

# The Association of Neuropsychiatric Symptoms and Environment With Quality of Life in Assisted Living Residents With Dementia

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**Purpose:** We conducted this study to determine whether neuropsychiatric symptoms and environmental characteristics are associated with quality of life in assisted living residents with dementia. **Design and Methods:** We used a cross-sectional study of 134 residents from 22 facilities and employed the Alzheimer's Disease-Related Quality of Life Scale and the Neuropsychiatric Inventory. A scale was developed to capture the homelike climate of each facility. Linear regression analyses were used to estimate the relationship of neuropsychiatric symptoms and homelike climate with quality of life, controlling for sociodemographics, cognition, functional dependence, and physical health. Exploratory analyses and graphical techniques were employed to test for environmental-level moderating effects. **Results:** Agitation, depression, apathy, and irritability were significant predictors of quality of life, explaining 29% of the variance. Neither facility size nor homelike environment was significantly associated with quality of life in univariate analyses. Size of facility moderated the relationship between agitation and quality of life. **Implications:** Neuropsychiatric symptoms impair quality of life in residents with dementia. Further re-

search should investigate the role of other environmental aspects.

**Key Words:** *Quality of life, Dementia, Mental health, Environment*

Assisted living has been growing rapidly as a residential long-term care option over the last decade (AARP, 2002) and is increasingly utilized by older adults who can no longer live independently (National Center for Assisted Living [NCAL], 2001). Presently, there is no federal regulatory oversight of assisted living, though most states have policies in place or planned (Mollica, 2001). Although definitions vary, assisted living is generally conceptualized as a residential setting primarily serving elders that provides or coordinates personal care, 24-hour supervision, scheduled and unscheduled assistance, activities, and meals (Hawes, Phillips, & Rose, 2000; NCAL). In contrast to other care settings, assisted living has an expressed mission, which is to maximize quality of life and the ability to "age in place" (Bernard, Zimmerman, & Eckert, 2001; NCAL) by providing a supportive, homelike environment (Hawes et al.).

Dementia, a major cause of disability, is extremely common in assisted living. Estimates of the prevalence of dementia and cognitive impairment in assisted living vary depending on assessment methods. Indirect assessments, which include medical chart reviews and caregiver interviews, have suggested rates that range from 18% to 70% (Hendrie, 1998). Direct assessments, involving in-person measurement of cognitive functioning, suggest rates of cognitive impairment ranging from 45% to 63% (Morgan, Gruber-Baldini, & Magaziner, 2001). In a recent study based on an extensive in-person clinical examination, we found that

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67.7% of 198 randomly selected assisted living residents met dementia criteria, and 74.3% had clinically significant cognitive impairment (Rosenblatt et al., 2004). Given the substantial number of affected residents, the examination of factors related to quality of life in this subgroup will be important in determining the efficacy of current health care practices and policies in assisted living.

The conceptualization and measurement of quality of life, especially in the context of dementia has been the focus of much debate (Rabins & Kasper, 1997). Quality of life is a complex, multidimensional construct (Whitehouse & Rabins, 1992) that has been defined and interpreted in various ways. Traditional definitions of quality of life have included a subjective component (Lawton, 1991). That is, the individual has the opportunity to rate his or her own quality of life. Dementia presents a unique problem in that some affected individuals are unable to accurately reflect on and/or express their internal states.

There are a number of measurement techniques researchers have employed to measure quality of life in individuals with dementia (Ready & Ott, 2003). Some measures focus on patient self-assessments (Brod, Stewart, Sands, & Walton, 1999; Selai, Trimble, Rossor, & Harvey, 2001; Logsdon, Gibbons, McCurry, & Teri, 2002). Preliminary investigations of these scales demonstrate good reliability and some validity (Brod et al.; Selai et al.; Logsdon et al.), although the study samples have been limited to individuals with mild to moderate dementia. Lawton (1994) suggested the importance of developing measures that include externally observable elements. In this vein, direct observational techniques have been developed in which ratings in certain quality-of-life domains are based on a number of operationalized behavioral criteria during set time intervals of observation (Kitwood & Bredin, 1997; Lawton, Van Haitsma, & Klapper, 1996). These techniques also have shown good internal consistency reliability, have correlated with informant ratings, and have been useful for those with more severe dementia (Lawton et al.). Proxy ratings, a third type of assessment strategy, typically use caregiver respondents to assess an individual's quality of life by having respondents rate items based on observable behaviors (Albert et al., 1996; Rabins, Kasper, Kleinman, Black, & Patrick, 1999). These also have shown internal consistency reliability (Black, Rabins, & Kasper, 2002), inter-rater reliability, and some have shown moderate degrees of validity when compared to direct patient interview on certain behavioral indicators of quality of life (Albert et al.). For the two latter approaches, a potential limitation is the lack of direct patient input in measuring a concept that is intrinsically subjective. The tradeoff is that these measures may be more appropriate for individuals with greater degrees of cognitive impairment (Ready & Ott).

In the current study, we have used a proxy-rated, multidimensional measure specifically designed for use in dementia—the Alzheimer's Disease-Related Quality of Life Scale (ADRQL; Black et al., 2002). This scale consists of five domains: social interactions, awareness

of self, feelings and mood, enjoyment of activities, and response to surroundings (Rabins et al., 1999). Because the ADRQL was developed as a dementia-specific tool, the questionnaire was designed to include items that would be minimally influenced by the cognitive and functional declines that characterize dementia. This approach allowed for the possibility of high quality of life even in later stages of disease. We chose this scale in anticipation of a wide range in severity of cognitive impairment in the assisted living setting.

The most common forms of dementia are progressive and inexorable. Mitigation of behavioral problems and optimization of the environment are the primary treatment modalities, and quality of life, however it is defined, is perhaps the most important outcome measure. Therefore, we set out to discover whether quality of life among assisted living residents with dementia is correlated with neuropsychiatric symptoms and the congenial, homelike qualities of the environment in which they live.

Several investigations have focused on the factors related to quality of life in long-term care residents with dementia. In one study, low quality of life was associated with worse orientation, increased functional dependence, depressive symptoms, and treatment with anxiolytics (Gonzalez-Salvador et al., 2000). Significant associations between reduced quality of life and functional dependence but not neuropsychiatric symptoms were found in another study that utilized an observational method (Ballard et al., 2001). Finally, in an observational study of assisted living residents with dementia, lower quality of life was associated with assisted living residents living in smaller, dementia-specific facilities compared to larger non-dementia-specific sites (Kuhn, Kasayka, & Lechner, 2002). Most of these studies did not have access to detailed neuropsychiatric assessments or randomly selected samples.

By definition, the homelike and supportive nature of the assisted living environment is itself an intervention meant to enhance quality of life. Sloane, Zimmerman, and Walsh (2001) suggested the importance of seven aspects of the physical environment: safety and security, resident orientation, stimulation without stress, privacy and personal control, facilitation of social interaction, continuity with the past, and cleanliness. Environmental factors may mitigate the negative effects of neuropsychiatric symptoms, such as agitation, by facilitating strong individualized relationships between caregivers and residents that lead to resolution of symptoms (Cohen-Mansfield & Werner, 1998). While the theorized relationship between assisted living facility factors and quality of life has face validity, there is little research to show the positive effects of environmental aspects such as "homelikeness" on resident quality of life (Sloane et al.).

In the current study we hypothesized that the presence of neuropsychiatric symptoms and the characteristics of the environment would be two major correlates of quality of life in assisted living residents with dementia. Specifically, we predicted that delusions, hallucinations, agitation, dysphoria or depression, anxiety, euphoria, apathy, disinhibition,

irritability, aberrant motor behavior, sleep, and appetite (Cummings, 1997) would be associated with lower quality of life. We further hypothesized that a smaller, more homelike setting would be associated with higher quality of life.

A second aim of these analyses was to determine whether environmental characteristics, specifically the homelike quality or size of facility, could moderate any relationship between neuropsychiatric symptoms and low quality of life. Therefore, we hypothesized that residents with neuropsychiatric symptoms living in smaller, more homelike facilities would have a higher quality of life than those with neuropsychiatric symptoms in other environments.

## Methods

### Study Overview

The data are derived from the Maryland Assisted Living Study, an ongoing epidemiological study of dementia and other psychiatric disturbances in assisted living. The methods from the cross-sectional phase of the study are described in detail elsewhere (Rosenblatt et al., 2004). In brief, 22 assisted living facilities stratified by size were chosen at random from a list of all licensed or pending license assisted living facilities within the Central Maryland region. This region included a large urban area (city of Baltimore), several suburban areas (Baltimore, Anne Arundel, Howard, Prince George's, and Montgomery counties), and two rural areas (Harford and Carroll counties). The sample consisted of 10 large facilities (16 or more beds) and 12 small facilities (15 beds or less). In large facilities, 15 residents were selected randomly from a list of occupied rooms provided by the facility director and approached to participate. All residents living in small facilities were approached to join the study.

Informed consent was obtained from all residents. For those with known or suspected cognitive impairment, consent to participate also was obtained from their legal representative or responsible family member. Participants received a comprehensive in-person clinical evaluation by a research team consisting of a geriatric psychiatrist, nurse, and psychometrist. Detailed history and information on current status were obtained from the participant, a family informant, assisted living medical records, and the facility staff. The state of Maryland requires all assisted living facilities to keep resident records that must include a preadmission assessment detailing medical and psychiatric conditions, medical orders and rehabilitation plans, the resident service plan, and an emergency data sheet (Code of Maryland Regulations [COMAR], 2004). All of the above information was reviewed at an adjudication conference for each case by a multidisciplinary panel of experts in the field of geriatrics. Diagnoses of dementia and psychiatric illness were assigned using Diagnostic and Statistical Manual of Mental Disorders: 4<sup>th</sup> Edition criteria (American Psychiatric Association [APA], 2000). The study was

approved by the Johns Hopkins School of Medicine Institutional Review Board.

### Participants

The original study sample consisted of 198 assisted living residents who were evaluated between February 2001 and January 2003. One hundred and fifty (75%) of these were living in large facilities. The majority of the residents were widowed (70%) and female (78%). Mean age was 85.6 years. The racial composition, which was representative of Maryland's population in this age group, was 83% Caucasian, 16% African American, and 1% other races. One hundred and thirty four (67.7%) residents met criteria for dementia, and an additional 13 (6.6%) met criteria for other types of cognitive disorders (Rosenblatt et al., 2004). This analysis focused on the 134 residents with dementia. All 22 assisted living facilities (i.e., 10 large and 12 small) were represented in the study sample.

### Measures

Quality of life was assessed using the ADRQL (Rabins et al., 1999). The ADRQL was developed explicitly for use in individuals with dementia and was administered to the resident's formal caregiver (i.e., the facility staff member most involved in the resident's daily care). The scale contains 47 true or false items divided into five domains: social interaction, awareness of self, feelings and mood, enjoyment of activities, and response to surroundings. Items are rated on observations made in the last 2 weeks. The measure has demonstrated internal consistency ranging from .77 to .91 (Black et al., 2002), concurrent validity (Gonzalez-Salvador et al., 2000) and sensitivity to change over time (Lyketsos et al., 2003).

The Neuropsychiatric Inventory (NPI), also administered to the formal caregiver, was used to quantify the frequency and severity of 12 neuropsychiatric symptoms: delusions, hallucinations, agitation or aggression, dysphoria, anxiety, euphoria, apathy, disinhibition, irritability, aberrant motor behavior, sleep, and appetite and eating disorders (Cummings, 1997). This measure has good interrater and test-retest reliability and good content and concurrent validity (Cummings et al., 1994). Higher scores indicate greater frequency and/or severity of symptoms.

Functional impairment of residents was assessed using the Psychogeriatric Dependency Rating Scale-Physical Dependency Subscale (PGDRS-P; Wilkinson & Graham-White, 1980). The measure was administered to the formal caregiver and scores ranged from 0 (not functionally dependent) to 39 (severely functionally dependent). The General Medical Health Rating (GMHR) was used to assess medical comorbidity (Lyketsos et al., 1999). Scores ranged from 4 (excellent health) to 1 (poor health). Cognition was assessed globally using the Mini-Mental State Exam (MMSE; Folstein, Folstein, & McHugh, 1975). Scores ranged from 0 to 30 (higher scores indicate better cognition).

The Hopkins Homelike Environmental Rating Scale (HHERS) was developed in the Maryland Assisted Living study. This 14-item measure was designed to capture the overall homelike climate of each facility. It consists of two subscales: family-like social climate (e.g., "Facility caregivers interact socially with the residents") and homelike physical environment (e.g., "Residents' rooms are tailored to their personal taste"). Each item is rated on a 6-point Likert scale. Interrater reliability was determined across all 22 facilities by three independent raters. Intraclass correlation coefficients ranged from .47 to .93 for the 14 items, and the total score coefficient was .88. Final item ratings used in this analysis were the mean of the three scores. The two subscales were highly correlated (Pearson's  $r = .85$ ). The total score equaled the sum of the two subscales. Internal consistency reliability for the scales items was high (Cronbach's  $\alpha = .86$ ). Higher scores indicated a more homelike climate.

### Analyses

Descriptive statistics were computed to determine the normality, mean, variance, and/or range of the variables. All NPI symptom domains and the length of stay in assisted living were significantly positively skewed. Log transformations were performed prior to statistical analyses. The ADRQL total percent score was calculated by adding all five domain scores and then deriving a total percentage score (participant's total observed score  $\div$  total possible score  $\times 100$ ). A histogram was generated to check the normality of the ADRQL distribution. The HHERS score was used both as a continuous variable and as a dichotomous variable (split at the median).

Univariate linear regression was employed to estimate the association of putative variables with quality of life. At this stage, all 12 subscale scores from the NPI, the HHERS total score, and facility size (dichotomous variable) were entered separately. Demographic variables, functional dependence, medical health, and cognitive function were examined as potential covariates.

A series of multivariate linear regression models were then computed. In Model 1, all variables found to be significant in the univariate analyses were entered into a hierarchical multivariate regression to estimate the relative independent contribution of each. Entry parameters for this model were set at  $p \leq 0.05$  for a variable to be entered and  $p \geq 0.10$  to be removed. In Model 2, all significant covariates and some additional demographic variables were entered into the first step of a multivariate regression model followed by the stepwise entry of the four significant neuropsychiatric symptoms in Step 2. This model was constructed so that the association between quality of life and the neuropsychiatric symptoms could be isolated after accounting for the influences of significant covariates and demographic differences.

To assess whether homelike environment and/or size of facility were likely to moderate the relationship between quality of life and the strongest independent neuropsychiatric symptoms, a series of regression

models with associated graphs were examined. Interaction variables, designed to capture the moderating effects of these variables, were computed by multiplying each of the dichotomous homelike and size variables by the prominent neuropsychiatric symptom scores. These interaction variables were then added to the regression models. Scatterplots and boxplots were examined to assess whether there was evidence of patterns of interactions between the neuropsychiatric symptoms and facility environment variables on quality of life.

## Results

### *Description of Resident Characteristics and Quality of Life*

Descriptive statistics on participant demographics and the assessment variables for the study sample ( $n = 134$ ) are reported in Table 1. Seventy-one percent of the residents were living in large assisted living facilities. The majority of residents with dementia were widowed (72.4%), Caucasian (79.9%), and female (80.6%). The racial mix was consistent with the Maryland population in this age group. The mean age was 86.1 years. The mean score for the total ADRQL was 77.8% ( $SD = 13.55$ ), and scores ranged from 35% to 100%.

### *Correlates of Quality of Life*

The significant correlates of ADRQL include delusions, hallucinations, agitation or aggression, dysphoria or depression, anxiety, apathy, disinhibition, irritability, and aberrant motor behavior (see Table 2). Agitation or aggression (NPI-C) was the neuropsychiatric symptom that best predicted quality of life, accounting for 19% of the variance. Apathy (NPI-G) and irritability (NPI-I) were slightly weaker predictors, estimating 17.5% and 13.2% of the variance, respectively. Homelike environment and facility size were not significant predictors of quality of life. Of the covariates, greater physical dependency (PGDRS-P), worse cognitive functioning (MMSE), and worse physical health (GMHR) were significantly associated with lower quality of life. With the exception of marital status, none of the sociodemographic variables were significantly associated. Being widowed, as opposed to being married, divorced, or never married, was significantly correlated with better quality of life.

In Table 3, Model 1, the results of a hierarchical multivariate regression analysis are displayed. Agitation or aggression, apathy, functional dependency, dysphoria or depression, marital status, irritability, and cognition were significant predictors of quality of life and collectively accounted for approximately 51% of the variance. Table 3, Model 2 presents the results of a multivariate regression model in which all significant covariates and some demographic variables were entered into the first block followed by the stepwise entry of the 4 neuropsychiatric symptoms. In Block 1, age, gender, race, marital status, physical dependency,

**Table 1. Descriptive Statistics for Demographic and Assessment Variables**

Variable	M	SD	Minimum	Maximum
<b>Social demographic</b>				
Age, years ( <i>n</i> = 134)	86.1	(6.7)	65.1	104
Education, years ( <i>n</i> = 130) <sup>a</sup>	13.5	(3.0)	4	20
Cost, months ( <i>n</i> = 129) <sup>a</sup>	3139.53	(1463.62)	300.00	7500.00
Length of residence in assisted living, years ( <i>n</i> = 134)	2.0	(1.7)	0.1	9.4
<b>Assessment variable</b>				
MMSE ( <i>n</i> = 133) <sup>a</sup>	14.64	(7.67)	0	29
PGDRS-Physical ( <i>n</i> = 132) <sup>a</sup>	14.23	(8.81)	0	34
GMHR, ( <i>n</i> = 134)	2.47	(0.79)	1	4
HHERS, ( <i>n</i> = 134)	56.10	(9.78)	42.67	73.33
NPI-A (delusions; <i>n</i> = 134)	1.57	(2.86)	0	12
NPI-B (hallucinations; <i>n</i> = 134)	0.45	(1.66)	0	12
NPI-C (agitation or aggression; <i>n</i> = 134)	1.47	(2.35)	0	9
NPI-D (dysphoria or depression; <i>n</i> = 134)	1.19	(2.50)	0	12
NPI-E (anxiety; <i>n</i> = 134)	1.28	(2.86)	0	12
NPI-F (euphoria; <i>n</i> = 134)	0.11	(0.66)	0	6
NPI-G (apathy; <i>n</i> = 134)	1.32	(2.97)	0	12
NPI-H (disinhibition; <i>n</i> = 134)	0.43	(1.44)	0	8
NPI-I (irritability; <i>n</i> = 134)	1.69	(2.90)	0	12
NPI-J (aberrant motor behavior, <i>n</i> = 133) <sup>a</sup>	1.20	(2.72)	0	12
NPI-K (sleep; <i>n</i> = 133) <sup>a</sup>	1.47	(3.00)	0	12
NPI-L (appetite and eating; <i>n</i> = 133) <sup>a</sup>	0.75	(2.17)	0	9
ADRQL ( <i>n</i> = 134)	77.81	(13.55)	35	100

Notes: MMSE = Mini-Mental State Exam, PGDRS-P = Psychogeriatric Dependency Rating Scale, GMHR = General Medical Health Rating, HHERS = Hopkins Homelike Environment Rating Scale, NPI-A-L = Neuropsychiatric Inventory domains, ADRQL = Alzheimer's Disease-Related Quality of Life (total % scores).

<sup>a</sup>Data were not available for all 134 residents.

and cognitive function collectively accounted for 19.7% of the variance in quality-of-life scores. Agitation or aggression was again the strongest neuropsychiatric-symptom predictor, accounting for 15.7% of the variance. Dysphoria or depression was the second strongest predictor and accounted for 7.7% of the variance, followed by apathy and irritability (3.6% and 2.1% of the total variance of quality of life, respectively). The four neuropsychiatric symptoms collectively explained an additional 29.1% of the variance in quality of life.

**Table 2. Results of Univariate Regression Analyses: Significant Correlates of Quality of Life**

Independent Variables	$\beta$ (SE)	P	Adjusted R <sup>2</sup>
Marital status (dichotomous)	-5.64 (2.58)	.031	.028
MMSE	0.54 (.148)	< .001	.086
PGDRS-P	-0.62 (.124)	< .001	.157
GMHR	2.95 (1.46)	.046	.023
NPI-A (delusions)	-9.74 (3.23)	.003	.057
NPI-B (hallucinations)	-13.49 (5.38)	.013	.038
NPI-C (agitation or aggression)	-17.68 (3.11)	< .001	.190
NPI-D (dysphoria or depression)	-13.01 (3.47)	< .001	.089
NPI-E (anxiety)	-8.02 (3.40)	.020	.033
NPI-G (apathy)	-14.76 (3.21)	< .001	.132
NPI-H (disinhibition)	-14.21 (5.43)	.010	.042
NPI-I (irritability)	-15.54 (2.88)	< .001	.175
NPI-J (aberrant motor behavior)	-13.67 (3.29)	< .001	.109
HHERS total score <sup>a</sup>	0.12 (2.59)	.334	.000
HHERS median split (dichotomous) <sup>a</sup>	1.96 (2.46)	.427	-.003
Size of facility (dichotomous) <sup>a</sup>	0.77 (2.59)	.767	-.007

Notes: MMSE = Mini-Mental State Exam, PGDRS-P = Psychogeriatric Dependency Rating Scale, GMHR = General Medical Health Rating, NPI-A-L = Neuropsychiatric Inventory domains, HHERS = Hopkins Homelike Environment Rating Scale. Correlates of quality of life are significant at the  $p < .05$  level. age, gender, education, race, length of stay in assisted living, cost of assisted living, euphoria, sleep disturbance, and appetite and eating disorders were not significant.

<sup>a</sup>Hypothesis-driven facility variables were not significant.

### Facility Variables as Moderators

Homelike environment and size were each individually entered into regression models with agitation or aggression, dysphoria or depression, apathy, and irritability to explore whether the relationships between neuropsychiatric symptoms and quality of life were moderated by facility factors. There were no significant effects for either of the potential moderators with the exception of a weak effect of size of facility on the relationship between agitation and quality of life. As agitation symptom severity increased, residents of larger facilities tended to have increasingly lower quality of life compared to those in smaller facilities (Figure 1). In a regression that included agitation, size, and the interaction variable (e.g., Size  $\times$  Agitation symptom score), the amount of variance accounted for on quality of life increased from 19% to 20.3% (unstandardized  $\beta = 14.42$ ,  $p = .045$ ).

### Discussion

The major aim of this study was to evaluate whether specific resident characteristics and environmental characteristics are associated with quality of life in residents of assisted living with dementia. The results demonstrate that agitation or aggression, depression, apathy, and irritability are significantly associated with

**Table 3. Multivariate Linear Regression Models with Significant Correlates of Quality of Life**

Predictor Variable	$\beta$ (SE)	P	Cumulative Adjusted R <sup>2</sup>
<b>Model 1<sup>a</sup></b>			
NPI-C (agitation or aggression)	-12.01 (2.88)	< .001	.212
NPI-G (apathy)	-8.90 (2.55)	.001	.124
PGDRS-P	-0.25 (0.12)	.036	.049
NPI-D (dysphoria or depression)	-9.47 (2.68)	.001	.051
Marital status	-6.00 (1.87)	.002	.037
NPI-I (irritability)	-6.56 (2.64)	.014	.016
MMSE	0.32 (0.13)	.015	.020
<b>Model 2<sup>b</sup></b>			
<b>Block 1</b>			
Age	-0.21 (0.14)	.124	.197
Gender	0.40 (2.24)	.865	
Marital status (dichotomous)	-6.40 (2.32)	.001	
Race (dichotomous)	-0.05 (2.25)	.981	
PGDRS	-0.26 (0.12)	.030	
MMSE	0.34 (0.14)	.013	
<b>Block 2</b>			
NPI-C (agitation or aggression)	-11.11 (3.04)	< .001	.157
NPI-D (dysphoria or depression)	-9.24 (2.81)	.001	.077
NPI-G (apathy)	-8.62 (2.78)	.002	.036
NPI-I (irritability)	-6.63 (2.75)	.017	.021

Notes: NPI-C, D, G, I = Neuropsychiatric Inventory; PGDRS = Psychogeriatric Dependency Rating Scale; MMSE = Mini-Mental State Exam. For Model 1, total adjusted R<sup>2</sup> = .509; for Model 2, total adjusted R<sup>2</sup> = .488.

<sup>a</sup>All significant variables were entered in stepwise regression.

<sup>b</sup>Demographics and covariates were entered in Block 1. Significant NPI symptom variables were entered stepwise into Block 2.

lower quality of life. These effects are significant even after controlling for other resident factors, such as demographics, functional impairment, medical health, and cognition. Agitation or aggression was the strongest predictor of quality of life, surpassing the influence of demographic covariates and other neuropsychiatric symptoms. Contrary to our hypotheses, environmental factors, specifically size and homelike setting, were not significant correlates of quality of life. Homelike environment and size also did not appear to moderate many of the affects of agitation, depression, apathy, or irritability on quality of life. Only a weak moderating effect of facility size on the relationship between agitation and quality of life was found. This may suggest that small facilities are better able to handle symptoms of agitation so that their negative effects on quality of life are mitigated in comparison to large facilities. Alternatively, this may be a spurious finding attributable to multiple comparisons.

The findings related to psychiatric symptoms are consistent with the results of Gonzalez-Salvador and colleagues (2000), who found that quality of life measured by the ADRQL was associated with depressive symptoms in long-term care residents with dementia. Sikorska

(1999) found that among assisted living residents with and without cognitive impairment, depressive mood was negatively associated with resident satisfaction.

Our results, however, were contrary to findings from two other studies. One, a study of nursing home and residential care residents with dementia in England that used the NPI to assess behavioral and psychological symptoms of dementia, did not find any significant associations with quality of life as measured by a direct observational technique (Ballard et al., 2001). We believe the discrepancy in results is best explained by the differences in the conceptualization and operationalization of quality of life between the two studies and possibly by differences in the sample composition. The above-mentioned study assessed quality of life using a direct observational technique while we employed a proxy-rated measure.

Secondly, the current study did not confirm the beneficial effects of the social environment, specifically levels of cohesion and conflict, reported by Cummings (2002). This difference could be explained by our use of an environmental measure (HHERS) that aimed to capture specific dimensions of the assisted living environment but that may not have been as sensitive to specific social aspects such as cohesion and conflict. Studies reporting the significant main effects of facility size on quality of life have been mixed (Kuhn et al., 2002; Sikorska, 1999). The lack of a relationship in the present study suggests that the relationship, if any, is subtle and complex. This issue bears further study.

The strengths of this study include the use of standardized assessments of diagnosis and the use of an expert consensus panel to make a final diagnosis. Another major strength is the use of a stratified random sample strategy to identify a representative sample of Maryland assisted living facilities.

This investigation has some limitations. First, the ADRQL is a proxy measure of quality of life. It is based on assumptions about the elements that make up quality of life and may not represent an individual's subjective experience. Secondly, since some of the elements of the ADRQL are behavioral, there may be a circular aspect to the predictive power of the NPI. To counteract this possibility, we conducted the same analyses after excluding the feelings and mood domain, the domain most heavily weighted with affective items. The finding that apathy and agitation or aggression still account for the majority of the variance suggests that these play an important role in nonmood domains of quality of life. Third, the ADRQL and NPI were both rated by the same caregiver; it is possible that a caregiver caring for a resident with severe neuropsychiatric symptoms may inadvertently rate the resident's quality of life lower. Fourth, the scale for homelike environment has not been used or tested in any other study and therefore has not demonstrated concurrent validity or test-retest reliability. We plan to further develop this measure in the longitudinal continuation of the Maryland Assisted Living Study. Lastly, the study sample included only assisted living facilities from the state of Maryland. Although it is difficult to know for certain, characteristics of people living in

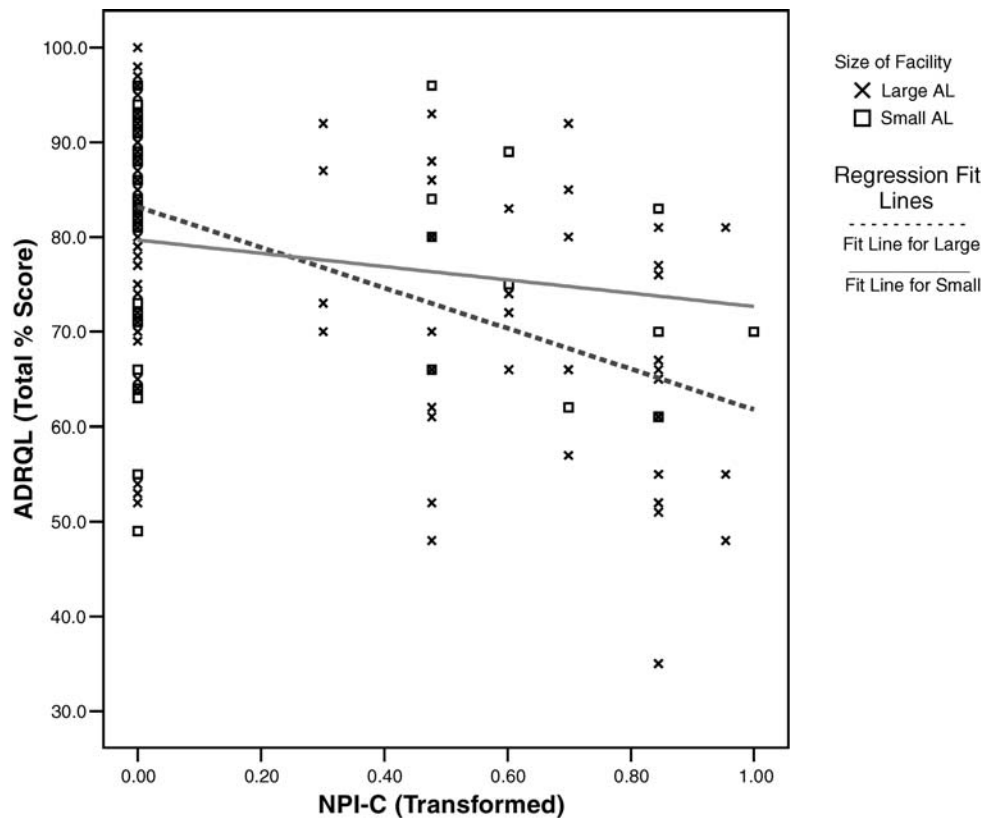


Figure 1. Interaction of agitation or aggression and size of facility on quality of life. ADRQL = Alzheimer's Disease-Related Quality of Life Scale; NPI-C = Neuropsychiatric Inventory (agitation or aggression).

assisted living may vary nationwide due to the lack of a uniform definition of assisted living.

In conclusion, neuropsychiatric symptoms, particularly symptoms of agitation and aggression, are independent correlates of quality of life in assisted living residents with dementia. While the care environment did not have a significant impact on quality of life in this study, further investigation in this area is needed. Future research should focus on the further identification of resident and environmental factors that influence quality of life in assisted living, the predictive power of these factors over time, and the effects of interventions targeting these factors.

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