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Does volunteering moderate the relation between functional limitations and mortality?

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ABSTRACT

Previous studies have demonstrated that functional limitations increase, and organizational volunteering decreases, the risk of mortality in later life. However, scant attention has been paid to investigating the joint effect of functional limitations and organizational volunteering on mortality. Accordingly, we tested the hypothesis that volunteering moderates the relation between functional limitations and risk of mortality. This prospective study used baseline survey data from a representative sample of 916 non-institutionalized adults 65 years old and older who lived in the continental United States. Data on mortality were extracted six years later from the National Death Index. Survival analyses revealed that functional limitations were associated with an increased risk of dying only among participants who never or almost never volunteered, suggesting that volunteering buffers the association between functional limitations and mortality. We conclude that although it may be more difficult for older adults with functional limitations to volunteer, they may receive important benefits from doing so.

Introduction

Volunteering has well-documented societal benefits and also appears to benefit the well-being, health, and longevity of volunteers (Grimm, Spring, & Dietz, 2007; Oman, 2007). Because many people choose to volunteer in later life, and later life is often a time of declining health, it is important to investigate whether volunteering might moderate the effects of declining health on older adults' longevity. The current study examined whether organizational volunteering buffers the relation between functional limitations and the risk of mortality. Organizational volunteering has been defined as an unpaid activity that involves "… taking actions within an organizational framework that potentially provides some service to one or more other people or to the community at large" (Piliavin & Siegl, 2007, p. 454). Functional limitations refer to health-related difficulties in carrying out activities of daily living (e.g., bathing) and instrumental activities of daily living (e.g., shopping) (Miller, Andresen, Malmstrom, Miller, & Wolinsky, 2006). There may be a reciprocal relation between organizational volunteering and health because researchers have found, on the one hand, that volunteering can reduce the risk of morbidity (Lum & Lightfoot, 2005; Luoh & Herzog, 2002; Morrow-Howell, Hinterlong, Rozario, & Tang, 2003; Omoto & Schlehofer, 2007; Van Willigen, 2000) and, on the other hand, that morbidity can be a barrier to serving as a volunteer (Li & Ferraro, 2006; Thoits & Hewitt, 2001).

Several studies have showed that functional limitations are associated with an increased risk of dying independent of other health indicators (Fried et al., 1998; Guralnik et al., 1994; Wolinsky, Johnson, & Stump, 1995) and that volunteering is associated with a reduced risk of mortality controlling for other indicators of social integration (Harris & Thoresen, 2005; Oman, Thoresen, & McMahon, 1999). However, to date, only one study (Sabin, 1993) has examined whether functional limitations and organizational volunteering jointly influence the risk of mortality.

The main effect of volunteering on the risk of mortality

During the past decade, there has been a growing interest in examining the association between organizational volunteering and mortality controlling for demographic variables, socioeconomic status, health, and social connections. Of the 12 studies that we located, the relation between volunteering and mortality, after adjusting for control variables, was statistically significant in 10 studies (Ayalon, 2008; Harris & Thoresen, 2005; Lee, Cenzer, &

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Covinsky, 2009; Lum & Lightfoot, 2005; Luoh & Herzog, 2002; Musick, Herzog, & House, 1999; Oman et al., 1999; Rogers, 1996; Sabin, 1993; Shmotkin, Blumstein, & Modan, 2003) and not significant in two studies (Gruenewald, Karlamangla, Greendale, Singer, & Seeman, 2007; Hsu, 2007). Oman (2007, pp. 25–26) concluded from his review of the literature that "Volunteering is associated with substantial reductions in mortality rates, and these reductions are not easily explained by differences in demographics or socioeconomic status, or by prior health status or other types of social connections and social support, or by prior levels of physical activity and exercise." Given the established link between volunteering and risk of mortality, another important question addressed in several of these studies is, who benefits the most from volunteering?

Moderators of the volunteering-risk of mortality association

Most studies that have examined moderators of the relation between volunteering and risk of mortality have framed their research in terms of whether the magnitude of this relation is amplified or dampened by level of social, cultural, and human capital (i.e., resources). The *complementary* hypothesis posits that the magnitude of the relation between volunteering and mortality increases as the fund of capital increases (Oman, 2007). This hypothesis is based on the premise that in the absence of adequate capital, volunteering by older adults taxes their limited reservoir of coping resources. In contrast, the *compensatory* hypothesis posits that the magnitude of the relation between volunteering and mortality increases as the fund of capital decreases (Oman, 2007). This hypothesis is derived from the notion that volunteering provides older adults with capital and a role that can offset the loss of other roles.

Seven of the 12 studies that we located on the relation between volunteering and mortality investigated moderator variables such as demographic characteristics (Ayalon, 2008; Hsu, 2007), attendance at church services (Harris & Thoresen, 2005), social connections (Musick et al., 1999; Oman et al., 1999), and leisure activities (Shmotkin et al., 2003). Much of the research testing these competing hypotheses has focused on social capital – the resources derived from relationships with other people and organizations. Oman (2007) concluded with respect to social capital that there is more support for the complementary hypothesis than the compensatory hypothesis (e.g., Harris & Thoresen, 2005; Musick et al., 1999; Oman et al., 1999; Shmotkin et al., 2003).

Sabin (1993) examined the relation between being a volunteer (yes versus no), and mortality in a sample of adults 70 years old and older. As part of 68 exploratory analyses, Sabin divided his sample into two groups—those who had no functional limitations and who viewed their health favorably and those who had one or more functional limitations and who viewed their health unfavorably. In support of the complementary hypothesis, Sabin found that the relation between volunteering and mortality was statistically significant only in the healthier group. The findings of this study need to be interpreted cautiously in light of the number of analyses carried out and the absence of a statistical test of the difference between the volunteering effect in the healthy and unhealthy groups.

Studies of health as a moderator of the relation between volunteering and other outcomes provide support for the compensatory hypothesis. In a longitudinal study, Greenfield and Marks (2007) examined whether functional limitations moderated the relation between participation in religious voluntary groups and personal growth. They demonstrated that the relation between continuous participation in religious voluntary groups and personal growth was stronger among older adults who experienced the onset of functional limitations relative to those who did not. Similarly, Okun, Rios, Crawford, and Levy (submitted for publication) found that the association between volunteering and well-being scores increased as the number of number of chronic health conditions increased.

The current study

In light of the scant attention that has been paid to the joint effect of volunteering and health on risk of mortality, we examined whether the association between functional limitations and risk of mortality varies with frequency of volunteering. We chose to cast functional limitations as the predictor variable and frequency of volunteering as the moderator variable because we were interested in highlighting the question of whether volunteering accentuates or dampens the increased risk of dying associated with increments in functional limitations. Based on the findings of the Sabin (1993) study, volunteering should reduce the risk of dying only among older adults who are in good health. Consequently, from this study, we can derive the *complementary* hypothesis that the association between functional limitations and risk of mortality will be stronger among volunteers than non-volunteers.

The findings from studies of the joint effects of health and volunteering on psychological well-being suggest a hypothesis that differs from the complementary hypothesis. For example, based on the findings of Greenfield and Marks (2007), not volunteering should increase the risk of dying only among older adults who are in poor health. Consequently, from their study, we can derive the *compensatory* hypothesis that functional limitations will be more strongly related to risk of mortality among non-volunteers than volunteers.

In testing these two competing hypotheses, we statistically controlled for three classes of variables—sociodemographic variables, lifestyle variables, and self-reported health. In epidemiological studies investigating the relation between organizational volunteering and the risk of mortality, different measures of volunteering have been used including whether or not people volunteer (Rogers, 1996), hours volunteered (Lum & Lightfoot, 2005), frequency of volunteering (Harris & Thoresen, 2005), and number of organizations volunteered for (Musick et al., 1999). Recently, Ayalon (2008) examined in separate analyses whether hours volunteered and a dummy variable contrasting volunteers and non-volunteers predicted risk of mortality. Whereas the dummy variable was a significant predictor of risk of mortality, hours volunteered was not. Therefore, in the present study, we examined both an interval measure of frequency of volunteering (referred to as *volunteer frequency*) and a dummy variable measure of frequency of volunteering (referred to as *volunteer status*).

Method

Participants

The survey data for the current study were from the Later Life Study of Social Exchanges (LLSSE), a 2-year, five-wave longitudinal study of 916 older adults. Ethics approval was provided by the IRB at the University of California, Irvine. Participants were interviewed in person ($M = 70$ min). At baseline, the sample was representative of individuals living in the 48 contiguous states of the U. S who were (a) non-institutionalized, (b) English-speaking, (c) cognitively functional, and (d) between the ages of 65 and 91 years old. To assess cognitive status, an adapted version of the Short Portable Mental Status Questionnaire (Pfeiffer, 1975) was administered to participants. Potential participants were excluded from the sample if they were unable to answer the questions. The ethnic composition of the sample was as follows:

83% White, 11% African American, 5% Hispanic, and 1% other minority group. (See Sorkin & Rook, 2004 for additional information regarding the sample.)

Data for the predictors and the control variables for the current study were derived from the first wave of the LLSSE survey in 2000. Six years later (and four years after the last wave of survey data were collected for the LLSSE) data on occurrence and date of death were obtained via a computerized query of the National Death Index (NDI) for deaths that occurred from the years 2000 through 2006. Survey respondents were matched with the NDI records using several criteria including Social Security number, date of birth, gender, and race using a probabilistic algorithm developed by NDI. Participants without matching records were assumed to be living, except for three cases which were reported to be deceased when contacted for follow-up during the survey period. Matching based on Social Security numbers alone or in conjunction with additional characteristics have been shown to have high levels of sensitivity and specificity for correctly identifying deaths (e.g., Williams, Demitrack, & Fries, 1992). There were 48 participants with missing data on one or more of the LLSSE survey variables at Wave 1. Thus, our analyses were based on the 868 participants with complete data on all study variables.

Measures

Time to death

Survival times to the nearest month were calculated for participants who died between their baseline LLSSE assessment in 2000 and the end of 2006. The remaining adults in the LLSSE sample were presumed to be alive at the end of the death certificate screening period (i.e., censored). During the mortality surveillance period, 25% of the participants died. Other studies of the relation between volunteering and risk of mortality among older adults using comparable mortality surveillance periods have reported similar death rates (Ayalon, 2008; Gruenewald et al., 2007; Oman et al., 1999).

Frequency of volunteering

To assess how often participants volunteered, they were asked, "During the past month, how often did you do volunteer work?" The six response options were "never or almost never", "once a month or less", "several times a month", "about once a week", "several times a week", and "daily." Sixty-nine percent of the participants indicated during the past month that they volunteered "never or almost never." Eight percent of the respondents reported that they volunteered "once a month or less" and 6% of the respondents reported that they volunteered "several times a month." Nine percent of the participants volunteered "about once a week," 6% indicated that they volunteered "several times a week," and 2% reported volunteering "daily." For volunteer frequency, the response options to the frequency of volunteering item were coded as follows: "never or almost never" (0 times per month), "once a month or less" (1 time per month), "several times a month" (3 times per month), "about once a week" (4 times per month), "several times a week" (14 times per month), and "daily" (30 times per month). The mean and standard deviation for volunteer frequency scores were 2.17 and 5.49, respectively. The skewness statistic for frequency of volunteering was 3.59. Positively- or right-skewed distributions are asymmetric distributions in which many scores have low values and only a few scores have high values. For the dummy variable, volunteering status, participants who volunteered "never or almost never" were coded 0 and participants who volunteered more frequently than "never or almost never" were coded 1.

Functional limitations

Participants were asked 15 questions regarding difficulties with activities of daily living, upper extremity strength, and mobility (Nagi, 1976). Response options ranged from 0 (not at all difficult) to 3 (very difficult). Responses to the individual items were averaged so that the minimum and maximum possible functional limitation scores were 0 and 3, respectively. The coefficient alpha for this scale was 0.93. Twenty percent of the respondents had scores of zero, indicating that they reported "no difficulty" with any of the activities of daily living. Fifty-five percent of the participants had functional limitation scores below 1.00, which indicates that they found the activities of daily living to be "not very difficult". Twenty-two percent of the sample had functional limitations scores between 1 and 2 ("somewhat difficult") and only 3% had functional limitation scores above 2. The mean and standard deviation for functional limitation scores were 0.61 and 0.62, respectively. Functional limitation scores were also positively skewed (skewness statistic = 1.12).

Covariates

Sociodemographic covariates included age in years, gender (0 = male, 1 = female), marital status (0 = not married, 1 = married or in marriage-like relationship), and educational attainment. The mean age in years of the sample was 74.12 ($SD = 6.61$). Sixty-two percent of the participants were female and 54% of the sample was married or living in a marriage-like relationship. The nine response options for educational attainment ranged from completed less than 8th grade to completed graduate or professional school. After rescaling the response options for years of schooling such that the minimum value was 3.5 for completed less than 8th grade and the maximum value was 19 for completed graduate or professional school, the mean and standard deviation for years of schooling were 12.16 and 3.42, respectively. Lifestyle covariates included hours worked per week at a paying job, attendance at religious services, participation in clubs and organizations, and the average of the number of times per month participants engaged in slight/moderate exercise and in vigorous exercise. The mean number of hours worked per week was 3.59 ($SD = 11.03$). The six response options for attendance at religious services and participation in clubs and organizations ranged from "never or almost never" (coded 0) to "daily" (coded 30). The means for times per month attending religious services and for participating in clubs and organizations were 4.03 ($SD = 5.43$) and 1.96 ($SD = 4.34$), respectively. The seven response options for the two exercise questions ranged from "never" (coded 0) to "daily" (coded 30). The mean for number of times of exercise per month was 7.22 ($SD = 9.01$).

Health covariates included number of diagnosed chronic health conditions (possible range from 0 to 12) and self-rated health. The mean and standard deviation for number of chronic health conditions were 2.19 and 1.54, respectively. The five response options for self-rated health ranged from poor to excellent. After rescaling the response options such that the minimum value was 0 for poor and the maximum value was 1 for excellent, the mean rating of self-rated health was 0.52 ($SD = 0.28$).

Results

Comparison of respondents with complete and missing data

We compared the 868 participants with complete data on the main study variables with the 48 participants who had missing data on one or more of the main study variables. For categorical variables, we used χ^2 tests and for continuous variables we used independent samples two-tailed t-tests. Results revealed that there were no significant (all p values > 0.05) differences between

participants with missing data and participants without missing data on any of the study variables.

The relations among functional limitations, frequency of volunteering, and mortality

The Pearson correlation between functional limitation scores and volunteer frequency scores only approached significance, Pearson $r = -0.07$, $p = .053$. Functional limitations were significantly ($p < .001$) positively correlated with mortality (point biserial correlation coefficient = 0.36). There was a significant association between frequency of volunteering and mortality, χ^2 (5, 868) = 14.53, $p < .05$. Volunteer status also was significantly related to mortality, χ^2 (1, 868) = 12.60, $p < .001$. On the one hand, the death rate was 29% among those who volunteered never or almost never and, on the other hand, the death rate was 17% among those who volunteered more frequently than never or almost never.

The relations between the covariates and mortality, functional limitations, and frequency of volunteering

Among the covariates, the strongest correlates of mortality were age ($r = 0.29$, $p < .001$), self-rated health ($r = -0.26$, $p < .001$), and number of chronic conditions ($r = 0.18$, $p < .001$). The variables exhibiting the largest associations with functional limitations were self-rated health ($r = -0.55$, $p < .001$), frequency of exercising ($r = -0.40$, $p < .001$), and number of chronic health conditions ($r = 0.39$, $p < .001$). Volunteer frequency was most strongly related to attending religious services ($r = 0.22$, $p < .001$) and participating in clubs and organizations ($r = 0.21$, $p < .001$).

Cox proportional hazard regression analyses

We carried out separate Cox proportional hazards regression models using volunteer frequency (see Table 1) and volunteer status (see Table 2) as predictors. Prior to testing these models, functional limitation scores and frequency of volunteering scores were centered. Centering is accomplished by subtracting the mean of a distribution from each of the raw (uncentered) score in the distribution. Centered scores have a mean of 0 and a standard deviation that is equal to the standard deviation of the distribution of raw (uncentered) scores. For functional limitation scores, we subtracted the mean of 0.61 from each raw score, creating a distribution with a mean of 0 and a standard deviation of 0.62. For frequency of volunteering scores, we subtracted the mean of 2.27 from each raw score, creating a distribution with a mean of 0 and a standard deviation of 5.49. Centering of continuous predictors that are components of an interaction effect enhances the interpretation of their main effects by reducing non-essential multicollinearity but has no effects on the coefficient for the interaction (Aiken & West, 1991).

The main analyses were conducted using the PHREG procedure in version 9.1.3 of SAS (DeLong, Guirguis, & So, 1994). Ties were handled using the exact method. Standard errors were computed by partial likelihood with the Newton–Raphson algorithm. It is important to note that the numbers shown in Tables 1 and 2 are hazard ratios (HR) accompanied by 95% confidence intervals for the final model. For binary variables, the hazard ratio represents difference in the hazard of mortality in the two groups. If the coefficient equals 1.0, the hazards are equal and group membership has no effect on survival, whereas values greater than 1.0 indicate greater hazard of mortality and ratios less than 1.0 indicate reduced hazard of mortality. For gender, the reference group is male and for marital status, the reference group is not married. With continuous variables such as age, the hazard ratio represents the increased or decreased hazard of mortality for each 1-unit increment in the predictor.

When we entered the covariates in Block 1 of both models, five covariates were significantly ($p < .05$) associated with the risk of

Table 1
Summary of Cox Proportional Hazards Regression Analysis with Volunteer Frequency and the Functional Limitations by Volunteer Frequency Interaction Effect ($N = 868$).

Predictor	Model		
	1	2	3
Self-rated health	0.24***	0.45**	0.44** (0.24, 0.79)
Number of chronic health conditions	1.10*	1.06	1.07 (0.98, 1.17)
Age (years)	1.08***	1.06***	1.06*** (1.04, 1.09)
Sex (female)	0.65**	0.61**	0.60*** (0.45, 0.81)
Marital status (married or living in a married-like relationship)	0.65**	0.67*	0.68* (0.50, 0.93)
Educational attainment	0.98	0.99	0.99 (0.96, 1.03)
Hours working (per week)	0.99	1.00	1.00 (0.98, 1.02)
Exercise frequency	0.98	0.99	0.99 (0.97, 1.01)
Attend religious services	1.00	1.01	1.01 (0.98, 1.04)
Attend meetings of clubs and organizations	0.99	0.99	0.99 (0. 96, 1.02)
Functional limitations		1.75***	1.63*** (1.28, 2.08)
Volunteer frequency		1.00	1.00 (0.98, 1.03)
Functional limitations by volunteer frequency			0.95[a] (0.91, 1.00)
Model Fit Statistics[b]	**Model**		
	1	2	3
χ^2/df	146.89/10***	168.17/12***	172.16/13***
$\Delta\chi^2$/df	146.89/10***	21.28/2***	3.99/1*

*$p < .05$; **$p < .01$; ***$p < .001$. *Notes*. All entries for the predictors are hazard ratios with 95% confidence intervals for block 3.
[a] p value associated with this effect using the Wald chi-square test is <0.06.
[b] With only the y-intercept in the model (block 0), the value of the −2 log likelihood function was 2562.41.

Table 2
Summary of Cox Proportional Hazards Regression Analysis with Volunteer Status and the Functional Limitations by Volunteer Status Interaction Effect ($N = 868$).

Predictor	Model hazard ratios (95%CI)	
	2	3
Self-rated health	0.46*	0.43** (0.23, 0.78)
Number of chronic health conditions	1.06	1.08 (0.99, 1.18)
Age (years)	1.06***	1.06*** (1.04, 1.09)
Sex (female)	0.61**	0.60*** (0.44, 0.81)
Marital status (married or living in a married-like relationship)	0.67*	0.68* (0.50, 0.92)
Educational attainment	1.00	1.00 (0.96, 1.04)
Hours working (per week)	1.00	1.00 (0.98, 1.02)
Exercise frequency (times per month)	0.99	0.99 (0.97, 1.01)
Attend religious services	1.01	1.01 (0.98, 1.04)
Attend meetings of clubs and organizations	0.99	0.99 (0. 96, 1.02)
Functional limitations	1.74***	1.87*** (1.48, 2.36)
Volunteer status	0.82	0.87 (0.61, 1.26)
Functional limitations by volunteer status		0.41** (0.22, 0.76)
Model Fit Statistics	**Model**	
	2	3
χ^2/df	169.38/12***	178.35/13***
$\Delta\chi^2$/df	22.49/2***	8.97/1**

*$p < .05$; **$p < .01$; ***$p < .001$. *Note*. All entries for the predictors are hazard ratios with 95% confidence intervals for block 3. The −2 log likelihood function with only the y-intercept in the model (block 0) was not reported because it is identical to the value presented in Table 1. Block 1 values for predictors and for model fit statistics are not shown because they are identical to the block 1 values displayed in Table 1. All variables are the same as in Table 1 except that volunteer status replaced centered volunteer frequency scores.

dying (see Table 1). Independent of the other variables, the odds of dying: (a) were over 4 times larger for older adults with poor self-rated health as compared to older adults with excellent self-rated health (1/0.24 = 4.17); (b) were over 1.5 times larger for males than females (1/0.65 = 1.54); (c) were over 1.5 times larger for older adults who were not married or in a marriage-like relationship relative to older adults who were married or in a marriage-like relationship (1/0.65 = 1.54); (d) increased by 10 percent for each additional chronic health condition; and (e) increased by 8 percent for each additional year of age. In Block 2, when we entered centered functional limitation scores and either centered volunteer frequency scores (see Table 1, Model 2) or volunteer status (see Table 2, Model 2), number of chronic health conditions were no longer a significant ($p > .05$) predictor of mortality. Controlling for the other predictors in the model, neither measure of volunteering was a significant ($p > .05$) predictor of risk of mortality (see Table 1, Model 2 and Table 2, Model 2).

Controlling for the other variables in the model, functional limitations scores were a significant ($p < .001$) predictor of risk of mortality. Based on the HR estimate in Model 2 of Table 1, the odds of dying increased by 75 percent for each 1-point increase on the functional limitations scale. As can be seen in Model 3 of Tables 1 and 2, the main effect of functional limitations scores on risk of mortality was qualified by the interaction between functional limitations scores and the volunteering variables. The functional limitations scores by volunteer frequency interaction effect approached statistical significance ($p < .06$) using the Wald chi-square test and was statistically significant using the change in −2LL test recommended by Hosmer and Lemeshow (1999), $\Delta\chi^2$ (1, 868) = 3.99, $p < .05$. The functional limitations scores by volunteer status interaction effect was significant ($p < .01$) using both the Wald chi-square test and the change in −2LL test, $\Delta\chi^2$ (1, 868) = 8.97.

To investigate the form of the interaction between functional limitations and volunteer status further, we computed the simple slopes for centered functional limitation scores as a predictor of risk of dying for participants who volunteered (a) never or almost never; and (b) more frequently than never or almost never. For older adults who volunteered never or almost never, there was a significant ($p < .001$) positive relation between centered functional limitation scores and the risk of dying (HR = 1.87; 95% confidence interval ranged from 1.48 to 2.36). In contrast, for older adults who volunteered more frequently than never or almost never, there was a non-significant ($p = .42$), inverse relation between functional limitation scores and the risk of dying (HR = 0.78; 95% confidence interval ranged from 0.42 to 1.44).

In Fig. 1, based on the estimates derived from Model 3 in Table 2, we present a graphic depiction of the interaction effect. This was accomplished by plotting the estimated log of the hazard for dying (Hosmer & Lemeshow, 1999) across values of the centered functional limitation scores for older adults who volunteered never or almost never and for older adults who volunteered more frequently than never or almost never. As depicted in the figure, when functional limitations were low, there was little difference in the log hazard values between those who volunteered never or almost never and those who volunteered more frequently. Differences were larger between the volunteer groups when there was a higher level of functional limitations, however. For example, the predicted hazards for the group that volunteered never or almost never and the group that volunteered more frequently than never or almost never were 2.99 (log hazard = 1.1) and 0.64 (log hazard = −0.45), respectively, when the (centered) functional limitation scale had a value of 1.75. The estimated hazard ratio at this value (Hosmer & Lemeshow, 1999) was equal to 2.50, reflecting a risk of death two and a half times greater for those who do little or no volunteering relative to those who volunteer more frequently.

In light of the substantial correlations among self-reported measures of health (Mora, DiBonaventura, Idler, Leventhal, & Leventhal, 2008), we conducted supplemental analyses to determine whether frequency of volunteering also moderated the relations between (a) self-rated health and risk of mortality, and (b) chronic health conditions and risk of mortality. To address these questions, we tested four models. In each model, one of four interaction terms was entered in Block 3 (number of chronic health conditions by volunteer frequency, number of chronic health conditions by volunteer status, self-rated health by volunteer frequency, or self-rated health by volunteer status). None of the four interaction effects were significant (lowest $p = .13$) suggesting that the joint effect of volunteering and health on risk of mortality does not generalize across self-report measures of health.

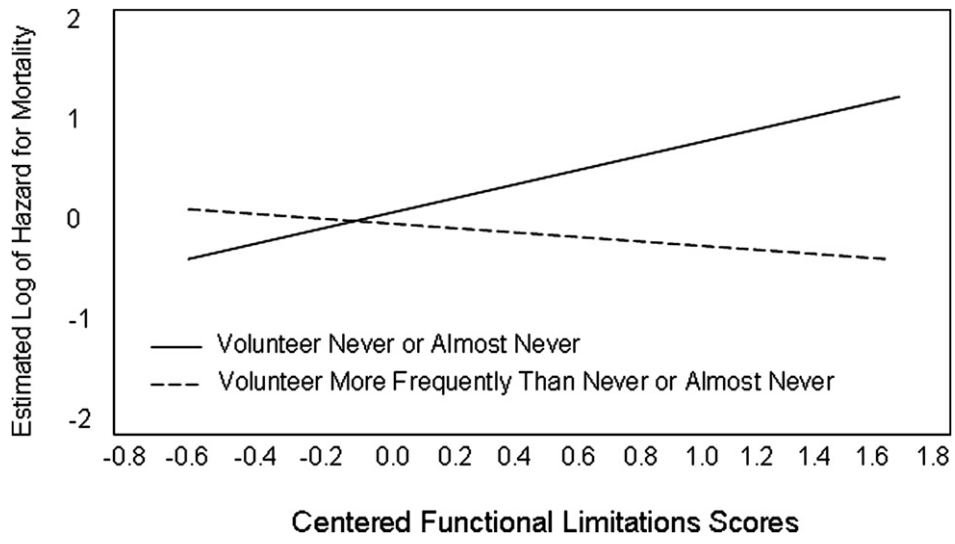

Fig. 1. Estimated log of the hazard ratio for mortality across observed values of centered functional limitation scores for older adults who volunteer never or almost never and for older adults who volunteer more frequently than never or almost never. The centered functional limitations scores ranged from −0.61 to 2.39 for the group that volunteered never or almost never and ranged from −0.61 to 1.79 for the group that volunteered more frequently than never or almost never.

Discussion

The current study addressed the question of whether the impact of functional limitations on the risk of mortality is stronger among older adults who volunteer or who do not volunteer. The complementary hypothesis posits that the association between functional limitations and the risk of mortality is stronger among volunteers as compared to non-volunteers. In contrast, the compensatory hypothesis proposes that the association between functional limitations and the risk of mortality is stronger among non-volunteers than among volunteers. The findings of the current study support the compensatory hypothesis that volunteering buffers the association between functional limitations and the risk of dying.

Our results differ from those reported by Sabin (1993) who found that functional limitations were associated with an increased risk of mortality only among participants who volunteered. However, they are consistent with more recent studies showing that the inverse relation between poor health and well-being scores was stronger among older adults who did not volunteer than among older adults who volunteered (Greenfield & Marks, 2007; Okun et al., submitted for publication). It is important to note that compensatory relations may be observed for some moderator variables whereas complementary relations may be observed for other moderator variables. For example, Oman et al. (1999) found, on the one hand, that the relation between volunteering and mortality increased as level of social activity decreased (i.e., a compensatory effect) and, on the other hand, that the relation between volunteering and mortality increased as the frequency of church attendance increased (i.e., a complementary effect).

One question raised by the findings of the current study pertains to the mechanism(s) by which functional limitations and volunteering exert a joint effect on mortality. Specifically, why does volunteering dampen the positive association between functional limitations and the risk of mortality? It may be useful to employ a biopsychosocial perspective in speculating about the mediation of this interaction effect.

One possible mediator of the joint effect of functional limitations and volunteering on risk of mortality is purpose in life (Frankl, 1963). Ryff and Keyes (1995) define purpose in life as the sense that life has meaning and direction and that one's goals and potential are being achieved or are achievable. Older adults with functional limitations, relative to those who are free of functional limitations, have significantly lower purpose in life scores (Boyle, Barnes, Buchman, & Bennett, 2009). Functional limitations may undermine feelings that one is capable of attaining one's goals (Reitzes & Mutran, 2006). Oman (2007) observed that by engaging in a collective endeavor with other people, volunteering may enhance meaningfulness and purpose in life. This observation is supported by studies showing that volunteering by older adults is related to a sense of mattering (Piliavin & Siegl, 2007) and to perceived usefulness to others (Gruenewald et al., 2007). Furthermore, relative to middle-aged adults, older adults report substantially lower purpose in life scores (Ryff, 1995). Consistent with this finding, Okun (1994) showed that older adults who volunteer more frequently were motivated to a greater extent by a desire to feel useful than older adults who volunteer less frequently. Thus, volunteering may offset the loss of purpose in life that occurs with aging and that may be amplified by functional limitations. Purpose in life has been shown to postpone mortality in later life (Boyle et al., 2009) as have related constructs such as perceived usefulness to others (Gruenewald et al., 2007) and subjective usefulness (Okamoto & Tanaka, 2004). Boyle et al. (2009) suggest that purpose in life influences risk of mortality through its association with several biomarkers of health including salivary cortisol, proinflammatory cytokine soluble interleukin-6 receptor, waist-to-hip ratio, and high-density lipoprotein cholesterol (Ryff, Singer, & Dienberg Love, 2004).

We found that volunteering dampened the influence of functional limitations on the risk of mortality but that it did not moderate the relations between self-rated health and the risk of mortality and number of chronic conditions and the risk of mortality. With respect to offsetting the influence of poor health on risk of mortality, one puzzle raised is why the benefits of volunteering do not extend to self-rated health and number of chronic health conditions. Iso-Ahola (1980) proposed that perceived competence is the most important intrinsic reward associated with leisure activities. Because older adults enact fewer roles, Lawton (1985) observed that perceived competence is a particularly important feature of their leisure activities. As a leisure activity, volunteering has been shown to promote an agentic self-identity (Herzog, Franks, Markus, & Holmberg, 1998) and a sense of competence (Midlarsky & Kahana, 1994). Perhaps the moderating effect of frequency of volunteering on the health-risk of mortality relation is specific to functional limitations because, as compared to self-rated health and number of chronic health conditions, functional limitations directly tap into the lack of competence to perform daily activities such as preparing meals and driving or using public transportation. It may be that the threat to feelings of competence posed by functional limitations is mitigated by the esteem-boosting effects of engaging in volunteer activities. Future studies should investigate the specific immunologic, health, and psychological mechanisms that might further explain the role of volunteering in extending longevity for those with functional impairments.

Limitations

The current study has several limitations. First, only 29 of the 868 participants in the current study (3%) had functional limitations scores above 2. Consequently, we do not know the extent to which our findings generalize to a more impaired population. Second, our measure of frequency of volunteering used a 1-month window and thus may not have captured infrequent volunteering. Third, despite our use of a prospective design and multiple covariates, we cannot be certain that it is frequency of volunteering per se that buffers the association between functional limitations and risk of mortality. For example, frequency of volunteering might be a proxy variable for other unmeasured aspects of physical vitality, although the inclusion of controls for physical exercise and organizational involvement make this explanation less likely.

Implications

The current study has demonstrated that the association between functional limitations and the risk of mortality is buffered by volunteering. Yet, somewhat paradoxically, older adults with functional limitations are less likely to volunteer (Okun, 1993). Thus, strategies should be identified to encourage older adults with mild or moderate functional limitations to volunteer. In a pilot project in California, older patients recruited from a large HMO received a volunteerism "prescription" and information about opportunities to volunteer (Hirschfelder & Reilly, 2007). Such programs may provide low-cost interventions for delaying mortality among older adults with mild or moderate functional limitations. Additionally, older adults with functional limitations may be recruited to volunteer online (Cravens, 2003), although it is an empirical question as to whether the benefits derived from virtual volunteering are similar to those derived from traditional face-to-face types of volunteering.

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