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Religion, Death of a Loved One, and Hypertension Among Older Adults in Japan

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Objective. To see whether three dimensions of religion (private religious practices, religious coping, and belief in the afterlife) buffer the effect of the death of a significant other on change in self-reported hypertension over time.

Methods. Interviews were conducted with a nationally representative sample of people aged 60 and older in Japan at two points in time, 1996 and 1999. Complete data were available on 1,723 older Japanese. Respondents were asked a series of questions about their religious beliefs and practices, whether a family member or close friend had died in the past year, and whether they had hypertension.

Results. The data suggest that older adults in Japan who experienced the death of a loved one but who believed in a good afterlife were less likely to report they had hypertension at the follow-up interview than elderly people in Japan who lost a close other but did not believe in a good afterlife.

Discussion. The results suggest how one overlooked dimension of religion (i.e., religious beliefs) may bolster the health of older people in the face of adversity.

A convincing body of research has suggested that older people who are religious tend to enjoy better health than elderly people who are less religious (Koenig, 1999; Koenig, McCullough, & Larson, 2001). The relationship between these constructs appears to hold for an impressive array of outcomes, including global measures of self-rated health, functional disability, hypertension, heart disease, cancer, and mortality (see Koenig et al., 2001, for a comprehensive review of this literature).

A key task facing researchers is to explain why religion may exert a salubrious effect on the health of older people. Although a number of causal factors are likely to be involved, one line of reasoning that appears to be especially promising is pursued in this study. In particular, as Ellison and Levin (1998) pointed out, religion may exert a beneficial effect on health because it helps elderly people cope with the deleterious effects of stressful life events. Even though several investigators have already explored the interface between religion, stress, and health in late life (e.g., Krause, 1998), we hope to contribute to the literature in three potentially important ways.

First, we explore the relationships among religion, stress, and health in a diverse cultural setting—Japan. As Musick, Traphagan, Koenig, and Larson (2000) argued, the wide majority of studies on religion and health have focused on older Americans with Judeo-Christian religious orientations. Consequently, these investigators have argued that a top priority be placed on conducting research in culturally diverse settings so researchers can learn more about the robustness of the relationship between religion and health. More specifically, this type of work will help researchers figure out whether the potentially salubrious effects of religion are restricted to the Judeo-Christian religions of the West, or whether there is something common to faiths in all cultural settings that may benefit health.

Second, Ellison and Levin (1998) argued that if further headway is to be made in the study of religion and health, investigators must use data that have been gathered prospectively. We aimed to contribute to the knowledge base by analyzing data that came from a nationally representative sample of older people in Japan who were interviewed at more than one point in time. Doing so allowed us to observe the effects of religion on *change* in health over time. Throughout, we focus on one particular chronic illness, hypertension.

Third, far too many epidemiologic studies have examined a limited range of religion measures. In fact, many have focused solely on the frequency of church attendance (e.g., Strawbridge, Cohen, Shema, & Kaplan, 1997). Although this work has produced a number of valuable insights, many investigators do not take advantage of the fact that religion is a complex multidimensional phenomenon. If further advances are to be made in the field, researchers must examine the effects of multiple facets of religion on health within a multivariate framework. Consistent with this view, three dimensions of religion are examined in the analyses that follow: private religious practices, religious coping, and religious beliefs. This measurement strategy follows the guidelines specified by Ellison and Levin (1998), who maintained that researchers should investigate the functional aspects of religious involvement (e.g., coping) in conjunction with behavioral markers of religion (e.g., private religious practices).

In the discussion that follows, we begin by developing the theoretical underpinnings of this study. The sample and survey measures are introduced after this. Finally, the results are presented and discussed.

Theoretical Overview

To the best of our knowledge, there is no published empirical research on the relationships among religion, stress, and physical health among older adults in Japan. Consequently, we initially turn to studies that were conducted in the West to frame the study hypotheses. This is accomplished by first examining research on the relationship between religion and hypertension. Following this, we expand the scope of inquiry by reviewing research on religion and stress. Finally, select studies on religion in Japan are reviewed in an effort to embed the emerging hypotheses in a proper cultural context.

Religion and Hypertension

In their comprehensive review of the literature, Levin and Vanderpool (1989) made a compelling case for why religion may be associated with hypertension. In fact, they provided 12 hypotheses that help explain why these constructs may be related. This important conceptual work, coupled with a surprisingly large number of empirical studies that have already appeared in this area, led Koenig and his colleagues (2001, p. 259) to argue that if "the salutary effects of religion are going to be found anywhere, they will be found in hypertension studies."

Even though Levin and Vanderpool (1989) developed an impressive array of hypotheses to explain the relationship between religion and hypertension, they did not devote sufficient attention to the potentially significant role of stress. This is important because researchers working outside the context of religion have been studying the relationship between stress and hypertension since 1932 (see Gerin et al., 2000, for a review of this research). Although far from conclusive, this secular literature has indicated that people who are exposed to stressful experiences may be at risk for developing hypertension. Unfortunately, as Gerin and his associates pointed out, there is little consensus on the precise physiological mechanisms linking stress and hypertension, but most explanations focus on cardiovascular reactivity (e.g., increased heart rate and arterial wall pressure following exposure to stress; Gerin et al., 2000). Nevertheless, Gerin and his colleagues went on to identify an intriguing possibility that has not been examined frequently in the literature. In particular, they argued that instead of being due solely to cardiovascular reactivity per se, the key risk factor may involve the person's ability to return to prestress resting levels following a period of physiological hyperarousal.

Extensive research by Benson (1996) on the relaxation response is especially helpful for shedding light on how some people are able to return to prestress levels of cardiovascular functioning. Benson defined the relaxation response as a physiological state in which "blood pressure is lowered and heart rate, breathing, and metabolic rate are decreased" (p. 17). Two key findings from Benson's research are especially helpful for studies attempting to examine stress, religion, and hypertension. First, Benson argued that religious beliefs and rituals are among the most important factors eliciting the relaxation response. Second, Benson reviewed research showing that hypertensive patients who were able to cultivate the relaxation response subsequently experienced a decrease in blood pressure. Given these provocative possibilities, we need to learn more about how religion may foster the relaxation response in the face of adversity.

Religion and Stress

There are several ways in which religion may help promote the relaxation response when older people are confronted by stressful life events. However, to gain a better understanding of how this may happen, it is important to first examine a general issue that must be addressed when studying stressful life events. There are two broad approaches to the study of stress. First, some investigators rely on long checklists that assess exposure to a diverse array of life events. Here, the goal is to carefully enumerate all life events a person has experienced during a given time period. This approach is important because it rests on the plausible assumption that one cannot understand the impact of any one event without also examining other stressors that were present at the same time. In essence, this perspective suggests that it is the cumulative effects of stress that matter most. The second approach to studying life stressors involves focusing on single life events. Studying events individually is important because this strategy allows investigators to probe more deeply into the rich psychosocial context surrounding a particular stressor, thereby arriving at a more complete understanding of how specific coping resources, like religion, operate.

In the analyses that follow, we focus on a single life event, the death of a loved one. There are two reasons why it is important to examine this particular type of stress. The first has to do with Japanese culture. As Doi (1973) and many others have pointed out, Japan is a collectivist society. In this tightly integrated culture, people are highly dependent on each other, and individual identities are overshadowed by the group. Individual success arises from group success, just as individual failure is viewed as a failure of the group. In fact, Doi coined the term *amae* to underscore the high level of interdependence among people in Japan. If individual lives are fused so tightly, it follows that the loss of a close other may be especially challenging for older people in Japan. Evidence of this may be found in a recent study by Brannigan (1998). His research revealed that the death of a close other in Japan "constitutes the death of a part of one's self" (p. 165).

The second reason for focusing on the death of a loved one may be found in a series of empirical and theoretical papers suggesting that religion may be especially useful for coping with the effects of bereavement. Evidence for this may be found in the work of Hood, Spilka, Hunsberger, and Gorsuch (1996, p. 153), who observed that "institutionalized faith . . . plays many roles in life, but the issue of death lies at its core." Although Hood and colleagues explored a number of ways that death figures prominently in religion, they noted that it may be especially helpful for coping with the loss of a loved one. Evidence of this may be found in re-

search by Mattlin, Wethington, and Kessler (1990). These investigators examined whether a wide range of coping responses reduces the deleterious effects of six different types of stressful events on psychological well-being. Their findings revealed that religion is especially useful for helping people cope with the death of a loved one, but it is less effective for dealing with other types of stressors (e.g., interpersonal difficulties).

If religion is a complex multidimensional phenomenon, then it may help people deal with grief and bereavement in more than one way. As noted earlier, three dimensions of religion are examined in this study: private religious practices, religious coping, and religious beliefs. In the discussion that follows, we speculate on how each dimension may offset the noxious effects of losing a significant other. In the process, we show how each facet of religion may elicit the relaxation response (Benson, 1996).

A number of specific behaviors are typically included in measures of private religious practices, including prayers offered at home when one is alone and the reading of sacred scriptures. Also, in Japan, people typically make offerings of water and food to deceased ancestors (Klass, 1996). As Benson (1996) argued, these regularly occurring ritual behaviors help elicit the relaxation response by providing a temporary respite from troubling thoughts and concerns. Moreover, as Levin and Vanderpool (1989) pointed out, the regular practice of religious rituals may also lower the risk of hypertension by easing a sense of dread, reducing anxiety, allaying fears, and moderating loneliness. The latter factor (i.e., moderating loneliness) may be especially relevant when a loved one has died.

The rationale developed up to this point leads to the first hypothesis to be evaluated in this study:

> H_1: Compared with older adults who do not engage in private religious practices, older adults who regularly perform private religious rituals will be less likely to develop hypertension when a loved one dies.

A vast literature has also suggested that one of the primary functions of religion is to provide people with an explicit set of coping responses that helps reduce or offset the potentially deleterious effects of stress on health and well-being (Pargament, 1997). Although religious coping is a complex multidimensional domain in its own right, measures of this facet of religion typically focus on things like offering prayers for guidance, direction, and understanding (i.e., meaning), as well as pleas for the resolution of a difficult situation. As Pargament pointed out, religious coping is important for a number of reasons. However, one is especially important for the purposes of this study. In particular, he noted that those who engage in religious coping responses often find a sense of comfort, solace, and relief. These potential important benefits are closely akin to the key characteristics of Benson's (1996) relaxation response. Consistent with this literature, the analyses presented below also empirically evaluate the following hypothesis:

> H_2: Older adults in Japan who turn to religious coping responses when a significant other dies will be less likely to develop hypertension than those who do not rely on religious coping responses.

Religious beliefs are obviously an integral part of any faith, yet the study of this conceptual domain remains elusive because the number of specific religious beliefs seems almost limitless. However, this daunting task is simplified in studies that focus on a particular type of life event because researchers can examine only those beliefs that pertain to the particular stressor at hand. We capitalize on this strategy below by focusing on one specific type of religious belief that is especially relevant for studies of bereavement, belief in the afterlife. More specifically, we evaluate the potentially salubrious effects of believing that those who die go on to live in another place that is better than the present life.

To see why belief in the afterlife may play a key role in reducing the noxious effects of bereavement, it is important to examine the psychosocial challenges that arise when a loved one dies. Three issues are especially important in this respect. First, existing ties with the deceased are clearly severed. As a result, those who were once an important source of social support are no longer directly accessible. Believing there is life after death holds out the prospects of seeing the deceased again and speaks to the likelihood of resuming close ties with them following one's own death. Second, for many death is an uncertain outcome. No one has direct knowledge about whether there is life after death. Moreover, even if there is an afterlife, no one knows for certain what it is like. Consequently, when a significant other dies, those who are left behind may worry about what has happened to someone they love. More specifically, deep concerns may arise about whether the deceased continue to exist at all and, if they do, whether they are safe, cared for, and happy. Finally, the death of a significant other clearly brings thoughts of one's own mortality to the foreground (Wuthnow, Christiano, & Kuzlowski, 1980). Believing there is no life after death, or believing that the deceased may face a precarious existence in the next life, may be a source of significant distress for those who remain behind.

Given these challenges, Marrone (1999) argued that one of the most important tasks in dealing with the loss of a loved one involves a cognitive restructuring of the bereaved person's worldview. In particular, the bereaved individual must make sense of what happened and assimilate the death of a close other into a cognitive schemata that helps them get past the uncertainties of death and function effectively in the present life. Marrone maintained that some people are able to meet this challenge by relying on specific religious beliefs. In particular, he suggested that "the belief in an afterlife may be the most common religion-based assimilation strategy observed in individuals dealing with loss" (p. 500). In fact, several empirical studies have shown that those who believe in the afterlife recover more quickly (i.e., derive a better sense of well-being) from the death of a loved one than those who do not believe in life after death (Smith, Range, & Ulmer, 1991–1992).

Benson (1996) argued that worry is one of the primary factors that promotes physiological hyperarousal. Moreover, he suggested that factors eliciting the relaxation re-

sponse counteract these effects directly by helping people dispel their concerns. Cast within the context of bereavement, these observations suggest that belief in the afterlife may allay worries and concerns about the departed, and the resulting comfort and solace afforded by these beliefs may ultimately lower the risk of developing hypertension. Stated more formally, the third, and final, hypothesis to be examined in this study states the following:

> H_3: Older adults who believe in the afterlife will be less likely to develop hypertension following the death of a loved one than those who do not believe in life after death.

Religion in Japan

At first glance, religion in Japan may seem puzzling to those with a Judeo-Christian religious orientation. More specifically, it is difficult to identify the particular faith of Japanese people because most belong to more than one religion. As Miller (1992) pointed out, the majority of people in Japan practice a mixture of Shinto and Buddhism. This is reflected in data provided by the Japan Agency for Cultural Affairs, who reported that 93% of Japanese say they are Shinto, and 74% also indicate they practice Buddhism (Kasulis, 1990; see also Musick et al., 2000). Although it may appear that straddling two faiths would create difficulty in daily life, it is not a major problem because most people use the two religions for different purposes that reflect differences in the underlying worldviews of these faiths. More specifically, themes of birth and life are more evident in Shinto, whereas Buddhism is more concerned with suffering and issues related to death. Consequently, it is not unusual to have a child "confirmed" by a Shinto priest, yet have a relative buried by a Buddhist priest (Miller, 1995).

Religion in Japan also differs significantly from Judeo-Christian orientations because regular institutionalized participation in formal worship services is not as deeply ingrained as regular Sunday worship is in the United States (Musick et al., 2000). Instead, a good deal of worship in Japan takes place in the home, where people often maintain either a Buddhist altar (*butsudan*) or a Shinto god shelf (*kamidana*). It is especially important for the purposes of this study to note that the primary function of the *butsudan* is veneration of the dead.

Although there are differences between Japanese religions and those of the West (e.g., Christianity and Judaism), there are also similarities. For example, research has indicated that, as in the West, older people in Japan tend to be more religious than their younger counterparts. Evidence of this may be found in research reviewed by Swyngedouw (1993). He reported that only 28% of people aged 20 believe in Shinto deities and only 31% in this age group believe in Buddhist deities. But for age 70, these figures rise to 65% and 48%, respectively. This suggests that if religion improves health in Japan, then these effects should be especially evident among older people in this culture.

As Musick and colleagues (2000) pointed out, Japanese religious behavior tends to be focused on specific goals, such as improvement in health or success in academic entrance examinations. Viewed more broadly, this instrumental religious orientation is geared specifically toward finding relief from stress. This is captured succinctly in a Japanese phrase that is identified by Musick and his colleagues: *Kurushii toki no kamidanomi*, which means "turn to the gods in time of distress."

Although older people in Japan may be inclined to turn to religion during stressful times, there is evidence that they may be especially likely to do so when a significant other dies. In fact, elaborate rituals that traditionally last 49 days are often performed when a loved one passes on (see Klass, 1996, for a detailed discussion of these ancestor worship rituals). The purpose of these rituals is to convince the departed that they are dead and help ensure their entrance into the Buddhist Pure Land (i.e., heaven). However, if the prescribed rituals are not performed, Klass reported the dead will be turned into harmful spirits, who cause bad things to happen in the world of the living.

If religion is used to deal with adversity in Japan, and a good deal of religious ritual focuses on care for the dead, then it follows that religion may help older people in Japan avoid the deleterious health effects associated with bereavement. However, as relatively little is known about religion, stress, and health in Japan, it is difficult to determine whether religion is an effective stress buffer and, if it is, how these health-protective effects may arise. The three hypotheses derived above were designed to take a modest first step toward resolving this important issue.

Methods

Sample

The data for this study come from the 1996 (Wave 4) and 1999 (Wave 5) rounds of interviews in the National Survey of the Japanese Elderly. This ongoing project is conducted jointly by the University of Michigan and the Tokyo Metropolitan Institute of Gerontology. Prior waves of interviews were administered in 1987, 1990, and 1993. All waves of interviews were conducted face to face in the homes of the study participants. The survey was designed to create a panel data set for use in cross-cultural analyses of aging in Japan and the United States (see Liang, Borawski-Clark, Liu, & Sugisawa, 1996). In 1996, a supplemental sample (n = 898) was added to the respondents who participated in earlier waves of interviews (n = 1,549). This supplemental survey involved a self-weighted, two-stage probability sample of Japanese elders aged 60 and older. The sampling design included 192 primary sampling units stratified by geographical region and city size. Altogether, 2,447 Wave 4 interviews were completed successfully. Of this group, a total of 1,929 older people (79%) were reinterviewed successfully at Wave 5.

The analyses presented below focus solely on the Wave 4 and Wave 5 interviews because questions on religion were administered for the first time in the Wave 4 survey. As noted earlier, including the Wave 5 data allows us to examine the effects of religion at Wave 4 on change in the probability of having hypertension at Wave 5.

After taking item nonresponse into account with listwise deletion of missing data, we based the analyses presented below on the responses of 1,723 Japanese elders. The aver-

age age of the people in this group at Wave 4 was 69.17 years (SD = 6.76 years). Approximately 43% of the study participants were men. Moreover, 71% were married at the time of the Wave 4 survey. Finally, the respondents in this group reported that they had completed an average of 9.62 years of schooling (SD = 2.59 years).

Measures

Table 1 contains the measures of the main study constructs examined in this study. Information on the scoring procedures for these indicators is provided in the table's footnotes.

Before reviewing the study measures, it is important to briefly discuss procedures that were used to address a common problem in cross-cultural research. Because the key study measures were initially drafted in the United States, steps were be taken to ensure they were translated properly into Japanese and that they would be understood in the manner intended by the research team. As described elsewhere, we used standard back-translation methods (Marsella, 1987), a rigorous pilot-testing strategy, and sophisticated confirmatory factor analyses to address this issue (see Krause, Liang, Jain, & Sugisawa, 1998).

Hypertension.—Hypertension was assessed through self-report in the Waves 4 and 5 surveys. The same question was used at both interviews. Preliminary analyses revealed that 28% of respondents indicated they had hypertension at Wave 4, and 32% said they had this chronic illness at Wave 5. Perhaps more important, 191 respondents who said they did not have hypertension at Wave 4 indicated they had hypertension when they were reinterviewed at Wave 5.

The fact that we relied on self-reports of hypertension raises some concern about the accuracy of the data. There are two ways to address this issue. First, the Japanese government provides health insurance coverage to its entire population. Consequently, it is not surprising to find that in 1995, people in Japan averaged 16 physician visits per year compared with only 6 visits per year by people in the United States (Graig, 1999). This is important because having easy access to health care, and making a large number of yearly visits to a health care provider, increases the odds that hypertension will be detected and treated. If this is true, then there is a good chance older people in Japan would know whether they have hypertension. The second reason why we have faith in these self-reports of hypertension may be found in a recent study by the Japanese Health Services Bureau, Ministry of Health and Welfare (1997). Part of the protocol for this study involved directly measuring the blood pressure of a representative nationwide survey of older people in Japan. Subsequent analysis of these data revealed that 32% of men 70 years of age and older had hypertension, whereas 32% of the women in this age group had hypertension (Health Services Bureau, Ministry of Health & Welfare, 1997). These figures are close to those obtained in our Wave 4 (28%) and (especially) our Wave 5 interviews (32%).

Death of a loved one.—The respondents in our study were also asked if a family member or (separately) a close

Table 1. Study Measures

Measure	Item
1. Hypertension (Waves 4 and 5)[a]	Do you have high blood pressure?
2. Death of a loved one (Wave 4)[b]	During the past year did a member of your family die?
	During the past year did a close friend die?
3. Private religious practices (Wave 4)[c]	At my home, I pray and offer prayers for my ancestors (includes offering water, incense, and rice).
	How often do you read Buddhist scriptures or the Bible in your home?
	How often do you watch or listen to religious programs on TV or the radio?
4. Religious coping (Wave 4)[d]	When facing difficulties, I calm myself when I pray to God or Buddha.
	When making an important decision, it is important for me to consult with God or Buddha.
	Praying to God or Buddha helps me overcome my stress and worries.
5. Belief in the afterlife (Wave 4)[e]	Compared to life on earth, life after death will be a much better place.
	Death is just one point on the way to eternal happiness.
6. Body mass index (Wave 4)	How tall are you without shoes on?
	About how much do you weigh?
7. Smoking (Wave 4)[f]	Do you smoke at present?
8. Physical exercise (Wave 4)[g]	How often do you do yard work?
	How often do you exercise or engage in sports?
	How often do you take a stroll or walk a considerable distance (over 1 km or ten blocks)?
9. Alcohol intake (Wave 4)[h]	Do you drink beer, sake, or other alcoholic beverages?
	In the past month, on approximately how many days did you drink alcohol?
	On days that you drank, how much did you drink?

[a]This variable was scored in the following manner: yes, has hypertension (1); no, does not have hypertension (0).

[b]This variable was scored in the following manner: had both a family member and a close friend die (2), had either a family member or a close friend die (1), neither a family member nor a close friend died (0).

[c]These variables were scored in the following manner: always (4), sometimes (3), seldom (2), never (1).

[d]These variables were scored in the following manner: always (4), sometimes (3), not usually (2), never (1).

[e]These variables were scored in the following manner: strongly agree (5), agree (4), uncertain (3), disagree (2), strongly disagree (1).

[f]This variable is scored in the following manner: respondent currently smokes (1), respondent does not smoke at this time (0).

[g]These variables were scored in the following manner: often (4), sometimes (3), seldom (2), not at all (1).

[h]These measures were used to compute the total number of Japanese *go*s of alcohol consumed in the past month.

friend had died in the year before the Wave 4 interview. Preliminary analyses indicated that approximately 17% of the study participants ($n = 304$) had a family member or friend die during this time. A measure consisting of a simple count of deaths among family and close friends was used in the analyses presented.

Private religious practices.—As shown in Table 1, private religious practices were assessed at Wave 4 with three items that asked whether respondents offered prayers at home, read sacred scriptures, and watched or listened to religious programs on TV or the radio. A high score on these items denotes greater involvement in religion. The internal consistency reliability estimate for this brief index was .572.

Religious coping.—Religious coping was also evaluated at Wave 4 with three indicators that assessed whether respondents turned to a deity during difficult times, whether they consulted one of the gods when adversity arose, and whether they asked a deity to help them overcome the stressors they faced. A high score on this brief composite measure represents greater use of these religious coping responses. The reliability estimate for this index is .857.

Belief in the afterlife.—As shown in Table 1, two questions were administered in the Wave 4 interviews to see if study participants believed in life after death. However, these indicators captured more than just beliefs in the afterlife, per se. In particular, they also gauged whether a respondent believed the deceased is going to a better place. Consistent with the theoretical rationale provided earlier, believing that a deceased significant other is going on to a better life may help allay concerns about their safety and well-being, thereby providing an important prerequisite for eliciting the relaxation response. Preliminary analyses revealed that the correlation between the two afterlife items was .433 ($p < .001$).

Body mass index.—To place greater faith in the main study findings, controls were included in the analyses for a number of well-known risk factors for hypertension. The first was body mass index (BMI). As a number of investigators have pointed out, high BMI values are associated with a greater risk of developing hypertension (Lu, Tang, Wu, Yang, & Chang, 2000). BMI ratios were calculated from study participants' self-reported height and weight at Wave 4.

Smoking.—Research has also indicated that people who smoke are more likely to develop hypertension than individuals who do not smoke (Jackson, Jatulis, & Fortman, 1992). To control for this risk factor, a simple binary variable was created from self-reported smoking at Wave 4. Approximately 22% of the study participants indicated they smoked at that time.

Physical exercise.—A number of studies have suggested that engaging in regular light physical exercise helps to reduce the risk of developing hypertension (Nothwehr, Elmer, & Hannan, 1994). Three questions were administered at the Wave 4 interviews to determine how often study participants did yard work, engaged in regular physical exercise or sports, and walked at least 10 city blocks. A high score on this measure meant a respondent was more physically active.

Alcohol intake.—Finally, there is some evidence that high consumption of alcoholic beverages is associated with an elevated risk of developing hypertension (Rabbia et al., 1995). Information on alcohol consumption was assessed at the Wave 4 survey by asking respondents how often they had drunk alcoholic beverages in the past month and how much they typically drank on days they consumed alcohol. These data were used to compute an overall estimate of alcohol consumption that is expressed in terms of a traditional Japanese *go*. A *go* is a container for holding sake. To get a better sense of the size of a *go*, it is helpful to point out that a 350-ml can of beer equals 0.6 of a *go*.

Demographic control measures.—The relationship between religion, death of a loved one, and changes in self-reported hypertension was evaluated after the effects of the following demographic variables were controlled for statistically: age (scored continuously in years), sex (1 = male, 0 = female), marital status at Wave 4 (1 = presently married, 0 = otherwise), and education (the total number of years of completed schooling).

Data Analysis Strategy

The hypotheses developed for this study specify that religion will reduce the deleterious effects of bereavement on change in self-reported hypertension over time. Stated in more technical terms, this perspective calls for a statistical interaction between each dimension of religion (i.e., private religious practices, religious coping, and belief in the afterlife) and death of a loved one on hypertension. The following logistic regression equation was used to test for these effects:

$$HTN_5 = a + b_1\,HTN_4 + b_2\,DEATH_4 + b_3\,PRAC_4 + b_4\,COPE_4 + b_5\,AFTER_4 + b_6\,(PRAC_4 \times DEATH_4) + b_7\,(COPE_4 \times DEATH_4) + b_8\,(AFTER_4 \times DEATH_4) + \Sigma c_i Z_i. \quad (1)$$

In this equation, HTN_4 and HTN_5 denote hypertension at Waves 4 and 5, respectively; $DEATH_4$ is death of a loved one at Wave 4; $PRAC_4$ represents private religious practices at Wave 4; $COPE_4$ stands for religious coping at Wave 4; and $AFTER_4$ is belief in the afterlife at the Wave 4 interviews. Z_i denotes the control variables (i.e., BMI, smoking, alcohol consumption, exercise, age, sex, marital status, and education). Finally, a is the intercept, whereas the b_i and c_i are logistic regression coefficients. Following the recommendations of Selvin (1991), all independent variables were deviation scored (i.e., centered on their means) before Equation 1 was solved.

Equation 1 is estimated in a hierarchical fashion. The additive effects of the independent variables are entered in the first step (i.e., HTN_4, $DEATH_4$, $PRAC_4$, $COPE_4$, $AFTER_4$, and Z_i). Following this, tests for the statistical interaction between the religion measures and death of a loved one are performed in Step 2 by entering the multiplicative or cross-

product terms into the model (i.e., $DEATH_4 \times PRAC_4$, $DEATH_4 \times COPE_4$, and $DEATH_4 \times AFTER_4$). If the coefficients associated with the multiplicative terms are statistically significant, it is important to determine whether the interaction effects are in the hypothesized direction. We accomplished this by using the formula provided by Hosmer and Lemeshow (1989; see p. 69). Focusing on the interaction between death of a loved one and private religious practices illustrates how this formula was used. If Hypothesis 1 is correct, the effects of the death of a loved one on changes in hypertension should become progressively weaker at higher levels of private religious practice. This effect can be shown clearly by performing some hand calculations that use the estimates derived from Equation 1. The formula used for these hand calculations is

$$b_{DEATH_4} = b_2 + b_6\,(PRAC_4). \quad (2)$$

In this equation, b_{DEATH_4} stands for the effects of death of a loved one on change in self-reported hypertension at select levels of private religious practice. The estimates of b_2 and b_6 come directly from Equation 1. Equation 2 is solved by substituting select values of private religious practices ($PRAC_4$) into the formula. After this, additional formulas provided by Hosmer and Lemeshow are used to compute standard errors for the estimates (this permits the calculation significance tests) as well as odds ratios for each of the coefficients derived with Equation 2.

Supplementary analyses.—We performed two additional sets of analyses that are designed to provide greater confidence in the findings. The first has to do with the causal lag. As discussed in the previous section, the main analyses tested for the impact of religion and death of a loved one at Wave 4 on change in self-reported hypertension at Wave 5. Stated in more technical terms, this specification calls for a lagged effect of religion and bereavement on health. In our case, the lag was 3 years (1996 to 1999). But it is also possible that the effects of death of a loved one and religion on self-reported hypertension may appear in a much shorter period of time. Again, casting this issue in more technical terms, one might argue that there are contemporaneous effects of religion and bereavement on hypertension. One way to address this issue is to look at the relationships among religion, death of a loved one, and hypertension using measures that have all been gathered at the same point in time (i.e., at Wave 4). Consistent with this rationale, the first set of supplementary analyses involved estimating the relationships among the Wave 4 waves of religion, bereavement, and health only.

The second set of supplementary analyses involves a potential problem with confounding. As discussed earlier, the work of Marrone (1999) suggested that when a significant other dies, bereaved study participants face critical cognitive restructuring tasks that are geared toward altering their belief systems so that the loss of a loved one can be integrated into worldviews that guide daily behavior. Cast within the context of the present study, Marrone's (1999) observations suggest that older people in Japan may alter their beliefs about the afterlife in an effort to convince themselves that their departed loved ones still exist and that they are well cared for. If this is true, then beliefs in the afterlife may be correlated with the death of a loved one. However, if this correlation is sufficiently large, we may have difficulty disentangling the impact of death of a loved one on belief in the afterlife from the interaction between death of a loved one and belief in the afterlife on hypertension. To evaluate the extent of this problem, the second set of supplementary analyses presented in the Results focuses on the relationship between death of a loved one and belief in the afterlife at Wave 4. Ideally, it would have been nice to examine the relationships among these constructs with longitudinal data as well. Unfortunately, data on belief in the afterlife were gathered only at the Wave 4 survey.

Results

The findings from this study are presented below in three sections. The potential bias created by the loss of study participants over time is evaluated first. Following this, tests of the three main study hypotheses are presented in the second section. Finally, results from the supplementary analyses are reviewed in the third section.

Effects of Sample Attrition

Owing to the supplemental sampling strategy that was implemented at Wave 4, the data from this wave of interviews constitute a nationally representative sample of people who are at least 60 years of age and living independently in Japan (i.e., those who do not live in nursing homes). However, some participants who were interviewed at Wave 4 did not participate in the Wave 5 survey. The loss of participants over time in panel studies may bias empirical findings if sample attrition occurs nonrandomly. Although it is difficult to determine the extent of the problem precisely, some preliminary insight can be obtained by using select data from the Wave 4 interviews to see if those who were lost to follow-up differed significantly from those who remained in the study (see Norris, 1987, for a detailed discussion of this approach). These analyses were performed in the following manner. First, a binary outcome measure was computed by assigning a score of 1 to all participants who were lost to follow-up at Wave 5 and a score of 0 to all who participated in the Wave 5 interviews. Then, using logistic regression, this binary outcome was regressed on the following Wave 4 measures: hypertension, death of a loved one, private religious practices, religious coping, belief in the afterlife, BMI, smoking, physical exercise, alcohol consumption, age, sex, marital status, and education. If any of the independent variables are related significantly to the binary outcome, then it would be reasonable to assume that sample attrition did not occur in a random manner.

The sample attrition analyses revealed that the loss of participants over time did not take place in a random manner. More specifically, the data suggest that, compared with older adults who were reinterviewed successfully, elderly people who did not participate in the Wave 5 survey were more likely to be older ($\beta = .047$, $p < .001$), male ($\beta = .297$, $p < .05$), and more highly educated ($\beta = .083$, $p < .001$) and to have a lower BMI ($\beta = -.050$, $p < .01$). Moreover, older adults who did not participate at Wave 5 were also less likely to exercise ($\beta = -.118$, $p < .001$) and less

likely to engage in private religious practices ($\beta = -.077$, $p < .01$). However, significant differences failed to emerge with respect to Wave 4 hypertension, marital status, smoking, alcohol consumption, religious coping, belief in the afterlife, and death of a loved one (a table containing the results of these analyses is available from Neal Krause). Even so, the potential bias associated with nonrandom attrition should be kept in mind as the findings from this study are reviewed.

Religion, Death of a Loved One, and Hypertension

Table 2 contains the estimates derived from evaluating the three main study hypotheses. The additive effects of the study measures on change in self-reported hypertension over time are provided in the left-hand portion of this table (see Model 1), and tests for the interaction between death of significant others and the religion measures are presented in the right-hand side of this table (see Model 2). Three coefficients are provided in each part of the table so that the effects of the independent variables may be described more fully. In addition to the unstandardized logistic regression coefficients (βs) and odds ratios, Table 2 also contains standardized logistic regression coefficients (Bs). Before turning to the substantive results, it is important to briefly discuss why standardized estimates are important and how they are computed.

One problem with logistic regression analysis is that it is difficult to determine whether the impact of one independent variable is greater than that of another. Comparing odds ratios does not help because, as Selvin (1991) pointed out, these coefficients are influenced by the metric of the independent variable. Fortunately, Selvin provided a simple way of rank ordering (i.e., standardizing) the relative effects of the independent variables in logistic regression. This procedure involves multiplying an unstandardized logistic regression coefficient by the standard deviation of the independent variable. Cast in the context of the present study, these standardized estimates indicate the change in log-odds of developing hypertension for a one standard deviation increase in a given independent variable.

Three main findings emerge from the model assessing the additive effects of the study measures on change in self-reported hypertension over time (see Model 1). To begin with, the three dimensions of religion do not appear to exert a substantial additive effect on hypertension. More specifically, religious coping responses ($B = -.076$, *ns*), as well as belief in the afterlife ($B = .035$, *ns*), fail to exert a statistically significant effect. In contrast, private religious practices have a slight impact ($B = .161$, $p < .05$), but the relationship is not in the anticipated direction. In particular, the data suggest that a one-unit increase in private religious practices is associated with about a 7% increase in the odds of developing hypertension over the course of the follow-up period (odds ratio [OR] = 1.072). Although this finding was not anticipated, similar results have been obtained by other investigators. More specifically, Levin and Markides (1985) reported that respondents in their study with high levels of self-rated religiosity were more likely to have hypertension than respondents who did not feel that religion was very important to them.

The second finding to emerge from Model 1 has to do with the effects of bereavement on hypertension. More specifically, the data in the left-hand portion of Table 2 reveal that the death of a loved one is not related significantly to change in self-reported hypertension over time ($B = -.066$, *ns*).

Finally, the data in Model 1 indicate that the impact of some of the control measures on hypertension is similar to what other investigators have observed. More specifically,

Table 2. The Effects of Religion and Recent Deaths on Changes in Hypertension ($N = 1,723$)

	Model 1[a]			Model 2[b]		
Independent Variable	β[c]	B[d]	Odds Ratio	β	B	Odds Ratio
Hypertension (Wave 4)	2.813**	1.257	16.666	2.849**	1.273	17.273
Age	0.001	0.003	1.001	0.002	0.013	1.002
Sex	−0.080	−0.040	0.923	−0.080	−0.040	0.923
Marital status	0.025	0.011	1.025	0.040	0.018	1.040
Education	0.005	0.013	1.005	0.003	0.009	1.003
Smoking	−0.016	−0.007	0.984	−0.018	−0.007	0.982
Alcohol	0.001	0.011	1.001	0.001	0.019	1.001
Body mass index	0.095**	0.295	1.100	0.094**	0.291	1.098
Exercise	−0.063*	−0.143	0.939	−0.064*	−0.146	0.938
Religious coping	−0.028	−0.076	0.973	−0.031	−0.086	0.969
Private religious practices	0.069*	0.161	1.072	0.072*	0.167	1.074
Belief in the afterlife	0.018	0.035	1.018	0.015	0.030	1.016
Recent deaths	−0.164	−0.066	0.849	−0.157	−0.064	0.855
Religious Coping × Recent Deaths	—	—	—	−0.090	—	0.914
Private Religious Practices × Recent Deaths	—	—	—	0.043	—	1.044
Belief in Afterlife × Recent Deaths	—	—	—	−0.267**	—	0.766
−2 log likelihood			1,559.552			1,546.043
Hosmer-Lemeshow goodness of fit			9.633[e]			3.539[e]

[a]Model 1 tests additive effects only. [b]Model 2 tests for the interaction between recent deaths and the religion measures. [c]Unstandardized logistic regression coefficient. [d]Standardized logistic regression coefficient computed by multiplying the unstandardized logistic regression coefficient by the standard deviation of the independent variable. [e]Chi-square value is not significant at the .05 level.

*$p < .05$; **$p < .005$.

the findings suggest that a higher BMI is associated with an increase in self-reported hypertension over the course of the follow-up period (B = .295, $p < .001$). Similarly, the results further reveal that older adults in Japan who exercise more frequently tend to have a slightly lower risk of reporting they have developed high blood pressure at Wave 5 (B = −.143, $p < .05$).

Viewed broadly, the data that have been examined so far suggest that neither religion nor the death of a significant other appears to have a substantial effect on change in self-reported hypertension over the course of the study. However, as the findings in the right-hand side of the table reveal, this conclusion may be premature.

The data provided by Model 2 indicate that neither private religious practices (β = .043, *ns*) nor religious coping (β = −.090, *ns*) offset the noxious effects of bereavement on changes in self-reported hypertension (unstandardized coefficients are reported when focusing on the multiplicative terms because standardized estimates are meaningless in this context). In contrast, the multiplicative term representing the interaction between belief in the afterlife and death of a loved one is significant at the .005 level (β = −.267).

Although the interaction effect between belief in the afterlife and death of a loved one is statistically significant, it may be somewhat difficult to determine whether this relationship is in the hypothesized direction. Fortunately, as discussed earlier, the data in Table 2 can be used in conjunction with Equation 2 to provide estimates of the impact of death of a loved one on change in self-reported hypertension at select values of belief in the afterlife. Scores on the afterlife measure ranged from 2 to 10. Even though any of these values could be used to illustrate the interaction effect, we selected four that are almost equally spaced: 2, 5, 8, and 10. The results of the hand calculations that were performed by substituting these scores into Equation 2 are presented in Table 3.

The data in Table 3 reveal that at the lowest possible score on belief in the afterlife, death of a loved one is associated with a sharp increase in the odds of developing hypertension over time (OR = 1.716). This means that when older Japanese do not believe in a good afterlife, the odds of reporting they have high blood pressure following the death of a significant other increase by about 72%. This finding is important because approximately 22% of the study participants indicated they did not believe at all in a good afterlife (i.e., 381 respondents had a score of 2 on the afterlife measure).

A value of 5 on the afterlife measure represents the median score for the older participants in this study. The data in Table 3 reveal that, at this level, the noxious effects of bereavement are offset completely, and there is a slight decline in the odds of developing hypertension following the death of a loved one (OR = .771). However, as the upper confidence limit for this estimate exceeds 1, this finding must be viewed with caution.

The potentially protective effects of belief in a good afterlife become evident for those Japanese elders with a score of 8. This score is slightly higher than one standard deviation above the mean score for belief in afterlife (*SD* = 6.55). At an afterlife score of 8, the odds of reporting hypertension at the follow-up interview dropped by about 63% for older people who experienced the loss of a significant other but who maintained a strong belief in a good afterlife (OR = .347).

Table 3. The Impact of Recent Deaths on Change in Hypertension at Select Values of Belief in the Afterlife (N = 1,723)

	Value of Belief in the Afterlife			
Statistic	2	5	8	10
β[a]	0.540*	−0.260	−1.059**	−1.592**
B[b]	.219	−.105	−.429	−.644
Odds ratio	1.716	0.771	0.347	0.204
Upper confidence limit	2.913	1.086	0.700	0.565
Lower confidence limit	1.011	0.548	0.172	0.073

[a]Unstandardized logistic regression coefficient. [b]Standardized logistic regression coefficient computed by multiplying the unstandardized logistic regression coefficient by the standard deviation of the independent variable.

*$p < .05$; **$p < .005$.

Finally, the potentially protective effects of belief in a positive afterlife become especially apparent among older people in Japan with the highest score on measure of belief in the afterlife (i.e., 10). At this level, the death of a loved one is associated with a fairly substantial drop in the odds of reporting that one has developed hypertension over time (OR = .204). However, this coefficient must be viewed with caution, because only 35 elderly people had a score of 10 on the afterlife measure.

Supplementary Analyses

The findings presented up to this point suggest there may be a lagged effect of death of a loved one and belief in the afterlife on change in hypertension over time. However, as discussed above, greater confidence may be placed in these results if we explore other temporal specifications. Following the supplemental data analytic strategy discussed earlier, we tested for contemporaneous effects by examining the relationships among religion, death of a loved one, and hypertension with data that have been gathered at the same point in time (i.e., Wave 4). These additional analyses failed to reveal significant main effects of any religion measure or death of a loved one on self-reported hypertension. Moreover, these analyses failed to uncover any significant interaction effects between the religion measures and death of a loved one on hypertension (a table containing the results of these analyses is available from Neal Krause). Coupled with the findings presented in Table 2, these analyses reveal that the effects of religion and bereavement on hypertension are lagged and that it may take some time for the effects of these independent variables to become manifest.

As discussed earlier, the second set of supplemental analyses involved estimating the correlation between death of a loved one and belief in the afterlife. The findings reveal that the two constructs are not related significantly (r = .006). Three useful insights emerge from these results. First, belief in the afterlife does not appear to be stress responsive. Instead of altering beliefs to ease the pain of a loss, older people in Japan appear to be relying on beliefs that have arisen

from, and are maintained by, other factors. This finding is consistent with studies in the West, which have shown that other dimensions of religion are not stress responsive either (Krause & Tran, 1989). Pargament (1997) provided some insight into the factors that may be at work here. In particular, he noted that when people grapple with problematic events, they turn to cognitive frameworks that are firmly in place because these belief systems are familiar and plausible and have frequently worked in the past. Second, these results do not necessarily negate the points made by Marrone (1999). Rather, they suggest that cognitive restructuring following the loss of a loved one may involve factors other than belief in the afterlife. Third, and most important, the additional analysis reveals that data estimation problems are not likely to have arisen in our study and that the interaction between death of a loved one and belief in the afterlife is not confounded by a strong relationship between bereavement and belief in the afterlife.

Discussion

Some scholars have concluded that men and women have believed in life after death since the year 50,000 B.C. (e.g., Eliade, 1978). Since that time, many world religions have embraced the notion that people live on in another world following death. This is true in Japan, where elaborate rituals have arisen around communication with, and care of, those who have passed on to the next life (Klass, 1996). If belief in life after death has flourished for approximately 50 millennia, then it must serve some purpose. The central aim of the present study was to explore one possibility. In particular, the main thrust of our analyses was to see if older people in Japan who believed in a good afterlife were less likely to report they developed hypertension following the death of a loved one than those who did not believe in a good afterlife. Data from a nationwide longitudinal survey support this hypothesis. Viewed broadly, these findings provide evidence of yet another way in which religion may influence the health of elderly people. However, these results also reveal that the beneficial effects of religion appear to be fairly circumscribed when a significant other dies. Rather than involving private religious practices or more general religious coping responses, the data from this study suggest that the potentially salubrious effects of religion arise from specific beliefs about life after death.

There are four reasons why these findings are noteworthy. First, studies on religion tend to focus primarily on religious practices and behaviors while paying less attention to religious beliefs. By focusing on a single stressful experience (i.e., death of a loved one), we provide evidence showing how a particular religious belief (i.e., belief in the afterlife) may perform an important stress-buffering function. This more focused approach to studying religion, stress, and health is consistent with research in the wider stress literature on the matching hypothesis (Wills & Shinar, 2000). According to this perspective, greater insight into the stress process will be obtained if investigators endeavor to show how the noxious effects of particular types of stress are offset by specific coping resources that directly address the needs created by the stressor at hand. Researchers wishing to continue this type of research may benefit by examining how the deleterious effects of other specific types of stress are offset by different religious beliefs that are matched with, and take care of, the needs created by these life events.

Second, beliefs about sacred matters lie at the core of all religions, yet as Levin (2001) pointed out, religious beliefs have rarely been used to study physical health outcomes. Instead, the little work that has been done with religious beliefs focuses primarily on measures of psychological well-being, such as life satisfaction (Krause, 1993). The findings in the present study suggest that in addition to studying well-being, researchers in the West, as well as in Japan, should pay far more attention to the potentially important role that religious beliefs may play in the restoration and maintenance of physical health.

Third, the findings from this study are important because we examined the interface between religion, stress, and health in a culture that differs substantially from that of the United States. This is noteworthy because research in the West has already shown that belief in the afterlife helps people cope effectively with the death of a loved one (Smith et al., 1991–1992). Consequently, our work provides some evidence that at least this facet of the religion–health connection is fairly robust across cultures.

Fourth, the findings from this study are noteworthy because they are based on longitudinal data provided by a nationally representative sample of study participants. This has enabled us to examine the effects of religion and stress on change in self-reported hypertension over time. This represents a significant contribution to the literature because, as Koenig and his colleagues (2001) observed, the majority of studies on religion and health rely primarily on cross-sectional research designs and samples that are not representative.

Although the findings from our study may be thought provoking, a considerable amount of work remains to be done. For example, research in the West has revealed that religion is associated with a wide range of health-related outcomes, including mortality, a number of specific acute and chronic conditions, and several dimensions of psychological well-being (e.g., depression; Koenig et al., 2001). We need to know whether religion also exerts this type of broad-based effect on health in Japan.

Only three dimensions of religion were examined in this study. However, investigators have argued for some time that religion is a complex multidimensional phenomenon that may be assessed in a number of ways (Ellison & Levin, 1998). Further research is needed to see whether other dimensions of religion in Japan are related to health as well. For example, several studies in the West have examined the relationship between religiously motivated forgiveness and health (see McCullough, Pargament, & Thoresen, 2000, for a review of this research). Research is needed in Japan to see whether religion is related to forgiveness and, if it is, whether forgiveness is associated with health. Similarly, research in the West has suggested that religious affiliation or preference may also have an effect on health (Levin, 2001). We need to know whether the same is true with respect to Buddhist and Shinto affiliation in Japan.

But instead of merely assessing dimensions of religion that have been identified in the West, research is also

needed on facets of religion that are relatively unique to Asian cultures. For example, research on ancestor worship was reviewed earlier (Klass, 1996), but we did not measure this unique dimension of religion directly. Because ancestor worship is a core component of religion in Japan, it is important to devise specific survey measures of it and see whether ancestor worship is related to health and well-being.

In the process of devising plans for further research, it is important to keep the limitations of our study in mind. Three shortcomings are discussed briefly below.

The first limitation in our work has to do with the measurement of religious coping. Three indicators were used in the present study to assess this construct, but as the work of Pargament (1997) revealed, religious coping is a vast conceptual domain that contains a large number of dimensions and a wide range of specific attitudes and behaviors. Clearly, more extensive measures of religious coping are needed for further research in Japan.

Second, our measure of hypertension is based on respondent self-reports. This raises obvious questions regarding self-report bias. Although we presented data earlier that suggest that self-reports may be reliable, researchers would benefit from using other ways to assess hypertension, including physician diagnoses, medical record checks, or direct measurement blood pressure during the interview.

Third, as reported earlier, the reliability of the private religious practice measure used in this study is somewhat low (.572). Although there is not complete consensus in the literature, some investigators have recommended that internal consistency estimates should be at least .700 (Nunnally, 1978). However, the issue may not be as straightforward as it initially appears. Our measure of private religious practices consists of only three indicators. This is important because it is well-known that coefficient alpha is sensitive to the number of items in a scale. More specifically, it is harder to attain estimates of the size recommended by Nunnally (1978) when there are only a few measures in an index (Cortina, 1993). Even so, those wishing to conduct further research on private religious practices would benefit from using more reliable measures.

The death of a loved one is a truly universal event that is experienced by virtually everyone around the world. Moreover, the odds of losing a significant other through death increase as people grow older. Religion is also a universal phenomenon in the sense that it is found in virtually every major culture in the world. Consequently, it makes sense to explore the interface between religion and the loss of a loved one in cross-cultural settings. Doing so provides a exciting forum for exploring how older people around the world differ and are alike. We hope the findings reported in this study encourage others to pursue this integral facet of aging around the globe.

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