses the observed joint distributions of included model variables to simulate a series of randomly drawn values to replace each missing value (Horton & Lipsitz, 2001). Consistent with recommendations based on multiple imputation theory (Graham, Olchowski, & Gilreath, 2007), a series of five sets of imputed values were independently drawn, and all analyses were conducted separately on each of these imputed data sets. The only time-invariate measure with missing data was education (missing for 2.7% of respondents). Regarding time-varying measures, data were missing for 4.2% of observations for God-mediated control, 5.3% for religious commitment, and 9.1% for personal control. Aggregate results were computed using SAS 9.2 PROC MIANALYZE. After imputation, there were a total of 4,178 observations from 1,495 participants (five participants from the full sample of 1,500 were excluded because their ages could not be determined).

Model Specification

This study adopts a hierarchical linear modeling approach to estimate growth curves, treating participants as higher-order nesting units within which individual data points, corresponding to measurements taken at each survey wave, are clustered (Curran, Obeidat, & Losardo, 2010; West, Welch, & Galecki, 2007). Using this technique, a model describing the average trajectory of change in the sense of control across ages can be estimated based on a weighted composite of individual scores at each age (for all participants) and trajectories of change over time (for participants who remained in the study for one or more follow-up waves). Growth curve models were fit for both sense of personal control and sense of God-mediated control. Analyses were conducted using the SAS 9.2 MIXED procedure, with intercept treated as a random effect, and applying a variance-components covariance matrix. Additional random effects for the linear age (both dependent variables) and quadratic age (personal control only) terms were also included as described in the following paragraph.

The analyses were conducted in three stages. First, to ground the findings more firmly in the literature, the trajectories of change in personal control were examined independently of God-mediated control. Second, trajectories of change in God-mediated control were examined independently of personal control. Third, and most importantly, the relationship between personal and God-mediated control measures and their change over time was evaluated. In all models, race and gender were dichotomous variables (where Black = 0 and Men = 0, respectively), and all other variables were centered at their grand means.

The first stage of analysis involved fitting the growth curve model for personal control. Preliminary analyses were conducted to estimate the shape of the curve of age-related change for each of the two control measures. For each outcome, a series of three unconditional growth models were fit so that linear, quadratic, and cubic age effects could be compared in terms of the significance of the estimated fixed effects and amount of variance explained.

Personal control..—For personal control, there was evidence of a curvilinear trajectory over time following a quadratic curve. Hence, the following unconditional growth model was fit:

$$\begin{aligned}\text{Personal control}_{ij} &= \beta_0 + \beta_1 \text{Age}_{ij} \\ &+ \beta_2 \text{Age}_{ij}^2 + u_{0i} + \varepsilon_{ij}\end{aligned} \tag{1}$$

Here, $\text{Personal control}_{ij}$ is the value of the personal control scale for individual i at age j; β_0 is the intercept, or mean value of God-mediated control at the grand mean age of 77.45 years (because age is centered in the model); $\beta_1 \text{Age}_{ij}$ represents the mean linear age slope, or the mean rate of change in God-mediated control; $\beta_2 \text{Age}_{ij}^2$ represents the mean quadratic age slope, describing the acceleration of the rate of change over time; u_{0i} is the random intercept effect representing intraindividual variation in the mean of God-mediated control; and ε_{ij} is the random error term. Although some previous research has found a further cubic component of change in personal control (Mirowsky, 1995, 1997), preliminary analyses did not indicate this type of effect in the present sample, and thus it was not included in the final models.

The full model of personal control includes the effects of demographic factors (race, gender, and education) and religious commitment on the intercept (modeled by main effects), as well as on the growth curve (modeled by interaction terms with the linear and quadratic components of the slope for age). The full model can thus be expressed with the following equation:

$$\begin{aligned}\text{Personal control}_{ij} &= \beta_0 + \beta_1 \text{Age}_{ij} + \beta_2 \text{Age}_{ij}^2 + \beta_3 \text{Race}_i \\ &+ (\beta_4 \text{Race}_i \times \text{Age}_{ij}) + \left(\beta_5 \text{Race}_i \times \text{Age}_{ij}^2\right) + \beta_6 \text{Gender}_i \\ &+ (\beta_7 \text{Gender}_i \times \text{Age}_{ij}) + \left(\beta_8 \text{Gender}_i \times \text{Age}_{ij}^2\right) \\ &+ \beta_9 \text{Education}_i + (\beta_{10} \text{Education}_i \times \text{Age}_{ij}) \\ &+ \left(\beta_{11} \text{Education}_i \times \text{Age}_{ij}^2\right) + \beta_{12} \text{Commitment}_{ij} \\ &+ (\beta_{13} \text{Commitment}_{ij} \times \text{Age}_{ij}) + \left(\beta_{14} \text{Commitment}_{ij} \right. \\ &\left. \times \text{Age}_{ij}^2\right) + u_{0i} + \varepsilon_{ij}\end{aligned} \tag{2}$$

For each variable, the main effect indicates its relationship with personal control at the grand mean of the sample age (77.45 years), whereas the multiplicative effects indicate the changes in the linear and quadratic components of the slope of age-related change associated with a unit increase in the corresponding variable. Note that the lack of the subscript *j* on the demographic factors indicates that these are treated as time-invariate factors, or as being constant across time within individuals. Personal religious commitment, by contrast, is a time-varying covariate, which is allowed to change across observations.

God-mediated control.—The second stage of the analysis was fitting the growth curve model for God-mediated control. Preliminary analyses found no evidence of a quadratic or cubic pattern of change. Thus, the unconditional growth (descriptive) model can be expressed with the following equation:

$$\text{God-mediated control}_{ij} = \beta_0 + \beta_1 \text{Age}_{ij} + u_{0i} + \varepsilon_{ij} \quad (3)$$

To address the hypothesis that there would be differences in growth of God-mediated control based on religious salience, additional terms were added to the full model to examine the interaction between race and religious commitment as follows:

$$\begin{aligned}\text{God-mediated control}_{ij} &= \beta_0 + \beta_1 \text{Age}_{ij} + \beta_2 \text{Race}_i \\ &+ (\beta_3 \text{Race}_i \times \text{Age}_{ij}) + \beta_4 \text{Gender}_i \\ &+ (\beta_5 \text{Gender}_i \times \text{Age}_{ij}) + \beta_6 \text{Education}_i \\ &+ (\beta_7 \text{Education}_i \times \text{Age}_{ij}) + \beta_8 \text{Commitment}_{ij} \\ &+ (\beta_9 \text{Commitment}_{ij} \times \text{Age}_{ij}) + (\beta_{10} \text{Race}_i \\ &\times \text{Commitment}_{ij}) + (\beta_{11} \text{Race}_i \times \text{Commitment}_{ij} \\ &\times \text{Age}_{ij}) + u_{0i} + \varepsilon_{ij}\end{aligned} \quad (4)$$

Joint effects of personal and God-mediated control. In the third and final stage of analysis, personal control was integrated into the model of God-mediated control, along with its interaction with race.

$$\begin{aligned}\text{God-mediated control}_{ij} &= \beta_0 + \beta_1 \text{Age}_{ij} \\ &+ \beta_2 \text{Race}_i + (\beta_3 \text{Race}_i \times \text{Age}_{ij}) + \beta_4 \text{Gender}_i \\ &+ (\beta_5 \text{Gender}_i \times \text{Age}_{ij}) + \beta_6 \text{Education}_i \\ &+ (\beta_7 \text{Education}_i \times \text{Age}_{ij}) + \beta_8 \text{Commitment}_{ij} \\ &+ (\beta_9 \text{Commitment}_{ij} \times \text{Age}_{ij}) + (\beta_{10} \text{Race}_i \\ &\times \text{Commitment}_{ij}) + (\beta_{11} \text{Race}_i \times \text{Commitment}_{ij} \\ &\times \text{Age}_{ij}) + \beta_{12} \text{Personal control}_{ij} \\ &+ (\beta_{13} \text{Personal control}_{ij} \times \text{Age}_{ij}) + (\beta_{14} \text{Race}_i \\ &\times \text{Personal control}_{ij}) + (\beta_{15} \text{Race}_i \\ &\times \text{Personal control}_{ij} \times \text{Age}_{ij}) + u_{0i} + \varepsilon_{ij}\end{aligned} \quad (5)$$

Results

As described under model specification, the analyses proceeded in three stages: (a) estimation of change in personal control, (b) estimation of change in God-mediated control, and (c) a final model integrating both. To diagnose the impact of attrition on the results, supplementary analyses (not shown) were conducted, inserting a dummy variable representing attrition prior to Wave 4 in the unconditional growth model for each outcome, along with its interaction with the age slope. No significant differences by attrition status were detected for the slope of God-mediated control, but there was a significant attrition effect on the linear component of the slope for personal control, such that personal control declined more rapidly among those who went on to drop out of the study. The most likely explanation would seem to be that declining health status is associated with (a) a declining sense of control and (b) a greater likelihood of dying or becoming too ill to respond at some point during the study. It should be noted that, because the modeling procedure used here gives greater weight to participants with more observations (i.e., to those who do not experience attrition), any bias introduced would tend to result in underestimation of the extent of change reported in the results.

Descriptive statistics by wave are presented in Table 2. Addressing the first stage of the analysis, parameter estimates and model statistics for the growth curve models of personal control are presented in Table 3. In the unconditional growth model (corresponding to Equation 1), there

Table 2. Descriptive Statistics by Wave

	Wave 1 (N = 1,495)	Wave 2 (N = 1,019)	Wave 3 (N = 957)	Wave 4 (N = 716)
Age, *M* (SD)	75.16 (6.68)	77.48 (6.20)	78.89 (5.83)	80.29 (5.28)
Race (White), *N* (%)	763 (51.04 %)	540 (52.99%)	521 (54.44%)	391 (54.61%)
Gender (female), *N* (%)	923 (61.74%)	640 (62.81%)	610 (63.74%)	463 (64.66%)
Education, *M* (SD)	11.27 (3.47)	11.51 (3.39)	11.62 (3.34)	11.75 (2.25)
Religious commitment (3–12), *M* (SD)	9.97 (1.88)	9.88 (2.00)	10.08 (2.02)	10.01 (2.08)
Personal control (4–16), *M* (SD)	12.19 (2.01)	11.94 (2.28)	11.90 (2.83)	11.88 (2.27)
God-mediated control (3–12), *M* (SD)	10.22 (1.89)	10.16 (1.96)	10.46 (1.92)	10.24 (2.05)

Notes: *M* = mean; SD = standard deviation.

were significant effects for both the linear (b = –0.05, 95% confidence interval (CI) [–0.06, –0.03], $p < .001$) and quadratic (b = –0.002, 95% CI [–0.004, –0.001], p = .007) components of the age slope. This indicates that the entire sample shows an average pattern of accelerating decline in personal control with age. The full model (corresponding to Equation 2) indicates that this curve differs by race; whereas linear decline was present for both Black and White adults (b = –0.04, 95% CI [–0.07, –0.01], p = .002); there was quadratic acceleration only among White adults (b = –0.004, 95% CI [–0.01, –0.0004], p = .028). In addition, there were main effects indicating that sense of personal control was greater across ages among men (b = –0.37, 95% CI [–0.60, –0.14], p = .002), individuals with more education (b = 0.04, 95% CI [0.01, 0.07], p = .016), and those reporting stronger personal religious commitment (b = 0.27, 95% CI [0.21, 0.33], $p < .001$). Figure 1 illustrates the mean trajectory of change in the sense of personal control across the course of older adulthood and the impact of the race-by-slope interaction. Predicted means were calculated based on the full model presented in Table 3, with all other model variables held constant at their means.

Results for the second and third stages of the analysis, involving the independent and combined models of God-mediated control, are presented in Table 4. With respect to the independent trajectory of God-mediated control, the unconditional growth model (corresponding to Equation 3) indicated that there was no change on average across the entire sample (b = –0.002, 95% CI [–0.004, 0.001], p = .664). However, Model 1 (corresponding to Equation 4) indicated that a difference emerged once the interaction of race and levels of personal religious commitment were taken into account (b = 0.01, 95% CI [0.002, 0.02], p = .017). In effect, Black adults had a stable sense of God-mediated control, overall, across the course of late life, regardless of their level of personal religious commitment. By contrast, the pattern of change differed a great deal for White adults, increasing over time for those who were highly committed, but decreasing over time for those with lower-than-average religious commitment. Additionally, main effects indicate that the sense of God-mediated control was higher at all ages for Black adults (b = –0.52, 95%CI [–0.62, –0.41], $p < .001$), women (b = 0.23, 95% CI [0.12, 0.33], $p < .001$), individuals with fewer years of education (b = –0.02, 95% CI [–0.04, –0.01], p = .004), and those who were more religiously committed (b = 0.48, 95% CI [0.44, 0.52], $p < .001$).

The third and final stage of analysis integrated the effect of personal control into the growth curve model of God-mediated control. Results for Model 2 (corresponding with Equation 5) indicate that there was a relationship between personal control and change in God-mediated control over time, which differed depending on race (b = 0.01, 95% CI [0.0002, 0.01], p = .044). In this case, it was only Black adults who exhibited differences in trajectories over time: Low personal control over time was related to a pattern of increasing God-mediated control, whereas high personal control was related to remaining at a stable level of God-mediated control. All other effects that were observed in Model 1 persisted in Model 2. Thus, there is a pattern of significant age-related change in God-mediated control in both racial subgroups: For

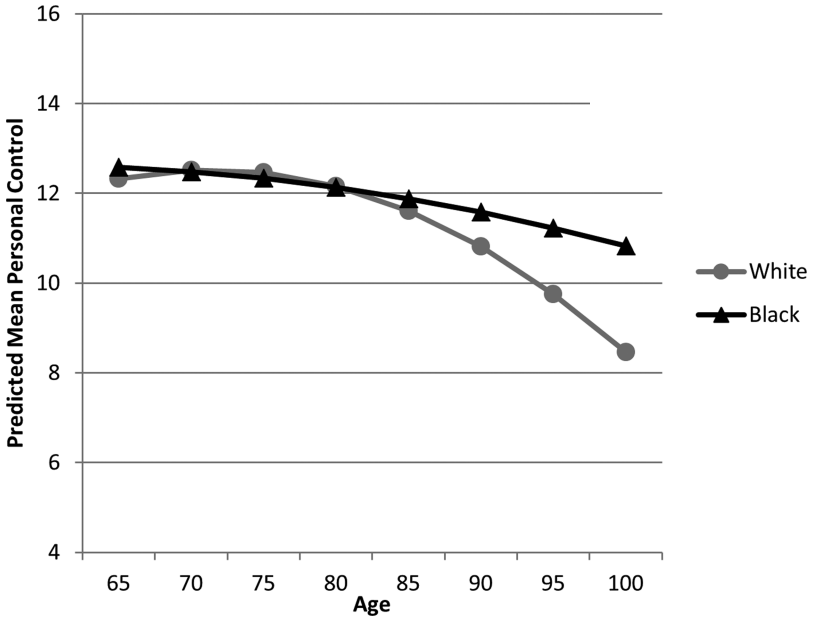

Figure 1. Comparison of predicted mean age–related trajectories of change in personal control by race. Values of all other model variables are held constant at their grand means.

Table 3. Growth Curve Model Results for Personal Control

	Unconditional growth		Full model	
	b	95% CI	*b*	95% CI
Intercept	12.06***	[11.96, 12.17]	12.24***	[12.03, 12.45]
Linear age slope	–0.05***	[–0.06, –0.03]	–0.04**	[–0.07, –0.01]
Quadratic age slope	–0.002**	[–0.004, –0.001]	–0.001	[–0.004, 0.002]
Race (White)			0.11	[–0.13, 0.35]
X Linear age slope			0.02	[–0.01, 0.05]
X Quadratic age slope			–0.004*	[–0.01, –0.0004]
Gender (female)			–0.37**	[–0.60, –0.14]
X Linear age slope			–0.02	[–0.05, 0.01]
X Quadratic age slope			0.001	[–0.0002, 0.001]
Education			0.04*	[0.01, 0.07]
X Linear age slope			–0.001	[–0.01, 0.003]
X Quadratic age slope			0.0002	[–0.0002, 0.001]
Religious commitment			0.27***	[0.21, 0.33]
X Linear age slope			–0.003	[–0.01, 0.003]
X Quadratic age slope			–0.001	[–0.001, 0.0003]
Random effects variance				
Residual	4.29***	[4.02, 4.56]	4.16***	[3.89, 4.44]
Intercept	1.06***	[0.85, 1.27]	0.91***	[0.71, 1.12]
BIC	18,739		18,639	

Notes: BIC = Bayesian Information Criteria; CI = confidence interval.
*$p < .05$, **$p < .01$, ***$p < .001$.

White adults, the direction of that change depends upon the individual level of personal religious commitment ($b = 0.01$, 95% CI [0.004, 0.02], $p = .039$), whereas for Black adults, the magnitude of the increase depends on the individual sense of personal control. These interaction effects are illustrated in Figure 2 (race by religious commitment) and Figure 3 (race by personal control). In each figure, predicted values were computed based on Table 4, Model 2, and represent the mean trajectory predicted within race for individuals with low and high scores on the corresponding scale, and all other model variables held constant at their means.

Note that there was no significant difference in Bayesian Information Criteria (BIC) between Models 1 and 2 (significance is tested based on the χ^2 distribution, with degrees of freedom corresponding to the change in the number of model parameters). Because the term BIC corrects for the effects of adding more parameters, this suggests that although personal control does not improve the explanatory power of the model of God-mediated control, it also does not make it worse. Taken together, these results are highly consistent with the broad existing literature on late-life decline in personal control and also provide support for the general hypothesis that God-mediated control serves to partially compensate for those losses. Personal control was seen to decline within individuals with increasing age, across the entire sample. Change in God-mediated control varied between individuals, depending on a combination of factors including race, personal religious commitment, and sense of personal control.

Discussion

Findings were generally supportive of the hypotheses that God-mediated control shows average within-person increase during older adulthood, that its trajectory of change varies depending on factors including religious commitment and sense of personal control, and that these relationships differ between Black adults and White adults. However, only partial support was found for expectations that God-mediated control acts to compensate for loss of personal control and that religious commitment is linked with more rapid changes. Patterns of change in the sense of personal control recapitulated findings from previous studies (Krause & Shaw, 2003; Mirowsky, 1995, 1997; Wolinsky et al., 2003), declining gradually early in older adulthood and then dropping off rapidly at the latest ages. In contrast to previous findings (Shaw & Krause, 2001), there was no significant race difference in personal control at the beginning of the span of older adulthood, and the sense of personal control in White adults declined more rapidly, as Figure 1 illustrates. Because the sample examined in the cited study was very similar to that in the present study, the most plausible explanation for this discrepancy lies in differences in conceptualization and measurement of personal control. Further research is needed to articulate possible differences in elements of personal control.

At the same time as declines were occurring in personal control, many older adults also exhibited significant increases in the sense of God-mediated control. Figures 2 and 3 illustrate that although the extent of the average yearly change was small, the differences were substantial when viewed across the entire span of older adulthood. Evidence

Table 4. Results of the Growth Curve Model for God-mediated Control

	Unconditional growth		Model 1		Model 2	
	b	95% CI	*b*	95% CI	*b*	95% CI
Intercept	10.25***	[10.16, 10.33]	10.44***	[10.33, 10.54]	10.42***	[10.32, 10.52]
Linear age slope	–0.002	[–0.004, 0.001]	0.01	[–0.01, 0.02]	0.01	[–0.003, 0.03]
Race (White)			–0.52***	[–0.62, –0.41]	–0.50***	[–0.61, –0.40]
X Linear age slope			–0.01	[–0.02, 0.01]	–0.01	[–0.03, 0.01]
Gender (female)			0.23***	[0.12, 0.33]	0.24***	[0.14, 0.35]
X Linear age slope			–0.01	[–0.02, 0.01]	–0.01	[–0.03, 0.01]
Education			–0.02**	[–0.04, –0.01]	–0.03**	[–0.04, –0.01]
X Linear age slope			0.002	[–0.0004, 0.004]	0.002	[–0.0003, 0.004]
Religious commitment			0.48***	[0.44, 0.52]	0.46***	[0.42, 0.50]
X Linear age slope			–0.002	[–0.01, 0.004]	–0.001	[–0.01, 0.01]
Race X Commitment			0.19***	[0.14, 0.24]	0.21***	[0.16, 0.26]
X Linear age slope			0.01*	[0.002, 0.02]	0.01*	[0.004, 0.02]
Personal control					0.06***	[0.04, 0.09]
X Linear age slope					–0.004*	[–0.01, –0.001]
Race X Personal control					–0.03	[–0.07, 0.01]
X Linear age slope					0.01*	[0.0002, 0.01]
Random effects variance						
Residual	1.87***	[1.76, 1.98]	1.52***	[1.43, 1.62]	1.51***	[1.42, 1.61]
Intercept	1.90***	[1.71, 2.10]	0.33***	[0.24, 0.41]	0.32***	[0.24, 0.41]
BIC	16,419		14,390		14,391	

Notes: BIC = Bayesian Information Criteria; CI = confidence interval.
*$p < .05$, **$p < .01$, ***$p < .001$.

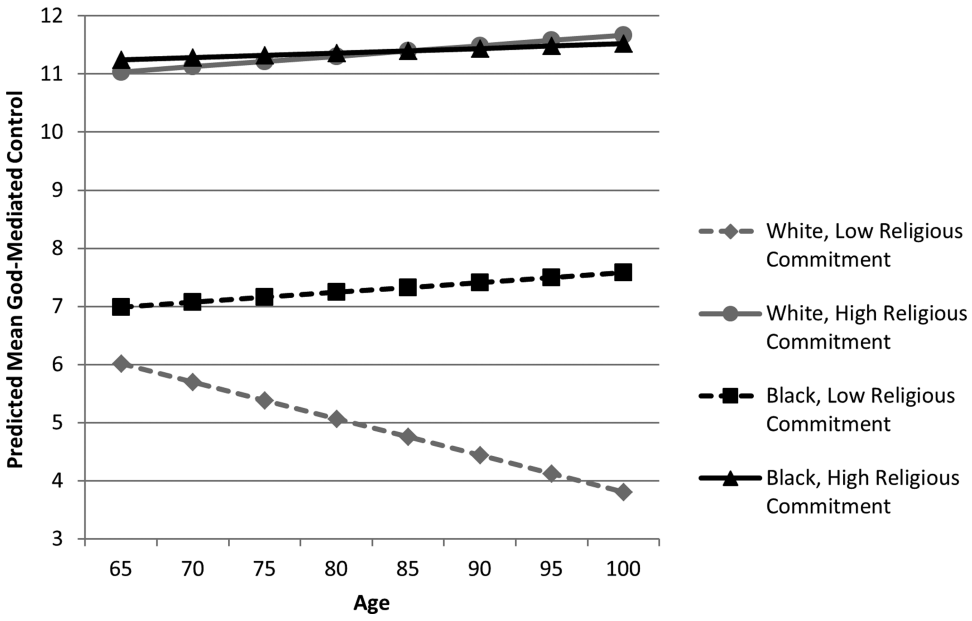

Figure 2. Illustration of race by religious commitment interaction effect on predicted mean age–related trajectories of change in God-mediated control. Plots for high and low religious commitment assume minimum (3) and maximum (12) scores on the religious commitment scale. Values of all other model variables are held constant at their grand means.

of a relationship between these patterns, however, was found only among Black adults, for whom the rate of growth in God-mediated control increased in proportion to the decrease in personal control. Among White adults, religious commitment was the defining factor in the pattern of change in God-mediated control, with increases seen among the most religiously-committed; and decreases among the least committed. Previous research suggests that both cultural (Sasaki & Kim, 2011) and social structural (Schieman et al., 2006) factors may contribute to these racial differences. It seems likely that the central position of the church in African American culture (Taylor et al., 2004), may serve to make

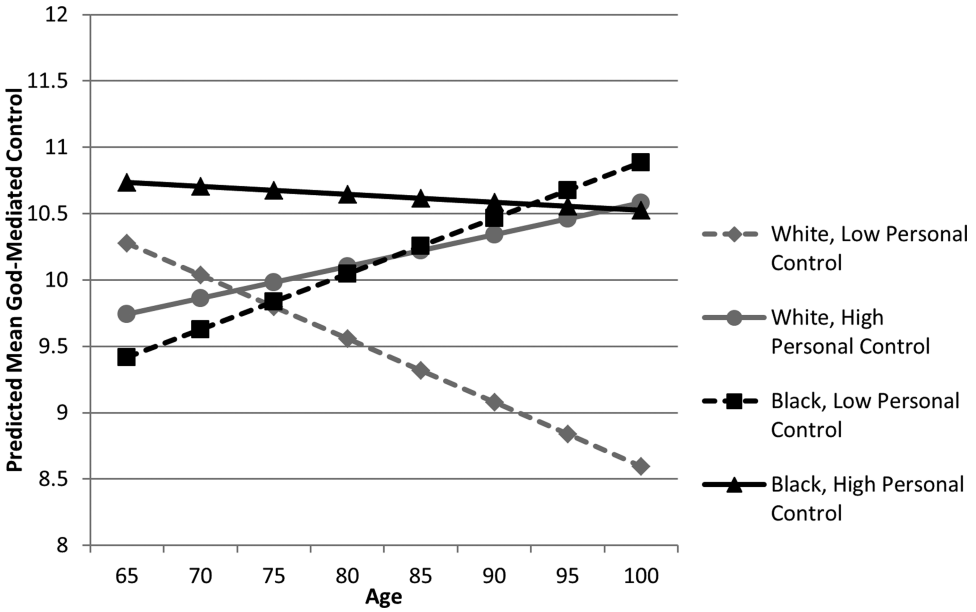

Figure 3. Illustration of race by personal control interaction effect on predicted mean age–related trajectories of change in God-mediated control. Plots for high and low personal control assume minimum (4) and maximum (16) scores on the personal control scale. Values of all other model variables are held constant at their grand means.

God-mediated control, and religious ideas more generally, salient and important even to older African Americans with weak formal ties to religion. At the same time, as a result of social structural factors, older White adults may tend to have access to a broader range of resources for dealing with declining personal control, making them less likely to use God-mediated control as a compensation strategy. Low-religiousness White adults, in particular, may tend to disengage from religion and seek other means of secondary control in late life.

Limitations of this study are related to the challenges inherent in interpreting longitudinal data. Because both personal control and God-mediated control varied throughout the course of the study, it is impossible to fully disentangle the dynamics of the relationship between them. Because of the well-established literature surrounding personal control over the life course and the biopsychosocial underpinnings of its decline in late life, it appears more plausible that it acts as an influence on changes in God-mediated control than the reverse. However, the possibility of other unmeasured explanatory factors that influence both types of perceived control remains. In addition, because slices of intraindividual change were observed at different points in terms of age, it is not possible to fully control for potential period and cohort effects. Finally, although four waves of data represent a substantial improvement compared with previous studies of change in God-mediated control, more points of observation for each individual would improve the sensitivity of the analyses, particularly in detecting curvilinear patterns of change over time. Future research in this area should seek to track individuals over longer periods of time and to collect data more frequently, to partially address some of these issues.

In spite of these limitations, the results of this study provide evidence that the sense of God-mediated control tends to increase in older adulthood and, furthermore, that among Black adults, this increase may act to partially compensate for losses in the sense of personal control that take place at the same time. This is in keeping with the theoretical perspective that sees successful aging as being related to the capacity for adapting new strategies in place of those that are diminished in late life (Baltes & Smith, 2003). These findings may also provide insight into some of the potential functional factors contributing to increases in religiousness among older adults, as well as the growing importance of religion for health and well-being during late life. More work is needed to fully explicate the racial differences observed in the correlates of changes in God-mediated control, particularly the relative impact of cross-cultural and social structural factors. Future research should also look for other specific domains in which religious processes may help to compensate for aging-related losses. Doing so promises not only to provide insight into the dynamic processes of development in older adulthood, but also to help illuminate the role that religion plays in adapting to those late-life changes.

Funding

This work was supported by the National Institute on Aging at the National Institutes of Health (grant number R01 AG014749); and the John Templeton Foundation (grant number 20887).

Correspondence

Correspondence should be addressed to R. David Hayward, Department of Health Behavior and Health Education, School of Public Health, University of Michigan, 1415 Washington Heights, Ann Arbor, MI 48109-2029. E-mail: rdhaywar@umich.edu.

References

Allport, G. W. (1950). *The individual and his religion: A psychological interpretation*. New York, NY: Macmillan.

Baltes, P. B., & Smith, J. (1999). Multilevel and systemic analysis of old age: Theoretical and empirical evidence for a fourth age. In V. L. Bengston & K. W. Schaie (Eds.), *Handbook of theories of aging* (pp. 153–173). New York, NY: Springer.

Baltes, P. B., & Smith, J. (2003). New frontiers in the future of aging: From successful aging of the young old to the dilemmas of the fourth age. *Gerontology*, *49*, 123–135. doi:10.1159/000067946

Berrenberg, J. (1987). The belief in Personal Control scale: A measure of God-mediated and exaggerated control. *Journal of Personality Assessment*, *51*, 194–206. doi:10.1207/s15327752jpa5102_4

Curran, P. J., Obeidat, K., & Losardo, D. (2010). Twelve frequently asked questions about growth curve modeling. *Journal of Cognition and Development*, *11*, 121–136. doi:10.1080/15248371003699969

Federal Interagency Forum on Aging Related Statistics. (2010). *Older Americans 2010: Key indicators of well-being*. Washington, DC: Government Printing Office. Retrieved from http://www.agingstats.gov/

Graham, J., Olchowski, A., & Gilreath, T. (2007). How many imputations are really needed? Some practical clarifications of multiple imputation theory. *Prevention Science*, *8*, 206–213. doi:10.1007/s11121-007-0070-9

Heckhausen, J., & Schulz, R. (1995). A life-span theory of control. *Psychological Review*, *102*, 284–304. doi:10.1037/0033-295X.102.2.284

Horton, N. J., & Lipsitz, S. R. (2001). Multiple imputation in practice. *The American Statistician*, *55*, 244–254. doi:10.1198/000313001317098266

Krause, N. (2002a). Church-based social support and health in old age. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *57*, S332–S347. doi:10.1093/geronb/57.6.S332

Krause, N. (2002b). A comprehensive strategy for developing closed-ended survey items for use in studies of older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *57*, S263–S274. doi:10.1093/geronb/57.5.S263

Krause, N. (2005). God-mediated control and psychological well-being in late life. *Research on Aging*, *27*, 136–164. doi:10.1177/0164027504270475

Krause, N. (2008). *Aging in the church : How social relationships affect health*. West Conshohocken, PA: Templeton Foundation Press.

Krause, N., & Shaw, B. A. (2003). Role-specific control, personal meaning, and health in late life. *Research on Aging*, *25*, 559–586. doi:10.1177/0164027503256695

Lachman, M. E., Neupert, S. D., & Agrigoroaei, S. (2011). The relevance of control beliefs for health and aging. In K. W. Schaie & S. L. Willis (Eds.), *Handbook of the psychology of aging* (7th ed., pp. 175–190). San Diego, CA: Academic Press.

Lachman, M. E., Rosnick, C. B., & Röcke, C. (2009). The rise and fall of control beliefs in adulthood: Cognitive and biopsychosocial antecedents and consequences of stability and change over 9 years. In H. B. Bosworth (Ed.), *Aging and cognition: Research methodologies and empirical advances* (pp. 143–160). Washington, DC: American Psychological Association.

Lachman, M. E., & Weaver, S. L. (1998). Sociodemographic variations in the sense of control by domain: Findings from the MacArthur studies of midlife. *Psychology and Aging*, *13*, 553–562. doi:10.1037/0882-7974.13.4.553

Mirowsky, J. (1995). Age and the sense of control. *Social Psychology Quarterly*, *58*, 31–43. doi:10.2307/2787141

Mirowsky, J. (1997). Age, subjective life expectancy, and the sense of control: The horizon hypothesis. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *52*, S125–S134. doi:10.1093/geronb/52B.3.S125

Morling, B., & Evered, S. (2006). Secondary control reviewed and defined. *Psychological Bulletin*, *132*, 269–296. doi:10.1037/0033-2909.132.2.269

National Institute on Aging/Fetzer Institute. (1999). *Multidimensional measurement of religiousness/spirituality for use in health research*. Kalamazoo, MI: John E. Fetzer Institute.

Pargament, K. I., Koenig, H. G., & Perez, L. M. (2000). The many methods of religious coping: Development and initial validation of the RCOPE. *Journal of Clinical Psychology*, *56*, 519–543. doi:10.1002/(sici)1097-4679(200004)56:4<519::aid-jclp6>3.0.co;2-1

Ross, C. E., & Mirowsky, J. (2002). Age and the gender gap in the sense of personal control. *Social Psychology Quarterly*, *65*, 125–145. doi:10.2307/3090097

Ross, C. E., & Sastry, J. (1999). The sense of personal control: Social-structural causes and emotional consequences. In C. S. Aneshensel & J. C. Phelam (Eds.), *Handbook of the sociology of mental health* (pp. 369–394). New York, NY: Klewer Academic/Plenum.

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

Sasaki, J. Y., & Kim, H. S. (2011). At the intersection of culture and religion: A cultural analysis of religion's implications for secondary control and social affiliation. *Journal of Personality and Social Psychology*, *101*, 401–414. doi:10.1037/a0021849

Schieman, S. (2008). The religious role and the sense of personal control. *Sociology of Religion*, *69*, 273–296. doi:10.1093/socrel/69.3.273

Schieman, S., Pudrovska, T., & Milkie, M. A. (2005). The sense of divine control and the self-concept. *Research on Aging, 27*, 165–196. doi:10.1177/0164027504270489

Schieman, S., Pudrovska, T., Pearlin, L. I., & Ellison, C. G. (2006). The sense of divine control and psychological distress: Variations across race and socioeconomic status. *Journal for the Scientific Study of Religion*, *45*, 529–549. doi:10.1111/j.1468-5906.2006.00326.x

Shaw, B. A., & Krause, N. (2001). Exploring race variations in aging and personal control. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *56*, S119–S124. doi:10.1093/geronb/56.2.S119

Skinner, E. A. (1996). A guide to constructs of control. *Journal of Personality and Social Psychology*, *71*, 549–570. doi:10.1037/0022-3514.71.3.549

Skinner, E. A. (2007). Secondary control critiqued: Is it secondary? Is it control? Comment on Morling and Evered (2006). *Psychological Bulletin*, *133*, 911–916. doi:10.1037/0033-2909.133.6.911

Taylor, R. J., Chatters, L. M., & Levin, J. S. (2004). *Religion in the lives of African Americans: Social, psychological, and health perspectives*. Thousand Oaks, CA: Sage.

Welton, G. L., Adkins, A. G., Ingle, S. L., & Dixon, W. A. (1996). God control: The fourth dimension. *Journal of Psychology and Theology*, *24*, 13–25.

West, B. T., Welch, K. B., & Galecki, A. T. (2007). *Linear mixed models: A practical guide using statistical software*. Boca Raton, FL: Chapman & Hall/CRC.

Wolinsky, F. D., & Stump, T. E. (1996). Age and the sense of control among older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *51*, S217–S220. doi:10.1093/geronb/51B.4.S217

Wolinsky, F. D., Wyrwich, K. W., Babu, A. N., Kroenke, K., & Tierney, W. M. (2003). Age, aging, and the sense of control among older adults: A longitudinal reconsideration. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *58*, S212–S220. doi:10.1093/geronb/58.4.S212