

The Effect of Productive Activities on Depressive Symptoms Among  
Older Adults with Dual Sensory Loss

The purpose of this study was to evaluate the ability of three productive activities (paid employment, volunteer work, and informal helping) to mitigate the negative effects of dual sensory loss (DSL) on depressive symptoms among older adults. Multilevel modeling was used to analyze longitudinal data from the nationally representative Health and Retirement Study. The sample consisted of 2688 persons: 1380 who developed DSL during the study and 1308 who did not. Although participation in each of the productive activities was associated with fewer depressive symptoms for older adults with DSL, volunteering was also the only variable that moderated the relationship between DSL and depressive symptoms. Persons with a DSL who volunteered exhibited a larger decrease in depressive symptoms compared to persons without sensory loss who volunteered. A volunteer intervention for older adults with DSL may be a viable option to help reduce depression in this population.

**KEYWORDS:** hearing loss, vision loss, volunteering, employment, informal helping

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Deficits in both vision and hearing, referred to as dual sensory loss (DSL), are a common occurrence in older age. The exact percentage of persons who experience DSL is unknown, as estimates vary widely based on method used to define hearing and vision loss and the age of the population studied. Estimates have varied from a low of 7.3% to a high of 21% (e.g., Caban et al. 2005; Crews and Campbell 2004; Brennan, Horowitz, and Su 2005). Regardless of the current prevalence, DSL is expected to increase in the coming years with the aging of the population and the increasing lifespan (Caban et al. 2005).

The occurrence of DSL in older adults is a concern because it is associated with several negative outcomes, including depression and functional disability (e.g., Author 2009; Capella-McDonnall 2005; Brennan et al., 2005; Crews and Campbell 2004; Keller et al, 1999). In one recent study, 40% of older adults with DSL exhibited depression based on CES-D scores (McDonnall 2009), a rate significantly higher than the 8 to 16% reported in the older adult general population (Blazer 2003). Research has documented the association between DSL and depression or depressive symptoms, but no research has been published that evaluated the ability of adaptable factors to moderate the relationship between DSL and depression. Although many variables could potentially moderate the relationship between DSL and depression (such as health or socioeconomic status), only some of these variables are adaptable (i.e., can be easily modified by the individual). The focus on adaptable variables is important because they offer individuals a chance to

reduce their experience of depressive symptoms and have the potential to be included in interventions with this population. The purpose of the present study was to evaluate the ability of engagement in productive activities (paid employment, volunteer work, and informal helping) to reduce the negative effects of DSL on depressive symptoms.

### *Theoretical Background*

DSL is often associated with activity loss (McDonnall 2009). Losses in hearing make social interactions more difficult, and losses in vision make travel, among many other things, more difficult. With this combination of challenges, many people with DSL significantly reduce participation in their regular activities. Similarly, productive roles may be lost, and more dependent roles are often taken (Brennan et al. 2005). Personal efficacy and sense of control may be decreased due to an increased need for assistance associated with the sensory losses. Activity loss and role loss are factors that may contribute to the association between DSL and depression. The activity theory of aging states that there is a positive relationship between activity and life satisfaction and the greater the role loss associated with aging, the lower the life satisfaction (Lemon, Bengtson, and Peterson 1972; Longino and Kart 1982). In addition to life satisfaction, this general theory has been applied to other outcomes associated with well-being, such as depression, happiness, and self-esteem (e.g., Hao 2008; Menec 2003; Rietzes, Mutran, and Verrill 1995; Wahrendorf et al. 2008). Activity theory suggests that the more active and productive older people are, maintaining or creating social networks, the better off they will be psychologically.

The idea that persons who are more disadvantaged in social and personal

resources will benefit the most from productive activities has been suggested and research has supported this idea (e.g., Greenfield and Marks 2004; Fengler 1984; Musick, Herzog, and House 1999). Because of the losses associated with DSL, many persons with DSL are disadvantaged in these areas (Capella-McDonnall 2005; Crews and Campbell 2004), and therefore may benefit more from participation in productive activities. If loss of activities can be avoided following a DSL and one can maintain or create new positive roles, the negative effect of DSL on psychological outcomes may be diminished.

### *Employment and Well-Being*

Paid employment is the most common productive activity in our society and an increasing number of people are working beyond the traditional retirement age (U.S. Census Bureau 2009). Older adults can receive many benefits from working, beyond the obvious financial ones (Brown 2003; Pope 2008). Work can provide stimulation, challenges, social interaction, and a sense of being valuable or needed. Several studies have documented the protective effect paid employment has on future well-being in older adults, in the areas of depression (Choi and Bohman 2007; Hao 2008) and health and mortality (Luoh and Herzog 2002). Calvo (2006) also found that longer working lives improved physical health and emotional well-being. Christ and colleagues (2007), however, did not find that older adults who work past traditional retirement age had lower levels of depression when controlling for disability. Working in certain job sectors or types of jobs (e.g., higher status positions) did provide a benefit against depression, regardless of disability status.

Christ et al.'s finding corresponds with other studies that focused on the effect of

choice in working or retiring on well-being. Research has supported the idea that having a choice in whether to retire or continue working is what is associated with higher levels of well-being, not whether a person is working or not (e.g., Calvo, Haverstick, and Sass 2009; Herzog, House, and Morgan 1991). Similarly, involuntary job loss in later life has been associated with negative physical functioning and mental health (Gallo et al. 2000). Although many older adults stop working, either voluntarily or involuntarily, after developing a DSL, a substantial percentage of this population do work or express an interest in working (McDonnall and LeJeune 2008).

#### *Volunteering and Well-Being*

An extensive amount of research has been conducted on volunteering and well-being in older adults. The effect of volunteering on health, functional impairment, life satisfaction, and depression has been investigated. A meta-analysis of 29 studies published between 1968 and 1994 found a significant relationship between volunteering and well-being (primarily measured in terms of life satisfaction, happiness, and depression) in older adults (Wheeler, Gorey, and Greenblatt 1998). The vast majority of more recent research has also supported volunteer work's positive effect on well-being. Strong support has been provided from both cross-sectional and longitudinal research on the positive association between volunteering and depression, as well as other measures of well-being (e.g., Hao 2008; Li and Ferraro 2005; Lum and Lightfoot 2005; Morrow-Howell et al. 2003; Musick and Wilson 2003; Van Willigen 2000; Wahrendorf et al. 2008).

#### *Informal Helping and Well-Being*

Informal helping can also be considered a form of volunteering, but it involves helping individuals that one knows (e.g., friends, relatives, neighbors) directly. It is likely that obligations have a more powerful influence on informal helping than they do on formal volunteer work (Wilson and Musick 1997), and informal helping is much more common than formal volunteering (Wilson and Musick 1997; Herzog and House 1991; Wahrendorf et al. 2008). However, for persons with DSL, it is possible that some who do not feel capable of doing formal volunteer work may feel able to informally help people they know. If this were the case, then the effects of informal helping for this group may be similar to the positive benefits of formal volunteering. Informal helping has also been the focus of research, but to a lesser extent. Several researchers have evaluated the effects of volunteering and informal helping on well-being in the same study. Two studies documented a positive association between informal helping and increased well-being (Krause, Herzog, and Baker 1992; Wahrendorf et al. 2008). Interestingly, Krause and colleagues found that informal helping reduced depressive symptoms by increasing feelings of personal control, but that formal volunteering did not have a positive effect on depressive symptoms. Another study found that informal helping was significantly associated with well-being only if reciprocity in exchange was present (Wahrendorf, Knesebeck, and Siegrist 2006), while one study did not find an association between informal helping and depression (Li and Ferraro 2005).

### *The Current Study*

Depression is a significant problem for older persons who experience a DSL. This relationship is well-documented, but research is lacking on the ability of adaptable factors

to moderate the relationship. Research involving the general population of older adults has documented a positive association between participation in productive activities and lower levels of depression. This relationship is expected to exist for persons with DSL, but it is hypothesized that the relationship may be even stronger for this population, as DSL is frequently associated with role loss and activity loss, resulting in disadvantages in social and personal resources. The primary purpose of the present study was to evaluate the ability of three productive activities to moderate the effects of DSL on depressive symptoms. Three hypotheses were investigated; for each, participation in the productive activity is expected to result in a weaker relationship between DSL and levels of depressive symptoms. In these hypotheses, the productive activity variables function as moderator variables and DSL functions as the independent variable.

1. Participating in paid employment will moderate the relationship between DSL and depressive symptoms over time.
2. Participating in volunteer work will moderate the relationship between DSL and depressive symptoms over time.
3. Providing informal help will moderate the relationship between DSL and depressive symptoms over time.

In addition to providing a test of these hypotheses, this research provides information about whether these productive activities have a different effect on depressive symptoms for persons with DSL compared to persons without sensory loss.

#### Method

The present study is part of a larger research project, funded by the National

Institute on Aging (grant # 1R03AG029355-01A1), whose purpose was to first determine the effect of developing a DSL on depression over time and to further evaluate the ability of adaptable variables to moderate this relationship. Results from the initial study, which documented the longitudinal relationship between DSL and depression, have been published elsewhere (Author, 2009) but are described briefly in the Method section (under *Data Analyses*). The descriptions of the data, sample, and some of the variables (i.e., time, DSL, depressive symptoms) in this section are similar to those presented in the initial study (Author, 2009).

#### *Data Source*

Data were obtained from the Health and Retirement Study (HRS) and the Aging and Health Dynamics study (AHEAD). These nationally representative panel studies were initially conducted separately, but data collection was combined in 1998 and since referred to as HRS. HRS is an ongoing longitudinal study conducted by the Institute for Social Research at the University of Michigan. Its focus is economic resources and retirement, but data collection covers a wide range of topics, including physical and functional health, disability, employment, cognitive status, and activity participation. Data is collected approximately every two years via in-person or telephone interview. Excellent follow-up of participants is provided, and reasons for missing data are available in the majority of cases. Data collection for HRS began in 1992 and for AHEAD in 1993, was repeated in 1995, and then was combined with HRS in 1998. HRS includes 22,000 participants who were born between the years of 1931-1941 or before 1923 and their spouses. Data from the years 1993-1996, 1998, 2000, 2002, 2004, and 2006 were used for

this research.

### *Sample*

The population of primary interest was older persons who experienced a dual sensory loss (DSL) during the course of the study. Persons with a DSL at their first time point in the study were excluded from the sample. The sample consists of two groups: (a) persons who developed DSL during the study and did not at a later time report improved hearing or vision (the DSL group) and (b) an approximately equal number of persons who did not report sensory loss during the study, matched to the DSL group based on age and gender (the comparison group). The purpose of the comparison group was to determine whether differences in the effect of the adaptable variables on depressive symptoms existed between the groups. Stratified random sampling (with gender and age at the first observation point for the DSL group being the strata) was used to select the comparison group. A total of 1380 people who developed persistent DSL during the course of the study and who had depression data available were identified for the DSL group. Because sensory loss is common in old age, there were not enough people without sensory loss to match to the DSL group in the oldest age groups. All available sample members without sensory loss over the age of 75 were included in the comparison sample; this resulted in 1308 people for the comparison group. Rather than including additional younger people in the comparison group, unequal group sizes were used. Approximately 12% of persons eligible for the DSL sample and 15% of persons eligible for the comparison sample had to be excluded due to missing depression data.

Being a longitudinal study, almost all persons contributed more than one wave of

data to the analyses. Number of observations per person ranged from 1 to 7, with a large majority having 3 or more observations (i.e., waves of data available for analysis). The sample size and number of observations differed slightly for each moderator variable analysis due to missing data. The available sample was 2,688 (13,218 observations) for the employment model, 2,688 (12,373 observations) for the volunteering model, and 2,687 (11,173 observations) for the informal helping model. A final model including all moderator variables was also tested; its sample size was 2,628 with 10,250 observations.

A variety of intermittent missing data patterns were present in the data for a small percentage of participants; however, the most commonly occurring missing data pattern was dropout from the study. Because the HRS data includes information on why people are not present in the data by waves, it was possible to obtain reasons for missing data in the majority of cases. The most common reason for missing data for both groups was death, followed by use of a proxy to complete the interview for persons in the DSL group. (In cases of a proxy interview, CES-D items were not asked, but other information was obtained. Therefore, persons who developed DSL were more likely to have missing depression data after the DSL was reported, due to proxy interviews.) Inspection of the patterns of missingness based on depression score were conducted and no differences were found. The data are assumed to be missing at random, based on these analyses and on the knowledge that depression scores are highly correlated over time (Singer and Willett 2003).

#### *Variables and Measures*

*Time.* Time was measured in terms of months since baseline. Months were then

converted to years for these analyses. The time variable associated with the first available data point for each person (regardless of which wave it is from) was assigned a value of zero. The next time point was assigned an exact value based on the number of years and months since the previous data was collected. The second time point was approximately “2” for most participants; the third was approximately “4”, etc., as the waves are spaced approximately two years apart. A second time-related variable associated with the development of DSL was included in the models. This time-varying predictor, labeled “Time-Post DSL,” documents the passage of time *after* the development of DSL. For all time points prior to DSL and the first time reporting DSL, its value is zero. After the development of DSL, each individual’s values on Time and Time-Post DSL increase at the same rate (Singer and Willet 2003). This variable provides the difference in slopes of depression after a person experiences DSL.

*Dual Sensory Loss.* DSL was the independent variable in all analyses. The question used to measure vision loss was: “(With your glasses), Is your eyesight excellent, very good, good, fair, or poor?” Legally blind was a sixth category available for this question, if the person volunteered that information. Vision loss was identified by a report of fair eyesight, poor eyesight, or legal blindness. The question used to measure hearing loss was: “(With your hearing aid) Is your hearing excellent, very good, good, fair, or poor?” A report of fair or poor hearing was identified as a hearing loss. Persons were identified with DSL when they reported both vision loss and hearing loss at the same time point. This time-varying dichotomous variable had a value of “0” prior to the person reporting both hearing and vision loss and a value of “1” at and after this initial

report. It provides the magnitude of the shift in elevation in depression when a person experiences DSL. A time-invariant variable, Group, was included in the models to identify those persons who would eventually develop DSL, as none of the participants had DSL at the first time point in the study. This variable indicated whether there were pre-existing differences in depression between participants who would develop DSL and those who would not.

*Depressive Symptoms.* Depressive symptoms were measured with the shortened Center for Epidemiologic Studies Depression scale (CES-D). Only respondents who answered items for themselves (rather than by proxy) were asked these questions. The original CES-D, one of the most widely-used measures of depression, contains 20 items that are rated on a four-level frequency scale (Radloff 1977). The shortened version of the instrument used in HRS consists of 8 of these 20 items, rated with a yes-no response. Rather than asking how often the person experiences the feelings (i.e., symptoms of depression), the respondent is asked whether the statements are true for him or her *much of the time* during the past week. Responses to these eight items were summed, with responses indicative of depression given a score of 1. Therefore, scores ranged from 0 to 8 with higher scores representing more depressive symptoms. The HRS Health Working Group (Steffick 2000) evaluated the psychometric properties of this abbreviated CES-D scale. They determined that the scale shows good internal consistency, with Cronbach's alphas ranging from .77 to .83. Analyses conducted by the group documented that non-response was not a large problem with the CES-D items. However, to maximize the sample size, responses for respondents who missed only one item were imputed with

individual mean substitution for the missing item.

*Covariates.* Several variables that were not of focal interest to this study but are known to be related to depression or the adaptable variables in older adults were included as covariates in the models. Four were time-invariant (minority status, gender, age [at first time point], education level) and two were time-variant (net worth and health). Minority status and gender were both dichotomous variables, with White persons and males coded as “0” and persons of any other race or Hispanic origin and females coded as “1.” Education level was measured by the highest degree received on a 7-point scale, from no degree to a professional degree (i.e., Ph.D., J.D., or M.D.). Net worth was a continuous variable that represented the dollar value of all assets the person held, minus liabilities. This variable was selected as a measure of socio-economic status instead of income, as the majority of participants were not working. It was rescaled by dividing its value by 100,000 to make its scale more closely match the outcome variable. Health was measured by number of half days the respondent reported spending in bed due to illness or injury during the past month.

#### *Productive Activities*

Productive activities functioned as the moderator variables in these analyses. Because participation in productive activities can change over time, all three of the variables were modeled as time-varying. The items used to measure volunteering and informal helping differed over the course of data collection, particularly in the first several waves. How these items differed and how the dichotomous measures used for this study were developed is described here.

*Employment.* Information about employment was available for all waves of HRS. The item selected to measure employment for this study remained the same at each wave: “Are you doing any work for pay at the present time?” A total of 13,218 observations were available for the analyses involving employment.

*Volunteering.* All waves of HRS included items about volunteering, but these items have changed over the different waves. The question used in 1993 and 1994 was “In the past 12 months, have you done volunteer work totaling 100 hours or more for religious or other charitable organizations?” For years 1996 through 2004 the items were “Have you spent any time in the past 12 months doing volunteer work for religious, educational, health-related, or other charitable organizations?” and “Altogether, how many hours did you spend in the past 12 months doing volunteer work for such organizations?” Following questions encourage people who are not able to provide a specific number of hours to give an estimate of less or more than 100 and less or more than 200 hours. For this study, a dichotomous volunteering variable was created, which had a value of 1 if the person reported volunteering for 100 hours or more in the preceding year and a value of 0 if they did not. In 1995 the item that provided information about volunteering was different in several ways: it was combined with informal helping, it specified 200 hours or more of volunteering, and the time period was two years rather than 12 months, which would average to 100 hours per year as in the other items. Because the item from 1995 included informal helping in addition to volunteering, analyses were conducted with and without the data from this year included. The results were essentially the same with and without the data, therefore a decision was

made to include 1995 data for volunteering in the final analyses. A total of 12,373 observations were available with information about volunteering.

*Informal helping.* Most but not all waves of HRS included items about informal helping, and wording of the items differed over the years. Data about informal helping was not available for 1993 or 1994. Two items were used to obtain information about informal helping in 1995: “In the past two years, have you, yourself, spent time helping others with household chores, errands, transportation, etc?” and the one described under volunteering. If the person responded yes to both of the items, informal helping was given a value of 1. Otherwise, it had a value of 0. The item available for years 1996 through 2002 was “Altogether, about how many hours did you spend in the past 12 months helping friends, neighbors, or relatives who did not live with you and did not pay you for the help?” As with the volunteer item, people were encouraged to give an estimate of the number of hours of help they provided if they could not provide an exact number. In 2004, information about informal helping was changed to two items “Have you spent any time in the past 12 months helping friends, neighbors, or relatives who did not live with you and did not pay you for the help?” and “Altogether, would you say the time amounted to less than 100 hours, more than 100 hours or what?” As with volunteering, these items were recoded to develop a dichotomous variable to measure informal helping, which was assigned a value of 1 if the person reported providing informal help of at least 100 hours/year, and was assigned a value of 0 if the person did not report providing this amount of informal help. A total of 11,173 observations were available with information about informal helping.

*Data Analyses*

The statistical technique used to analyze the data was multilevel modeling, also known as individual growth curve modeling. The model-fitting method recommended by Singer and Willett (2003) was followed to investigate the hypotheses. Results of preliminary model fitting to determine the trajectory of depression for persons who experience DSL was undertaken initially and is described in detail elsewhere (Author 2009). Briefly, the experience of DSL was associated with an initial increase in depressive symptoms and a larger increase over time, which was curvilinear in nature. To address the hypotheses presented in this study, the productive activities, interaction terms associated with these variables, and additional covariates potentially related to the productive activities were added to the base model (i.e., the final model from the previous analyses). Interaction terms (DSL x productive activity) in each model were used to test the hypotheses. These interaction terms also indicate whether persons with DSL experience an effect from the productive activity variables that differs from the effect for persons without DSL. The productive activity variables and their interactions with time were also tested in each model, to determine whether they had an impact on rate of change of depressive symptoms over time. Variables that were not significant at  $p < .05$  were dropped from the final models. After each moderator variable was tested individually in a separate model, all significant variables were combined into a single model to determine their relative significance. SAS version 9.2 (SAS Institute, Inc., Cary, NC), and specifically the PROC MIXED procedure with full maximum likelihood estimation, was used for the analyses.

## Results

### *Descriptive Information*

Descriptive information about the samples is provided in Table 1. The groups are very similar in terms of gender and age as they were matched on these variables. Differences were noted between the groups in terms of race, education level, net worth, and health: the DSL group had more minority group members, lower levels of education, lower average net worth, and had a higher average number of bed days per month. There were also differences in terms of percentages who reported participating in the three productive activities during at least one wave of the study, with persons in the comparison group more likely to participate in each activity. The percentages of participants who reported participating in the productive activities *when they also reported a DSL* were smaller: 13.2% for employment, 9.1% for volunteering, and 11.6% for informal helping.

<Table 1 here>

### *Employment*

Employment and its interaction terms were added to the base model. DSL x Employment provided the test for Hypothesis 1 (that employment moderates the relationship between DSL and depressive symptoms). Employment was the only significant variable; it was associated with a slight decrease in depressive symptoms for all people ( $\gamma = -0.19, p < .0001$ ; see Table 2 for complete results). Because DSL x Employment was not significant, Hypothesis 1 was not supported.

<Table 2 here>

*Volunteering*

Volunteering and its interaction terms were added to the base model. DSL x Volunteering was used to test Hypothesis 2 (that volunteering moderates the relationship between DSL and depressive symptoms). Volunteering and DSL x Volunteering were both associated with fewer depressive symptoms, but the effect size associated with DSL x Volunteering was substantially larger ( $\gamma = -0.16, p < .001$  versus  $\gamma = -0.38, p = .02$ ). Therefore, support for Hypothesis 2 was provided. Because DSL x Volunteering was significant, the interaction between volunteering and the Time-Post DSL was tested but was not found to be significant.

*Informal Helping*

Informal Helping and its interaction terms were added to the base model. DSL x Informal Helping provided the test for Hypothesis 3 (that informal helping moderates the relationship between DSL and depressive symptoms). DSL x Informal Helping was not significant; hence, Hypothesis 3 was not supported by these analyses. Informal Helping ( $\gamma = 0.14, p = .03$ ) and Time x Informal Helping ( $\gamma = -0.04, p = .001$ ) were significantly associated with depressive symptoms. Contrary to what was expected, informal helping was associated with slightly greater depressive symptoms initially, but this effect was attenuated over time. By the end of the study, those who were providing informal help experienced a moderate positive benefit from it.

*Final Model*

A final model consisting of all significant independent variables, covariates, and moderator variables (i.e., Employment, Volunteering, DSL x Volunteering, Informal

Helping, and Time x Informal Helping) was tested to determine the relative importance of the productive activities (results not reported in Tables). Due to missing data across the different moderator variables, the sample size and number of observations were reduced to 2,628 and 10,250 respectively. In order to compare the results across the models directly, each moderator variable model was run again with this reduced sample. Results were essentially the same for the Employment and Volunteering models, but Informal Helping became non-significant in that model (Time x Informal Helping remained significant). In the final model, Employment, Volunteering, and DSL x Volunteering all retained their significance with approximately the same effect size. Informal Helping was no longer significant (as in the reduced sample model), while Time x Informal Helping was significant but its effect size was smaller.

#### Discussion

The purpose of this study was to evaluate the ability of several productive activities – paid employment, volunteer work, and informal helping – to moderate the relationship between DSL and depression among older adults. The results indicate that all three of the variables were associated with lower levels of depression for all persons in the study (i.e., older persons with DSL and older persons without sensory loss), but only volunteering acted as a moderator of depressive symptoms for persons with DSL. The results indicate that older persons with a DSL who volunteer experience lower levels of depression compared to older persons with DSL who do not volunteer and compared to the older persons without sensory loss who volunteer.

Employment was associated with a small decrease in depressive symptoms for

persons with DSL, as it was for the general population. One possible reason that employment exhibited only a small association with depressive symptoms may have to do with choice. Many people are working at older ages, but frequently one of the reasons they work is out of necessity (i.e., not enough money to retire). When work becomes obligatory, particularly in the older age groups when many peers are retiring, it may not be as positive of an experience. Research has documented the importance of choice in whether work will have a positive benefit on well-being (e.g., Calvo et al. 2009; Christ et al. 2007), but in this study choice in working was not included as a variable. If it had been available, employment based on a personal choice to work may have exhibited a stronger association with depressive symptoms.

Informal help was initially associated with a small increase in depression for persons with DSL and the comparison group, but this effect was reduced over time by its significant interaction with time. Essentially, for those persons who provided informal help at their first wave in the study, providing this help was associated with a small average increase in depressive symptoms. At each wave thereafter, providing this help was associated with a smaller increase in depressive symptoms, until at four years into the study informal helping was associated with a net positive effect, or decrease in depressive symptoms. This decrease became larger over time, reaching its peak at the last wave. If a participant in the study provided informal help at the last wave of the study (approximately 12 years after the first wave), he or she had a depressive symptom score which was decreased by approximately 0.30 on average.

Participants started the study at varying ages, but all participants were older by the

last wave in the study. Given that informal helping provided a positive benefit but only in later waves of the study, the assumption can be made that providing informal help is more beneficial as people reach older ages. Of those who were providing informal help at 10 or more years into the study, 65% were age 70 or older, and 33% were age 80 or older. This compares to the first wave, when only 31% of those providing informal help were age 70 or older. Perhaps still being capable of providing this kind of assistance to family, friends, or neighbors, and of being useful to others and feeling needed, provides the benefit against depression for those in the oldest age groups. The effect may have been negative for these younger persons in the first wave because of the obligatory nature this kind of help is often associated with, and younger persons are more likely to have multiple obligations.

Volunteering was negatively associated with depressive symptoms for all persons in the study, and it also acted as a moderator of depressive symptoms for persons with DSL. The effect size was more than three times greater (-0.54 vs. -0.16) for persons with DSL who volunteered compared to the persons without sensory losses who volunteered. The moderator effect of volunteering for persons with DSL was approximately the same size as the initial effect of developing DSL. If a person who developed DSL during the study also volunteered, and continued to volunteer after the DSL, the initial increase in depressive symptoms seen when the DSL appeared would, on average, be eliminated, as illustrated in Figure 1. Because there was not a significant interaction between volunteering and Time-post DSL, volunteering did not diminish the increase over time in depressive symptoms that occurred after the experience of DSL.

A graphical display of the relationship between volunteering and depressive symptoms over time is presented in Figure 1. The black lines in the figure represent the depressive symptoms trajectories of average people who develop a DSL at six years, one who volunteers and one who does not. The increase in depression score seen for the average non-volunteer with DSL represents the average increase associated with the first report of DSL. The gray lines represent the depressive symptoms trajectories of average people in the comparison group, one who volunteers and one who does not. The initial difference in depression scores between persons who develop a DSL and those who do not represents the value of the Group variable (i.e., pre-existing differences between the groups). Note that because volunteering was a time-variant variable, it was possible for people to move from one line to the other (i.e., volunteer to non-volunteer) during the course of the study.

<Figure 1 here>

Based on prior research and theoretical speculation about who may benefit the most from volunteering, it is not necessarily surprising that it acted as a moderator of depressive symptoms for persons with DSL, or that a stronger association between volunteering and depressive symptoms was found for persons with DSL compared to persons without sensory loss. However, the size of the effect is perhaps surprising: 3.3 times greater, on average, for persons with DSL. What are the reasons for the substantial positive effect of volunteering on depressive symptoms for persons with DSL? Key factors that may help explain the effect exhibited in this study include increasing a sense of control; increasing social integration, thereby addressing loneliness and isolation; and

providing a sense of being valuable or needed. A majority of older persons with DSL have identified several of these as important negative feelings associated with a DSL: 61% reported experiencing a feeling of loss of control and 72% reported experiencing both a sense of isolation and loneliness (Author 2007). In addition, 45% reported feelings of worthlessness associated with the DSL. Volunteering may offer individuals with DSL the opportunity to shift their focus away from their own difficulties to focus on helping others in need. Other productive activities may not have been as valuable, either because they do not address all of these areas or because of other negative aspects of them. The role of volunteer has many positive connotations (Wilson, 2000). In this role, older adults with DSL can feel that they are providing a positive benefit to society through volunteering, without the stress associated with a job, and with an activity that is more flexible than either paid employment or informal helping (due to the often obligatory nature of it).

### *Limitations*

A limitation of this study is the use of self-report sensory data rather than clinically measured data. It is recognized that there may be some differences in the DSL population identified by self-report as opposed to measured acuties (see Author 2009 for a complete discussion of this). The use of self-report sensory data in this study creates an evaluation of the relationship between *self-perceived functional dual sensory loss* and depressive symptoms rather than clinically measured dual sensory loss and depressive symptoms, and this distinction should be considered in the interpretation of results.

Another limitation is that the wording of the items to measure volunteering and informal

helping changed during some years of the study, and data was also entirely missing for some years. However, given the large number of observations available, this limitation is likely minor in terms of its effect on results. The fact that volunteering and informal helping could only be measured as dichotomous variables (based on 100 hours or more per year of these activities) is another limitation. Many, if not most, people provide a smaller number of hours of these activities per year. The fact that these older adults were providing a large amount of volunteering or informal helping may be an important factor in the findings. A continuous variable that represented the actual number of hours of these activities would have been preferable.

### *Implications*

The most important finding of this study for older persons with DSL is that volunteering was associated with a substantial decrease in depressive symptoms for this population. Volunteering when one had a DSL provided a much greater protective effect against depressive symptoms than it did for persons without a DSL, including persons who never developed a DSL and persons who eventually did. The implications of this finding are that an intervention involving volunteering may be a viable option to help address depression with this population. An intervention may be necessary because of the low percentage of participants who reported volunteering after the DSL. Persons with a DSL were less likely to volunteer than those without a DSL, which is suggestive of a selection effect process. Persons with DSL may not think they can volunteer, may not have transportation to volunteer, and may not be as likely to learn about volunteer activities due to their sensory losses. All of these things, in addition to their lower levels

of health, may make them less likely to volunteer.

An intervention with this population could provide them information about volunteer opportunities, arrange for transportation, preferably with other volunteers of the same organization, and provide them with training to complete the required activities of the volunteer position. A possible approach would be to utilize something similar to a supported employment model for persons with disabilities, in which workers are provided with a job coach who helps them learn the functions of the job. The job coach may provide assistance for a few days or much longer, depending on the difficulty of the job and the abilities of the person. For this intervention, short term assistance to learn the functions of the volunteer position would likely be needed, and the job coach could be recruited from the volunteer organization. Given the significant problems with depression experienced by this population and the evidence of the positive effect volunteering can have on depressive symptoms, it would be valuable to develop and empirically test volunteer interventions for older adults with DSL.

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Table 1

*Descriptive Statistics of DSL and Comparison Group Samples*

Variable	DSL Group	Comparison Group
Gender – Male	45.9%	46.6%
Average age	69.15 (10.91)	67.86 (10.14)
Race/ethnicity		
White, Non-Hispanic	74.8%	84.1%
Black/African American	13.6%	10.5%
Hispanic	10.3%	3.4%
Other	1.3%	2.0%
Education level		
Less than high school	40.1%	20.6%
High school/GED	46.8%	53.3%
College degree (2 or 4 year)	9.3%	16.2%
Master's or Professional degree	3.8%	9.9%
Average net worth	246,807.70 (671,659.80)	403,525.03 (992,787.42)
Average number of bed days	1.24 (4.82)	0.36 (2.19)
Employed*	32.3%	44.3%
Participated in volunteer work*	24.9%	38.3%
Participated in informal helping*	37.0%	51.9%

\*Represents percent who participated in these activities during at least one wave of the study

Table 2

*Results of Model Building: Estimates of Fixed and Random Effects*

Parameter estimates (SE) for Depression			
	Employment	Volunteering	Informal Helping
<i>Fixed effects</i>			
Intercept	0.62 (0.05)	0.58 (0.05)	0.46 (0.06)
Time	0.08 (0.01)	0.09 (0.01)	0.11 (0.01)
Time <sup>2</sup>	-0.004 (0.001)	-0.005 (0.001)	-0.006 (0.001)
Group	0.74 (0.06)	0.75 (0.06)	0.71 (0.06)
DSL	0.34 (0.06)	0.37 (0.06)	0.39 (0.06)
Time-post DSL	0.17 (0.04)	0.18 (0.04)	0.19 (0.04)
Time-post DSL <sup>2</sup>	-0.02 (0.006)	-0.02 (0.006)	-0.02 (0.006)
Gender	0.35 (0.05)	0.40 (0.05)	0.36 (0.05)
Minority	0.35 (0.07)	0.35 (0.08)	0.38 (0.09)
Minority*Time	-0.04 (0.01)	-0.04 (0.01)	-0.04 (0.01)
Education	-0.13 (0.02)	-0.14 (0.02)	-0.13 (0.02)
Net worth	-0.005 (0.002)	-0.005 (0.002)	-0.005 (0.002)
Health	0.06 (0.005)	0.06 (0.005)	0.06 (0.005)
Vision Loss	0.33 (0.08)	0.33 (0.08)	0.36 (0.08)
Productive Activity	-0.19 (0.04)	-0.16 (0.04)	0.14 (0.07)
DSL*Volunteering	--	-0.38 (0.16)	--
Informal Help*Time	--	--	-0.04 (0.01)

Parameter estimates (SE) for Depression			
	Employment	Volunteering	Informal Helping
<i>Variance components</i>			
Within- Person	1.57 (0.03)	1.58 (0.03)	1.55 (0.03)
Intercept	1.43 (0.07)	1.38 (0.07)	1.45 (0.09)
Time	0.01 (0.001)	0.01 (0.001)	0.01 (0.002)
DSL	1.33 (0.17)	1.40 (0.18)	1.47 (0.19)
Time-post DSL	0.06 (0.02)	0.06 (0.02)	0.06 (0.02)

Note: All variables are significant at  $p < .05$ .

Figure 1

*Association between Volunteering and Depressive Symptoms for Persons with DSL and Persons without Sensory Loss*

