

The Effects of Single and Dual Sensory Loss on Symptoms of Depression in the Elderly

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ABSTRACT

OBJECTIVES: The primary purposes of this study were to determine the effect of dual sensory loss (i.e., combined hearing and vision loss) on depressive symptoms, to determine whether dual sensory loss has an effect on depressive symptoms when controlling for common covariates of depression, and to determine whether persons with dual sensory loss were more likely than those with a single sensory loss to experience depressive symptoms.

DESIGN: Secondary analyses of 2001 National Health Interview Survey data

PARTICIPANTS: 9,832 people aged 55 and older residing in the community in the U.S.

MEASUREMENTS: Self-report answers to questions about hearing and vision status, depressive symptoms, health, education level, poverty, social activities, social support, and functional disability (ADL & IADL status)

RESULTS: Dual sensory loss had a significant effect on depressive symptoms (OR: 3.2, 95% CI: 2.8 to 4.0), which was lowered but still significant after controlling for covariates of depression (OR: 2.2, 95% CI: 1.7 to 2.9). Those with dual sensory loss were not significantly more likely than those with vision loss, but were significantly more likely than those hearing loss, to experience symptoms of depression.

CONCLUSION: Experiencing depressive symptoms is a problem that needs to be addressed with elderly persons with dual sensory loss. Not only is this population more likely to experience these symptoms, because of their sensory losses treatment for them may be problematical. Professionals working with the elderly should be aware of the increased risks of depressive symptoms in those with single or dual sensory loss, and should screen for them. If present, rehabilitation for sensory losses may help decrease them.

KEY WORDS: Dual sensory loss, vision loss, hearing loss, symptoms of depression, elderly

INTRODUCTION

Depression is a commonly occurring problem in persons who are elderly and one that has been found to significantly decrease quality of life in older adults (Blazer, 2003). Minor depression or symptoms of depression are more common than a diagnosis of major depression in the elderly (Beekman et al., 1995; Blazer, 2003). Despite being a less severe form of mental disorder, depressive symptoms have been associated with the same negative factors as major depression (Blazer, 2003).

Several variables are known to be related to depression in the elderly. These variables include functional disability, older age, being female, poorer health, lower socioeconomic status (income and education level), and lack of actual or perceived social support (Beekman et al., 1995; Cummings, 2002; Jang et al., 2002; Penninx et al., 1999; Taylor & Lynch, 2004). Two additional variables that have frequently been associated with higher levels of depression are hearing loss and vision loss (Campbell et al., 1999; Carabellese et al., 1993; Lupsakko et al., 2002; Penninx et al., 1999; Rovner & Ganguli, 1998). As our population in the United States continues to live longer, the incidence of hearing loss and vision loss, as well as dual sensory loss (i.e., both hearing and vision loss), is increasing. Current estimates, taken from the 2001 National Health Interview Survey, of the number of people aged 55 and older in the United States who experience some level of dual sensory loss is 4.4 million. This represents 7.8% of the community-dwelling population (Author, unpublished analyses of raw data). If looking at the entire population, these numbers would likely be much higher because many elderly persons with hearing and/or vision loss are institutionalized. In fact, Peterson and Kirchner (1985) reported that rates of visual impairment are at least four times higher for elderly persons in nursing homes than they are for elderly persons in the community.

Most of the studies that have addressed the effects of sensory loss on depression have only looked at the effects of one loss (Herbst & Humphrey, 1980; Rovner & Ganguli, 1998) or both losses separately (Carabellese et al., 1993; Wallhagen et al., 2001), but have not evaluated the effects of dual sensory loss on depression in the elderly. These studies have established the relationship between depression and vision loss and the relationship between depression and hearing loss, although this relationship does not seem to be as strong or consistent. Despite the interest in depression and sensory loss, only four research studies were identified that addressed depression *and* included elderly individuals with dual sensory loss. Some of these studies primarily focused on univariate analyses (Campbell et al., 1999; Lupsakko et al., 2002) or included only a very small number of persons with dual sensory loss (Carabellese et al., 1993). Only one study, published recently, has included persons with dual sensory loss in multivariate analyses (Chou & Chi, 2004).

Research is currently lacking on the relationship between dual sensory impairment and depression in the elderly, especially research that involves multivariate analyses. This study is meant to address that void by evaluating the effect of dual sensory loss on depressive symptoms in the United States community-dwelling population of persons aged 55 and older. Because persons with dual sensory loss are known to be more disadvantaged than those without sensory loss in many areas, including health, poverty, education level, social activities, levels of functional disability (Capella & Sansing, 2004), and many of these factors are known to be related to depression in the elderly, it was important to combine these variables in a multivariate model to determine whether persons with dual sensory loss were still more likely than others to experience depression when controlling for these variables. This research has three specific purposes: (a) to determine the odds of experiencing symptoms of depression for persons with

sensory loss aged 55 and older in the U.S., (b) to determine whether sensory loss status, particularly dual sensory loss, has an effect on depressive symptoms when controlling for age, sex, health, socioeconomic status, functional disability, social activities, and social support, and (c) to determine if there are differences in the experience of depressive symptoms by persons with a vision loss only, hearing loss only, and dual sensory loss.

METHODS

Data Source & Sample

The data used in this research was obtained from the 2001 National Health Interview Survey (Department of Health and Human Services, 2001). This data is nationally representative of non-institutionalized persons living in the United States at that time and is available for public use. Every year, the National Center for Health Statistics of the Department of Health and Human Services conducts the National Health Interview Survey. The dataset includes 33,326 people interviewed in the 2001 Adult Sample. Of these, 10,023 were aged 55 or older, which is the age group of interest for this study, and answered the questions for themselves. (This age group corresponds to the population of interest for the National Institute for Disability and Rehabilitation Research grant that funded this work.) When only persons who had complete data were selected, the sample sizes used in these analyses were reduced to 9,832 for the unadjusted analyses (representing more than 54.6 million people) and 6,089 for the analysis using control variables (representing approximately 33.4 million people).

Independent and dependent variables

Depressive symptoms

The dependent variable in the analysis was depressive symptoms. This was a dichotomous variable, based on self-report of symptoms of depression and their effect. The

NHIS asked several questions about whether the person has experienced specific negative feelings within the last 30 days. The feelings are all common symptoms of depression and include sadness (“so sad nothing cheers you up”), hopelessness, that everything was an effort, worthlessness, nervousness, and restlessness. If the person answered that he or she had experienced at least one of these feelings at least some of the time in the last 30 days, he or she was also asked about the effect they had: “Altogether, how much did these feelings interfere with your life or activities?” To be classified as experiencing symptoms of depression, an individual had to indicate that the feelings that he or she experienced had interfered with his/her life at least a little. In this way not only the symptoms of depression, but the effect of those symptoms was taken into consideration to make a determination of experiencing depressive symptoms.

Sensory loss

The independent variable of interest in the analysis was sensory loss. This variable was divided into four categories: dual sensory loss, vision loss only, hearing loss only, and no sensory loss, which served as the reference group. Those with vision loss were identified by a yes answer to the following question: “Do you have trouble seeing, even when wearing glasses or contacts lenses?” Those with hearing loss were identified by their answer to the following question: “Which statement best describes your hearing (without a hearing aid)?” If the person indicated he/she had a little trouble, a lot of trouble, or was deaf, then the person was classified as having a hearing loss. Those who had both a vision loss and a hearing loss were classified as having a dual sensory loss. Of the 6,089 people in the second sample, 7.3% (447) had dual sensory impairment, 8.9% (541) had vision loss only, 24.9% (1,515) had hearing loss only, and 58.9% (3,586) did not have sensory impairments. Additional demographic information about the sample is provided in Table 1.

Control variables

Socio-demographic variables

Age, sex, education level, and poverty were the socio-demographic factors used as control variables in the analysis. Age was the only continuous variable included in the models. One caveat to the age variable is that it was measured up to age 84. If a person was older than age 84, their age was coded as “85 or older.” Socioeconomic status was measured with education level and poverty level. Education was recoded into three categories (less than high school, high school, and more than high school). Poverty level was determined by family income, family size, and number of children living in the household, and was recoded as at or above the national poverty threshold or below the national poverty threshold.

Health status

Two variables were used to assess health: number of days spent in bed within the last year (due to illness or injury) and self-perception of whether health was worsening. Number of bed days was a continuous variable that was categorized for this study. The categories were (a) none, (b) 1 to 2 days, (c) 3 to 7 days (d) more than 7 days. Secondly, participants were asked whether their health was better, worse, or the same compared to 12 months ago. This variable was dichotomized to worsening health or not.

Functional disability

Functional disability was assessed by evaluating independence with ADLs and IADLs. These variables were dichotomous, and based on self-report of whether the person needed help with one or more specific ADL and IADL. The specific ADLs asked about were bathing, dressing, eating, and getting around inside the home. The specific IADLs asked about were

everyday household chores, doing necessary business, shopping, and getting around for other purposes.

Social variables

Two control variables were related to social factors: number of activities participated in and amount of support. NHIS respondents were asked whether they had participated in four social activities within the past two weeks: talking on the telephone with friends, getting together with friends, talking on the telephone with family, and getting together with family. Most people had participated in all four of these activities. Therefore this was the reference group, and those who had participated in none or one activity were categorized together and those who had participated in two or three of the activities were categorized together. The final control variable had to do with social support. The item was “How often do you get the social and emotional support you need?” Responses were always, usually, sometimes, rarely, and never. Always was the most common response and thus served as the reference group. Rarely and never responses were combined into one category, resulting in a four-category variable.

Data Analyses

Logistic regression was the statistical procedure used to analyze the data. The LOGISTIC procedure in SUDAAN Version 9.0 (RTI, Research Triangle Park, NC) was the statistical program used to perform the analyses. This software is specifically designed for the analysis of data obtained through complex sampling designs, which was necessary to accurately analyze the NHIS data. SUDAAN allows the user to specify which type of sample design was used, the design stages, and the weight assigned to each person in the dataset. In this study, the primary variable of interest was sensory loss status, while the other independent variables served as control variables. Two models were analyzed: one included only the primary variable of interest,

sensory loss status, and the other included sensory loss status along with all of the control variables. For both models, contrasts were made between each of the sensory loss groups (i.e., dual sensory loss vs. vision loss only, dual sensory loss vs. hearing loss only, and vision loss only versus hearing loss only), to determine whether one was more likely than the other to experience symptoms of depression. The Wald chi-square statistic was used for these comparisons. Predicted marginal proportions are also reported for the second model. These values represent the proportion of people within each of the sensory loss groups who would be expected to report depressive symptoms, when holding the other variables in the model constant.

RESULTS

The model that included only the variable sensory loss status was statistically significant, Wald $\chi^2(3, N=9,832) = 228.19, p < .001$. The proportion of people within each group experiencing symptoms of depression were: (a) dual sensory loss, .35, (b) vision loss only, .28, (c) hearing loss only, .19, (d) no sensory loss, .14. The odds ratios and 95% confidence intervals for each group (presented in the same order as above), with the no sensory loss group as the reference, were 3.32 (2.78 – 3.97), 2.38 (1.98 – 2.86), and 1.51 (1.32 – 1.73). The differences between each of the sensory loss groups were statistically significant at the $\alpha = .01$ level.

As recommended with logistic regression models (Hosmer & Lemeshow, 2000), statistical significance of interactions between independent variables were evaluated (i.e., sensory loss and the control variables). It was determined that age served as an effect modifier for social activities (i.e., there was a significant interaction). This interaction term was therefore included in the final model reported here. The overall model was statistically significant, Wald $\chi^2(21, N=6,089) = 711.48, p < .001$. Sensory loss status and all independent variables in the model except for poverty were also statistically significant. Based on the direct comparisons between

the groups, it was determined that there was a significant difference between those with dual sensory loss and hearing loss only, but there were not significant differences between those with dual sensory loss and vision loss only, or vision loss only and hearing loss only. Predicted marginal proportions for the sensory loss groups were: (a) dual sensory loss, .26; (b) vision loss, .22; (c) hearing loss, .19; (d) no sensory loss, .15. Full statistical results of this logistic regression model and the contrasts are reported in Table 2. The Hosmer and Lemeshow goodness-of-fit test was not significant, indicating adequate fit of the model to the data, $\chi^2(8, N=6,089) = 3.74, p = .88$.

DISCUSSION

Without controlling for other variables, there is a definite relationship between all types of sensory loss and symptoms of depression, with persons with sensory loss, especially dual sensory loss, significantly more likely to experience symptoms of depression. Those with dual sensory loss have the greatest odds of experiencing these symptoms, followed by those with vision loss only and those with hearing loss only. Even after controlling for the independent variables known to be related to depression, sensory loss status was still significantly associated with the experience of depressive symptoms. However, those with dual sensory loss were no longer more likely than those with vision loss only to experience symptoms of depression. It is relevant to note that persons with dual sensory loss in this study did have higher odds of reporting depressive symptoms, but this difference did not reach statistical significance at the .05 level ($p = .079$). These findings are similar to Chou and Chi's study (2004) that investigated dual sensory loss and depression in elderly persons in Hong Kong. Although not a focus of this study, these findings support other research that has documented a relationship between depressive

symptoms and social support, functional disability, health, and education in a nationally representative sample of the elderly.

Although its effect is not as great as some of the control variables used in the analyses (i.e., social support and health status), the relationship between dual sensory loss and symptoms of depression is important. It is relevant to remember that the actual experience for those with dual sensory loss is that they are more likely than all other groups compared here to experience depressive symptoms that have an effect on their lives. The statistical analyses let us know that not all of this is directly related to having dual sensory loss, but is also influenced by other factors. Still, as a group those with dual sensory loss experience more of the negative factors that are related to depression and are in fact much more likely to report depressive symptoms.

Consequently, this population is in need of services, and there is a concern that there are not enough service providers who are familiar with dual sensory loss and how to work with such persons. This is a problem both in providers who traditionally serve persons with sensory loss and in those who provide other services, such as health care and social work. Rehabilitation for sensory loss usually focuses on one loss or the other, not both. Providers with training in one area often do not have knowledge or expertise about the other, and therefore may not be able to provide all services needed. Additionally, those who would normally diagnose or work with persons who experience depression or depressive symptoms (such as physicians, counselors, and psychologists) generally do not have skills or expertise in working with those with dual sensory loss. Communication with these professionals will be difficult for many of these individuals, which may reduce the likelihood that depression/depressive symptoms will be diagnosed and treated.

Despite the lack of training in dual sensory loss for most rehabilitation providers, receiving rehabilitation may be one avenue to address depression with this population. There is evidence that functional disability leads to depression (Kennedy et al., 1990) and also that there is a reciprocal relationship between the variables (Kempen et al., 1998; Taylor & Lynch, 2004). Therefore, one way to deal with depression or depressive symptoms in those with dual sensory loss is to provide rehabilitation and training to help them adjust to and compensate for their sensory losses. Rehabilitation will improve their skills and increase independence, thereby decreasing functional disability. This should in turn have a positive effect on depression, which is what has been documented in several research studies (Bernbaum et al., 1988; Dodds et al., 1993; Horowitz et al., 2003; Mulrow et al., 1990; Mulrow et al., 1992). These studies have demonstrated that the use of aids (such as hearing aids and low-vision optical devices) and training in blindness skills have been associated with a reduction in depression and improvement in other areas of psychological functioning for consumers. However, these studies have only been conducted with persons with a single sensory loss. It is important to document the effect of these rehabilitation interventions on depression in those with dual sensory loss also.

Limitations

A limitation of this study is that all variables are self-report. Self-reported depressive symptoms, rather than a diagnosis of depression, was the dependent variable, by necessity of the data available. Therefore, an extension of these findings to the relationship between dual sensory loss and clinical depression is not appropriate. Also, vision and hearing loss were based on self-report rather than clinical tests or diagnoses. We do not know the level of vision loss, for some in the sample it was likely minor, for others very severe. The ability to classify people as mildly,

moderately, or severely impaired in both of these areas would have added to the value of the study.

Summary

Those with dual sensory loss are more likely than those with single sensory loss or those without sensory loss to experience depressive symptoms. This effect is attenuated when controlling for other variables known to be related to depression, but it is not eliminated. Those with dual sensory loss are significantly more likely to experience depressive symptoms than those with a hearing loss only and those without a sensory loss, even after controlling for sex, age, socioeconomic status, social support, social activities, health, and functional disability. These findings are important because experiencing symptoms of depression is known to reduce the quality of life for the elderly (Blazer, 2003), and is therefore an issue that needs to be addressed with persons with dual sensory loss. Depression is generally considered a treatable disorder, yet its diagnosis and the provision of treatment has been poor (Beekman et al., 1995; Reynolds et al., 2002). The experience of depression or depressive symptoms for those with dual sensory loss is complicated by the fact that most of these people have difficulty with communication and/or transportation. These are circumstances that may contribute to symptoms of depression, but they are also circumstances that make treatment for it more difficult. It is important for professionals who work with persons with dual sensory loss to be aware of their greater likelihood of experiencing depression or depressive symptoms, and to screen them for these symptoms. The early diagnosis of these problems can lead to treatments or interventions that may help the person attain or retain a high quality of life.

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TABLE 1

Characteristics of Sample* by Subgroup

Variable	DSL†	VL†	HL†	NSL†
Sex (Female)	53.2	67.8	47.3	61.7
Age:				
55 to 64	30.0	42.7	32.1	49.5
65 to 74	27.3	31.6	34.1	31.2
75 to 84	31.8	20.3	26.5	16.5
85 or older	11.0	5.4	7.4	2.8
Below poverty	20.6	22.6	11.4	13.6
Need help with ADLs	9.0	7.6	3.0	2.4
Need help with IADLs	21.7	21.8	8.3	5.9
Worsening health	25.7	22.9	13.6	8.7
Education level:				
Less than HS	39.8	39.4	28.6	26.5
High School	29.1	26.8	30.8	30.7
Beyond HS	31.1	33.8	41.6	42.8
Social support (always have support needed)	37.4	42.7	47.9	51.4

* Sample used for full logistic regression model, $N = 6,089$

† DSL = dual sensory loss; VL = vision loss; HL = hearing loss; NSL = no sensory loss

TABLE 2

Logistic Regression Model for the Effect of Sensory Loss on Depression

Variable	β	SE of β	DF	Wald χ^2 *	Odds Ratio (95% CI)
Sensory loss group:			3	44.76	
Dual sensory loss	0.80	0.13			2.23 (1.71 to 2.90)
Vision loss only	0.50	0.13			1.65 (1.27 to 2.13)
Hearing loss only	0.29	0.10			1.33 (1.10 to 1.61)
Sex	0.22	0.09	1	5.79	1.24 (1.04 to 1.48)
Age	-0.02	0.01		--	0.98 (0.97 to 1.00)
Poverty	0.09	0.12	1	0.51	1.09 (0.86 to 1.39)
Education level:			2	10.54	
Less than HS	0.22	0.11			1.24 (1.00 to 1.54)
Beyond HS	-0.13	0.11			0.88 (0.70 to 1.09)
Need help with ADLs	0.46	0.22	1	4.49	1.58 (1.03 to 2.43)
Need help with IADLs	0.62	0.15	1	15.82	1.85 (1.36 to 2.51)
Bed days per year:			3	48.91	
1 to 2	0.29	0.12			1.34 (1.05 to 1.71)
3 to 7	0.83	0.12			2.30 (1.81 to 2.92)
More than 7	0.18	0.30			1.20 (0.67 to 2.16)
Worsening health	0.92	0.11	1	67.54	2.50 (2.01 to 3.11)
Social support:			4	178.84	
Usually	0.44	0.10			1.55 (1.27 to 1.89)
Sometimes	1.52	0.12			4.58 (3.63 to 5.79)

Rarely/Never	1.22	0.16			3.40 (2.49 to 4.65)
Social activities x age:			2	6.31	
0 or 1	-0.05	0.02			0.81 (0.56 to 1.18)**
2 or 3	-0.00	0.01			1.65 (1.40 to 1.93)**
Contrasts:					
DSL vs. VL†			1	3.09	
DSL vs. HL†			1	13.88	
VL vs. HL†			1	2.00	

* All Wald χ^2 values are significant at $p < .05$ except for Poverty, DSL vs. VL, and VL vs. HL

† DSL = dual sensory loss; VL = vision loss; HL = hearing loss

**OR calculated at age = 70