Factors Associated with Problematic Vocalizations in Nursing Home Residents With Dementia

Ann Kolanowski, PhD, RN, Ann Whall, PhD, RN, Corinne Lambert, EdD, RN, Cornelia Beck, PhD, RN, Donna Algase, PhD, RN, Kathy Richards, PhD, RN, Rebecca Doan, MSW, Reid D. Landes, PhD, Zachary Feldman, MS
Factors Associated with Problematic Vocalizations in Nursing Home Residents With Dementia

Cornelia Beck, PhD, RN,*1 Kathy Richards, PhD, RN,2 Corinne Lambert, EdD, RN,†1 Rebecca Doan, MSW,1 Reid D. Landes, PhD,1 Ann Whall, PhD, RN,3 Donna Algase, PhD, RN,3 Ann Kolanowski, PhD, RN,4 and Zachary Feldman, MS5

1University of Arkansas for Medical Sciences, Little Rock, Arkansas.
2School of Nursing, University of Pennsylvania, Philadelphia.
3University of Michigan, Ann Arbor.
4College of Nursing, Penn State University, University Park, Pennsylvania.
5Department of Economics, University of Colorado at Boulder.

*Address correspondence to Cornelia Beck, PhD, RN, UAMS, 4301 W. Markham St–#808, Little Rock, AR 72205. E-mail: beckcornelia@uams.edu
†Deceased.

Received June 16, 2010; Accepted December 13, 2010
Decision Editor: William J. McAuley, PhD

Purpose of the Study: Problematic vocalizations (PVs) are the most frequent and persistent disruptive behaviors exhibited by nursing home residents with dementia. Understanding factors associated with these behaviors are important to prevent or reduce them. We used the Need-Driven Dementia-Compromised Behavior model to identify the characteristics of persons with dementia who are likely to display nonaggressive and aggressive PVs and the conditions under which these behaviors are likely to occur and persist. Design and Methods: This multisite descriptive study included 138 residents of 17 nursing homes, and approximately half had a history of PVs. Background data were gathered through interviews, chart reviews, and administration of physical and neuropsychological assessments. Proximal data were obtained from observations and videotapes. Results: When the 2 subscales of the Verbal Behavior Scale were used as the dependent variables, agreeableness and conscientiousness, positive affect, and discomfort were associated with nonaggressive vocalizations, and general health state (GHS), age, and negative and positive affect were associated with aggressive vocalizations. When the verbally agitated (nonaggressive) section of the Cohen-Mansfield Agitation Inventory was the dependent variable, the background factors of gender, agreeableness, GHS, and age remained predictors, as did the proximal factors of affect and discomfort. Implications: We identified 5 background factors and 3 proximal factors as risk factors for PVs in persons with dementia, with variation between nonaggressive or aggressive PVs. These data provide direction for caregiving for persons with dementia and design of interventions to prevent or reduce PVs.

Key Words: Disruptive behaviors, Verbal behaviors, Aggressive behaviors, Nonaggressive behaviors

Among the disruptive behaviors that are exhibited by nursing home residents with dementia, problematic vocalizations (PVs) are the most frequent, persistent (Nelson, 1995), and annoying (Cubit, Farrell, Robinson, & Myhill, 2007; Whall, Gillis, Yankou, Booth, & Bates, 1992). PVs include nonaggressive behaviors such as continuous talking and complaining and aggressive behaviors such as
screaming and abusive language, and the prevalence of PVs has been estimated at 11%–30% of nursing home residents (Sloane, Davidson, Knight, Tangen, & Mitchell, 1999). Negative consequences of PVs include increased distress or anxiety of the resident and others in the environment (Burgio, Scilley, Hardin, Hsu, & Yancey, 1996), often causing social isolation (Draper et al., 2000) and over medication (Cariaga, Burgio, Flynn, & Martin, 1991), which in turn results in higher health care cost (Murman et al., 2002). We based this study on the Need-Driven Dementia-Compromised Behavior model described by Algase and colleagues (1996) and used to explore aggressive behaviors (Whall et al., 2008). This model posits that need-driven behaviors (NDBs) arise in pursuit of a goal or as an expression of need. Behaviors are also influenced by history, abilities, personality traits, and experiences of the individual, which interact with conditions in the immediate environment to determine responses. These influences are grouped into two categories: (a) background factors, which are relatively stable neurological, cognitive, psychosocial traits, and health status and (b) proximal factors, which are more fluid or fluctuating aspects of the immediate physical environment and the dynamic or changing needs and states of the person with dementia. Background and proximal factors operate to produce NDBs, which may include PVs. The aim of our study was to examine the relative contributions to PVs of variables derived from the NDB model as a foundation for developing interventions to reduce the likelihood and intensity of PVs exhibited by nursing home residents with dementia. Research questions were as follows:

1. What background variables best predict which persons with dementia will display PVs?
2. What proximal variables best identify the conditions under which PVs occur?
3. In combination, what background and proximal variables are most closely associated with occurrences of PVs?
4. Do these combined background and proximal variables differ for nonaggressive and aggressive PVs?

**Literature Review**

The literature on problematic behaviors exhibited by persons with dementia is extensive. However, few studies have differentiated between PVs and other problematic behaviors. Only cognitive impairment (Beck et al., 1998; Burgio, Park, Hardin, & Sun, 2007; Burgio, Scilley, Hardin, & Hsu, 2001; Cohen-Mansfield & Libin, 2005; Cohen-Mansfield & Werner, 1997; Cohen-Mansfield, Werner, & Marx, 1990; Draper et al., 2000; Dwyer & Byrne, 2000; Matteau, Landreville, Laplante, & Laplante, 2003; Menon et al., 2001; Vance et al., 2003) and negative affect (Beck & Vogelpohl, 1999; Beck et al., 1998; Cohen-Mansfield & Libin, 2005; Draper et al., 2000; Dwyer & Byrne, 2000; Menon et al., 2001) have been strongly associated with the occurrence of PVs and only infrequently have nonaggressive and aggressive vocalizations been distinguished. McMinn and Draper (2005) reviewed the typology, risk factors, and management of PVs from the available literature on PVs. Their summary related to risk factors are similar to our review. A few years later, von Gunten, Alnawaquil, Abderhalden, Needham, and Schupbach (2008) in a comprehensive report of issues regarding PVs noted that “most aspects around verbally disruptive behaviors are insufficiently understood” (pg. 653). Our review of the literature also found that study results were inconclusive for most of the variables under discussion.

**Background Variables**

**Ethnicity and Race.**—We found that race/ethnicity of participants was often not reported or was not included in the analyses. The only study (Sink, Covinsky, Newcomer, & Yaffe, 2004) that we located on this topic reported that African American individuals with moderate-to-severe dementia displayed more PVs than persons of other races with similar levels of dementia.

**Gender.**—Most studies have found aggressive PVs to be more prevalent in males (Beck & Vogelpohl, 1999; Beck et al., 1998; Eustace et al., 2001; Menon et al., 2001; Zeisel et al., 2003), and women were more likely to exhibit nonaggressive PVs (Burgio et al., 2000; Cohen-Mansfield & Libin, 2005; Vance et al., 2003). In contrast, a few studies we examined found no association at all between gender and PVs (Keene et al., 1999; Pomara, Volavka, Czobor, Hernando, & Sidtis, 2005; Schreiner, 2001).

**Age.**—Only one study found a positive correlation between older age and frequency of PVs (Zeisel et al., 2003), but other studies did not find...
a significant relationship between them (Burgio et al., 2001; Dwyer & Byrne, 2000; Eustace et al., 2001; Keene et al., 1999; Schreiner, 2001).

**Education.**—Very few of the studies have reported the educational level of participants, and none looked at the association of past educational level with PVs.

**Cognitive Ability.**—Many studies have examined the cognitive level of participants in relation to the occurrence of PVs. Most of them used the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) as the cognitive measure, and they found an inverse correlation between cognitive scores and frequency of PVs (Beck et al., 1998; Burgio et al., 2001, 2007; Cohen-Mansfield & Libin, 2005; Dwyer & Byrne, 2000; Menon et al., 2001; Vance et al., 2003). Studies using other cognitive measures also found a relationship between low cognitive scores and a high level of PVs (Cohen-Mansfield & Werner, 1997; Cohen-Mansfield, Werner, et al., 1990; Draper et al., 2000; Matteau et al., 2003). We found two studies that indicated no association between MMSE scores and PVs (Aarsland, Cummings, Yenner, & Miller, 1996; Eastley & Wilcock, 1997).

**History of PVs.**—No studies that we reviewed looked at the association between history of PVs and postmorbid PV occurrences.

**General Health.**—The number of comorbid diagnoses is often used as a measure of general health in studies of the elderly individuals. Our review found studies that supported a relationship between a higher number of diagnoses and PVs (Cohen-Mansfield et al., 1990; Cohen-Mansfield, Werner, Hammerschmidt, & Newman, 2003; Feldt, Warne, & Ryden, 1998), but some studies did not report this relationship (Beck et al., 1998; Draper et al., 2000; Dwyer & Byrne, 2000).

**Motor Ability.**—In two studies, limited ambulation ability and physical restraints were associated with greater PVs (Cohen-Mansfield & Werner, 1995; Sloane et al., 1999, 1999). Most studies, however, included motor ability as one factor in a group of variables measuring independence, rather than considering ambulation separately for a possible relationship with PVs. We found a study that did look at motor restlessness or a high activity level for an association with disruptive behavior (Eustace et al., 2001), but the data were not analyzed specifically for PVs.

**Premorbid Personality.**—Only one study compared premorbid personality with the current level of PVs. It indicated that individuals with a history of introversion, rigidity, emotional control, and disagreeableness prior to the onset of dementia are more likely to exhibit PVs (Holst, Hallberg, & Gustafson, 1997; Kolanowski, Strand, & Whall, 1997). Low, Brodaty, and Draper (2002) found that premorbid agreeableness was associated with aggressiveness, affective disturbance, and the behavioral and psychological symptoms of dementia but did not analyze PVs separately.

**Premorbid Behavioral Response to Stress.**—Meddaugh (1990), who examined the relationship between prior response to stress and PVs by interviewing family members, found that a verbal response to stress was common prior to the onset of dementia among individuals who subsequently exhibited PVs. This was the only study we found that compared premorbid responses to stress with the current level of PVs.

**Proximal Variables**

**Physiological Needs.**—We found that studies regarding physical needs and PVs were even more limited than others that were examined.

- **Hunger.** Only two studies even mentioned a possible connection between hunger and PVs. While conducting a study on disruptive behaviors, Nelson (1995) incidentally observed that requests for food or an expression of hunger sometimes preceded screaming episodes in nursing home residents with dementia. Burgio and colleagues (2001) studied time patterns of PVs and found that one of the peak periods of PVs was at lunchtime (11 a.m.–12 p.m.).

- **Thirst.** Nelson (1995) observed that receiving no response to a request for a drink of water sometimes escalated into a PV for nursing home residents.

- **Pain.** We found five studies that looked specifically at PVs and their relationship to current indications of pain or the presence of conditions known to be painful or uncomfortable. Two studies found a relationship between
PVs and pain (Cohen-Mansfield, Billig, Lipson, Rosenthal, & Pawlson, 1990; Villanueva, Smith, Erickson, Lee, & Singer, 2003) and two did not (Burgio et al., 2007; Leonard, Tinetti, Allore, & Drickamer, 2006). Feldt and colleagues (1998) found a significant relationship between pain and physical aggression and higher rates of PVs for those with pain, though that difference was not significant.

**Elimination status.** In a qualitative study, researchers observed that the need to eliminate was often expressed repeatedly and in some cases by screaming (Nelson, 1995). In another study, staff interviews and chart review suggested that a large majority of disruptive vocalizers were incontinent of bowel and bladder most of the time (Sloane et al., 1999).

**Sleep Disturbance.**—Beck and Vogelpohl (1995) found that individuals with dementia and disordered or disturbed sleep patterns were more likely to exhibit PVs. Cohen-Mansfield and Werner (1995), who examined patterns of agitation, found that agitation was significantly lower immediately after sleep periods.

**Temperature and Humidity.**—We found only one study that addressed the relationship of environmental conditions to disruptive behaviors (Cohen-Mansfield & Werner, 1995). This study reported that nonaggressive PVs increased when the environment was perceived as cold, although significance was not established.

**Affect.**—Talerico, Evans, and Strumpf (2002) reported no association of negative affect with PVs, but six other studies found a relationship between depressed, anxious or irritated affect, and PVs (Beck & Vogelpohl, 1999; Beck et al., 1998; Cohen-Mansfield & Libin, 2005; Draper et al., 2000; Dwyer & Byrne, 2000; Menon et al., 2001).

In summary, some association has been found between lower cognitive status and more negative affect and higher levels of PVs, whereas findings are mixed on the relationship between gender and PVs and poor general health and PVs. There is some evidence that the presence of pain increases the likelihood of PVs. Several studies have been unsuccessful in establishing any relationship between age and PVs. The relationship of PVs to ambulatory ability, incontinence, premorbid personality, or premorbid response to stress, hunger, thirst, and sleep has not been adequately studied. Given the gaps and lack of definitive findings about PVs, we designed this study to look comprehensively at variables that might relate to PVs and to determine if these relationships differed for nonaggressive and aggressive PVs. (More information about the studies we reviewed is provided in Table 1)

**Methods**

**Design**

This was a multisite descriptive study of personal and environmental factors associated with the occurrence of PVs.

**Sites**

We recruited participants from 17 nursing homes in Central Arkansas with resident populations ranging from 75 to 180. Fifteen homes were privately owned and had a mix of private and Medicaid residents, one was state owned, one was part of the national system of hospitals for veterans, and eight had dementia special care units. The Institutional Review Board approved the study and provided human subjects oversight.

**Participants**

Criteria for study inclusion were a DSM IV (American Psychiatric Association, 1995) diagnosis of dementia as determined by research staff’s review of charts, an MMSE (Folstein et al., 1975) score of 24 or less, age of at least 65 years, absence of tremor in at least one arm (to ensure accuracy of Actigraph data), and an informant source able to provide information about premorbid personality and behavior. If participants were taking psychotropic medication, dosage stability was required for at least one month prior to and during the study. We recruited an equal number of participants with and without a history of PV in order to ensure adequate distribution of this variable.

The administrator or director of nursing at each facility contacted responsible parties of potential participants and received permission to release contact information to the University of Arkansas for Medical Sciences research team. We obtained written informed consent from the legal authorized representatives (LAR) of 146 potential participants. Verbal assent was obtained from potential participants, and when possible, written consent was obtained. We discussed the bath/shower taping at
Table 1. Literature Review Summary

<table>
<thead>
<tr>
<th>Authors (date)</th>
<th>N</th>
<th>Country</th>
<th>Methods</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity and race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sink et al. (2004)</td>
<td>5,776</td>
<td>United States</td>
<td>Caregiver interview</td>
<td>Greater likelihood of PVs for African American individuals with dementia;( p &lt; .001 ).</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beck et al. (1998)</td>
<td>88</td>
<td>United States</td>
<td>Assessments, staff observation, and chart review</td>
<td>Men had greater frequency of aggressive PVs;( r = .284, p &lt; .05 ).</td>
</tr>
<tr>
<td>Beck and Vogelpohl (1999)</td>
<td>97</td>
<td>United States</td>
<td>Assessments and staff observations</td>
<td>Male gender was one of three variables that accounted for a significant difference in aggressive vocal behavior.</td>
</tr>
<tr>
<td>Eustace et al. (2001)</td>
<td>150</td>
<td>Ireland</td>
<td>Assessment and interviews of individual and informant, CT scan, and lab testing</td>
<td>Relationship between verbal aggression and male gender;( F = 5.28, p = .022 ).</td>
</tr>
<tr>
<td>Menon et al. (2001)</td>
<td>1,101</td>
<td>United States</td>
<td>Interviews with staff, patient, significant others, and chart review</td>
<td>Verbal aggression related to male gender;( p &lt; .05 ).</td>
</tr>
<tr>
<td>Zeisel et al. (2003)</td>
<td>427</td>
<td>United States</td>
<td>Staff reporting</td>
<td>Males more likely to have verbal aggression;( r = .110, p &lt; .05 ).</td>
</tr>
<tr>
<td>Burgio et al. (2000)</td>
<td>46</td>
<td>United States</td>
<td>Direct observation</td>
<td>Agitation, including disruptive vocalizations were 3 times as likely in females compared with males; 35% vs. 12.8%,( p &lt; .01 ).</td>
</tr>
<tr>
<td>Cohen-Mansfield and Libin (2005)</td>
<td>175</td>
<td>United States</td>
<td>Observation, chart review and staff reports</td>
<td>Females had more verbal agitation than males( t(172.7) = 5.591, p &lt; .001 ).</td>
</tr>
<tr>
<td>Vance et al. (2003)</td>
<td>123</td>
<td>United States</td>
<td>Staff report and observation</td>
<td>Female gender related to higher verbal agitation; standardized coefficient = .21,( p &lt; .05 ).</td>
</tr>
<tr>
<td>Keene et al. (1999)</td>
<td>99</td>
<td>England</td>
<td>Caregiver report across time</td>
<td>No noted differences in PVs between genders.</td>
</tr>
<tr>
<td>Pomara et al. (2005)</td>
<td>22</td>
<td>United States</td>
<td>Record review at nursing home</td>
<td>No difference in screaming behavior between genders.</td>
</tr>
<tr>
<td>Schreiner (2001)</td>
<td>391</td>
<td>Japan</td>
<td>Nursing home staff ratings</td>
<td>No difference in verbal aggression between genders.</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zeisel et al. (2003)</td>
<td>427</td>
<td>United States</td>
<td>Staff reporting</td>
<td>Age and verbal aggression positively correlated;( r = .109, p &lt; .05 ).</td>
</tr>
<tr>
<td>Burgio et al. (2001)</td>
<td>68</td>
<td>United States</td>
<td>Observation</td>
<td>Age was not significant when comparing patterns of PVs.</td>
</tr>
<tr>
<td>Dwyer and Byrne (2000)</td>
<td>84</td>
<td>Australia</td>
<td>Interviews with staff, significant others, and chart review</td>
<td>No relationship of age to verbally aggressive behaviors;( F(1,82) = 1.75, p = .19 ).</td>
</tr>
<tr>
<td>Eustace et al. (2001)</td>
<td>150</td>
<td>Ireland</td>
<td>Assessment and interviews of individual and informant, CT scan and lab testing</td>
<td>No relationship between verbally aggressive behavior and age;( t(148)= -0.478, p = .635 ).</td>
</tr>
<tr>
<td>Keene et al. (1999)</td>
<td>99</td>
<td>England</td>
<td>Caregiver report across time</td>
<td>No relationship found between aggressive PVs and age.</td>
</tr>
<tr>
<td>Schreiner (2001)</td>
<td>391</td>
<td>Japan</td>
<td>Staff interviews and record reviews at nursing home</td>
<td>No significant relationship in age compared with verbal agitation.</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No studies found</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive ability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beck et al. (1998)</td>
<td>88</td>
<td>United States</td>
<td>Assessments, staff observation, and chart review</td>
<td>Inverse correlation between cognitive scores and PVs; aggressive PVs;( r = -.235, p &lt; .05 ); agitated PVs;( r = -.308, p &lt; .05 ).</td>
</tr>
<tr>
<td>Burgio et al. (2007)</td>
<td>78</td>
<td>United States</td>
<td>Staff report and observation</td>
<td>Agitated behavior, including verbal aggression, was more frequent for individuals with lower cognitive scores;( p &lt; .05 ).</td>
</tr>
<tr>
<td>Authors (date)</td>
<td>N</td>
<td>Country</td>
<td>Methods</td>
<td>Analysis</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------</td>
<td>--------------</td>
<td>-------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Burgio et al. (2001)</td>
<td>68</td>
<td>United States</td>
<td>Observation, MMSE</td>
<td>Comparison of patterns indicated higher rates of PVs associated with higher cognitive scores (stratified in three levels). Stepwise discriminate function analysis resulted in $F(2,55) = 3.71, p = .03$.</td>
</tr>
<tr>
<td>Cohen-Mansfield and Libin (2005)</td>
<td>175</td>
<td>United States</td>
<td>Observation, chart review, and staff reports</td>
<td>Cognitive impairment correlated significantly with verbal agitation; $r = .160, p = .017$.</td>
</tr>
<tr>
<td>Dwyer and Byrne (2000)</td>
<td>84</td>
<td>Australia</td>
<td>Interviews with staff, significant others, and chart review</td>
<td>Vocally disruptive had lower cognitive scores; $F(1,82) = 5.71, p = .019$.</td>
</tr>
<tr>
<td>Menon et al. (2001)</td>
<td>1101</td>
<td>United States</td>
<td>Interviews with staff, patient, significant others, and chart review</td>
<td>Higher verbal aggression related to lower cognition scores; $p = .05$.</td>
</tr>
<tr>
<td>Vance et al. (2003)</td>
<td>123</td>
<td>United States</td>
<td>Staff report and observation</td>
<td>Lower cognition related to higher verbal agitation; standardized coefficient = -.27, $p &lt; .01$.</td>
</tr>
<tr>
<td>Aarsland et al. (1996)</td>
<td>75</td>
<td>United States</td>
<td>Assessment and interviews of individual and informant, CT scan, and lab testing</td>
<td>No relationship found between verbal aggression and cognitive scores.</td>
</tr>
<tr>
<td>Eastley and Wilcock (1997)</td>
<td>262</td>
<td>England</td>
<td>Assessment and interviews of individual and informant, CT scan, and lab testing</td>
<td>No relationship found between verbal aggression and cognitive scores; $F(2,244) = 0.151, p = .860$.</td>
</tr>
<tr>
<td>Cohen-Mansfield and Werner (1995)</td>
<td>200</td>
<td>United States</td>
<td>Self, relative and staff assessments, and chart review</td>
<td>Staff assessment at baseline showed a relationship; $z = 3.77, p &lt; .01$.</td>
</tr>
<tr>
<td>Cohen-Mansfield, Werner, et al. (1990)</td>
<td>408</td>
<td>United States</td>
<td>Staff ratings and chart review</td>
<td>Screaming associated with cognitive impairment; $r = .25, p &lt; .01$.</td>
</tr>
<tr>
<td>Draper et al. (2000)</td>
<td>25</td>
<td>Australia</td>
<td>Patient assessments and staff reports; comparison with controls</td>
<td>Vocally disruptive behavior associated with low cognition; $t(24) = 1.74, p = .095$.</td>
</tr>
<tr>
<td>Matteau et al. (2003)</td>
<td>66</td>
<td>Canada</td>
<td>Chart review, assessments, and staff survey</td>
<td>Lower cognition was associated with higher language deterioration and higher frequency and types of PV; $F(1,59) = 8.38, p &lt; .005$.</td>
</tr>
<tr>
<td>History of PV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohen-Mansfield et al. (1990)</td>
<td>408</td>
<td>United States</td>
<td>Assessments, staff reports, and chart review</td>
<td>Verbal agitation associated with number of medical diagnoses; $r = .18, p &lt; .001$.</td>
</tr>
<tr>
<td>Cohen-Mansfield et al. (2003)</td>
<td>26</td>
<td>United States</td>
<td>Assessments, chart reviews, and audio tapes</td>
<td>Number of diagnosis associated with some acoustic characteristics of PVs such as minimum frequency $r = .35$; ending frequency $r = .37$, and maximum frequency $r = .38$; $p &lt; .01$ for each of these measures.</td>
</tr>
<tr>
<td>Feldt et al. (1998)</td>
<td>38</td>
<td>United States</td>
<td>Secondary analysis of data</td>
<td>Individuals with dementia and diagnosed with more than one painful condition had higher aggression than others, but findings were not significant for verbal aggression alone.</td>
</tr>
<tr>
<td>Beck et al. (1998)</td>
<td>88</td>
<td>United States</td>
<td>Assessments, staff observation, and chart review</td>
<td>No association found between PVs and number of comorbid diagnoses.</td>
</tr>
</tbody>
</table>

Table continues on next page
Table 1. (continued)

<table>
<thead>
<tr>
<th>Authors (date)</th>
<th>N</th>
<th>Country</th>
<th>Methods</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draper et al. (2000)</td>
<td>25</td>
<td>Australia</td>
<td>Patient assessments and staff reports; comparison of nursing home group without verbally disruptive behavior and group of those with the behavior.</td>
<td>No noted difference in PVs between the two groups when number of comorbid conditions were compared; (t(24) = -1.77, p = .089).</td>
</tr>
<tr>
<td>Dwyer and Byrne (2000)</td>
<td>84</td>
<td>Australia</td>
<td>Interviews with staff, significant others, and chart review</td>
<td>No relationship shown between physical illness and verbal aggression; (F(1,81) = 0.026, p = .87).</td>
</tr>
<tr>
<td>Motor ability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sloane et al. (1999)</td>
<td>203</td>
<td>United States</td>
<td>Staff interviews about most severe disruptive vocalizers in each facility</td>
<td>68% of severe disruptive vocalizers were extensively or totally dependent in ambulation; 48% were in physical restraint.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Verbal agitation increased significantly when physical restraints are used.</td>
</tr>
<tr>
<td>Cohen-Mansfield and Werner (1995)</td>
<td>24</td>
<td>United States</td>
<td>Direct observation and behavior mapping tool</td>
<td>Motor restlessness associated with verbal aggression; (p \leq .001).</td>
</tr>
<tr>
<td>Eustace et al. (2001)</td>
<td>150</td>
<td>Ireland</td>
<td>Assessment and interviews of individual and informant, CT scan, and lab testing</td>
<td></td>
</tr>
<tr>
<td>Premorbid personality</td>
<td></td>
<td></td>
<td></td>
<td>Qualitative data supported past personality characteristics are related to current PVs, but quantitative data were not significant.</td>
</tr>
<tr>
<td>Holst et al. (1997)</td>
<td>45</td>
<td>Sweden</td>
<td>Informant interview, chart review, and observation</td>
<td>Verbal aggression in persons with dementia is related to lower premorbid agreeableness; (r = -.54, p &lt; .05).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Agreeableness related to more aggressiveness; (b = 0.218, p &lt; .05).</td>
</tr>
<tr>
<td>Low et al. (2002)</td>
<td>53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premorbid behavioral response to stress</td>
<td></td>
<td></td>
<td></td>
<td>Qualitative finding: family members reported that patients who had been “talkers” when nervous were more likely to exhibit verbal disruptive behavior.</td>
</tr>
<tr>
<td>Meddaugh (1990)</td>
<td>27</td>
<td>United States</td>
<td>Observation</td>
<td></td>
</tr>
<tr>
<td>Physiological needs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hunger</td>
<td></td>
<td></td>
<td></td>
<td>Study looked at time period patterns of disruptive vocalizations. The frequency of PVs peaked from 11 to 12 for one group, suggesting possible hunger as a factor.</td>
</tr>
<tr>
<td>Burgio et al. (2001)</td>
<td>68</td>
<td>United States</td>
<td>Observation MMSE</td>
<td>Qualitative finding: PVs often terminated after provision of food.</td>
</tr>
<tr>
<td>Nelson (1995)</td>
<td>41</td>
<td>United States</td>
<td>Observation</td>
<td></td>
</tr>
<tr>
<td>Thirst</td>
<td></td>
<td></td>
<td></td>
<td>Qualitative finding: PVs often terminated after provision of liquids.</td>
</tr>
<tr>
<td>Nelson (1995)</td>
<td>41</td>
<td>United States</td>
<td>Observation</td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohen-Mansfield, Billig, et al. (1990)</td>
<td>408</td>
<td>United States</td>
<td>Assessments, staff reports, and chart review</td>
<td>Verbal agitation associated with pain; (r = .24, p &lt; .001).</td>
</tr>
<tr>
<td>Villanueva et al. (2003)</td>
<td>40</td>
<td>United States</td>
<td>Staff interviews, assessments, and observation</td>
<td>Verbal agitation was higher for patients with painful conditions; (z = -2.83, p &lt; .01).</td>
</tr>
<tr>
<td>Feldt et al. (1998)</td>
<td>38</td>
<td>United States</td>
<td>Secondary analysis of data</td>
<td>Individuals with dementia and diagnosed with potentially painful condition had higher aggression than others, but findings were not significant for verbal aggression alone.</td>
</tr>
</tbody>
</table>

Table continues on next page
Table 1. (continued)

<table>
<thead>
<tr>
<th>Authors (date)</th>
<th>N</th>
<th>Country</th>
<th>Methods</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leonard et al. (2006)</td>
<td>7,120</td>
<td>United States</td>
<td>Analysis of MDS data</td>
<td>No significant association between verbal aggression and pain.</td>
</tr>
<tr>
<td>Burgio et al. (2007)</td>
<td>78</td>
<td>United States</td>
<td>Staff report and observation over time</td>
<td>Agitated behavior, including verbal aggression, not related to pain.</td>
</tr>
<tr>
<td>Sloane et al. (1999)</td>
<td>203</td>
<td>United States</td>
<td>Staff interviews about most severe disruptive vocalizers in each facility</td>
<td>At baseline, 79% of severe disruptive vocalizers had urinary incontinence all or most of the time; 77% had bowel incontinence all or most of the time.</td>
</tr>
</tbody>
</table>

Sleep disturbance

Beck and Vogelpohl (1999) 97 United States Assessments and staff observations Sleep disturbance associated with occurrence of more PVs.

Cohen-Mansfield, Werner, et al. (1990) 16 United States Observations Overall agitation decreased immediately after sleep periods; \( z = 1.96, p < .05 \)

Temperature and humidity

Cohen-Mansfield and Werner (1995) 24 United States Direct observation and behavior mapping tool Verbal agitation increased when temperature was perceived as cold. But the finding was not significant.

Affect

Talerico et al. (2002) 405 United States Analysis of secondary data Verbal agitation increased when temperature was perceived as cold. But the finding was not significant.

Beck et al. (1998) 88 United States Assessments, staff observation, and chart review No relationship between negative affect and PV. Verbally aggressive PVs were associated with depressed affect; \( r = .31, p < .05 \).

Beck and Vogelpohl (1999) 97 United States Assessments and staff observations Occurrence of PVs higher in individuals with negative affect.

Cohen-Mansfield and Libin (2005) 175 United States Observation, chart review, and staff reports Depressed affect correlated with higher verbal agitation; \( r = .221, p = .002 \).

Draper et al. (2000) 25 Australia Patient assessments and staff reports; comparison with controls Those with PVs displayed more negative affect than controls; \( t(23) = -7.34, p = .074 \).

Dwyer and Byrne (2000) 84 Australia Interviews with staff, significant others, and chart review Depressive affect associated with more negative verbalizations; \( F(3,80) = 11.39, p < .001 \).

Menon et al. (2001) 1,101 United States Interviews with staff, patient, significant others, and chart review Depressive affect associated with aggressive verbalizations; adjusted odds ratio 3.1, 95% CI: 2.0–4.8.

Note: CI = confidence interval; MDS = Minimum Data Set; MMSE = Mini-Mental State Examination; PVs = problematic vocalizations.

The time of consenting with the LAR and did not film bathing if the LAR felt it would disturb the participant. We obtained verbal assent of the participant prior to each videotaped observation by introducing ourselves, showing them the equipment, explaining the process that would occur, and then querying participants for assent. If the participant appeared to or definitely declined participation at that time, we made a second attempt within 30 min. If the second response was also negative, we considered this nonassent to participate and did not videotape at that time. Four volunteers were ineligible because of age less than 65 years \( (n = 3) \) or absence of dementia diagnosis \( (n = 1) \).

Data Collection

After eligibility was established, we placed an Actigraph on the participant’s wrist for seven days prior to videotaping to record activity indicative of sleep/waking periods and establish baseline sleep data.

We gathered background data by interviews with LARs, staff, residents, chart reviews, and administration of physical and neuropsychological
assessments conducted by research staff. To obtain proximal data, we observed participants and videotaped them for seven 20-min periods on each of two nonconsecutive days. Twelve of the 14 observations were made at randomly selected times between 7 a.m. and 7 p.m. We filmed the other two observations at the participant’s regularly scheduled bath/shower time and at a randomly selected mealtime. During the bath/shower, we only recorded the neck and head of the participant. We stopped taping during times that participants used the toilet. We collected data on other proximal variables following a prescribed protocol during and immediately after each recorded observation, on forms developed by the research team. Because collection of data for these proximal variables involved taping and/or questioning the participants, observations were not made during the residents’ usual sleeping hours.

For videotaping, a research assistant (RA) recorded the participant with a Sony DVCAM video camera on a rolling tripod. Signed consents to videotape were received from facility employees, who interacted with the resident during the observations.

To obtain data on background variables, registered nurse research staff completed an initial physical examination and chart review. Master’s prepared social workers on the research staff assisted the nurses with neuropsychological assessments and informant interviews. Psychologists taught the testing protocols to our staff and each person practiced and was observed and given feedback prior to data collection. Written protocol instructions were also available. We trained RAs in on-site data collection and record protocol instructions were also available. We given feedback prior to data collection. Written each person practiced and was observed and gists taught the testing protocols to our staff and assessors and informant interviews. Psychologists assisted the nurses with neuropsychological prepared social workers on the research staff and physical examination and chart review.

After processing, the digital recordings were rated by other RAs, who were bachelor’s prepared and received an average of 20 hr of training in standard protocols for viewing and marking the behaviors for each of four instruments for each observation. We trained each rater by providing and discussing written protocols for using the Observer VideoPro to identify PVs and participant affect, for each rating instrument, and by watching training videos to demonstrate various behaviors and differences in categories. Each rater learned by rating videos and comparing their rating with the trainer for the same video. Each rater was required to achieve 70% interrater reliability with the trainer before rating videos independently. If interrater agreement fell less than 70% at reliability checks or raters had difficulty rating a particular observation, at least two observers viewed the tape until agreement was reached. Coding issues and decisions were resolved by group discussion.

Dependent Variable Measures

For each video observation, we recorded rates of PVs per minute as defined by the (a) nonaggressive (agitated) behavior subscale of the Verbal Behavior Scale (VBS; Beck et al., 1998), (b) the aggressive behavior subscale of the VBS, (c) the total of both VBS subscales, and (d) the verbally agitated (nonaggressive) section of the Cohen-Mansfield Agitation Inventory (CMAI) (Cohen-Mansfield, Marx, & Rosenthal, 1989). The intra-class reliability correlation for VBS was found to be .80 (Beck et al., 1998). In a factor analysis of the CMAI, all items (except for strange noises) had reliabilities of .70 or more (Rabinowitz et al., 2005). The rates were highly skewed (>5.0) under each definition, and rates of zero comprised between 65% and 80% of the observations (depending on the definition). These two attributes prevented suitable transformations of the PV rates; hence, we dichotomized each video session into the presence/absence of PV.

Background Variables

Demographics.—We obtained information on race, gender, age, and education from nursing home record reviews and verified by the LAR and/or resident interview.

Cognitive Ability.—We used total MMSE scores to define cognitive ability, and they were converted to T-scores to account for age and education level of each participant (Crum, Anthony, Bassett, & Folstein, 1993).

General Health.—Research nurses completed the Cumulative Illness Rating Scale for Geriatrics (Miller & Towers, 1991) to obtain health status by assessing 14 physical impairment groups in body system categories with a rating from 0 (normal or no problem) to 4 (extreme disability). Studies of this instrument have indicated that it is a reliable indicator ($r = .78$) of health status for medically impaired elderly individuals (Parmelee, Thuras, Katz, & Lawton, 1995).
History of PVs.—History of PVs was measured by review of the Minimum Data Set (MDS) 2.0 (Section E, items 1a, 1b, 1c, 4b, and 4d; Nursing Home Quality Initiatives, 2000) for each eligible participant and by an interview of a staff member and/or family member familiar with the resident. If one of these sources reported a history of PVs, the participant was placed in the category of positive PV history (1). Otherwise a category of no PV history (0) was recorded.

Motor Ability.—Information on motor ability was obtained from the most recent MDS report (version 2.0, Section G, items a–f) with ratings in six categories: bed mobility, transfers, walk in room, walk in corridor, locomotion on the unit, and locomotion off the unit. Most investigators report that the activities of daily living index is a useful tool for research purposes (Snowden et al., 1999).

Personality History.—Research staff completed the Neuroticism Extroversion Openness Five Factor Inventory (NEO-FFI), adapted for informant use (Costa & McCrae, 1992), by in-person or telephone interviews, usually with a first degree relative who was able to describe the participant’s premorbid personality characteristics as they were 10 years before the onset of dementia. The NEO-FFI generates scores in five personality domains: neuroticism, extraversion, openness, agreeableness, and conscientiousness. Inter-informant reliability, intra-informant reliability, and internal consistency are reported to range from good to excellent (Archer et al., 2006).

Behavioral Response to Stress History.—Colling and colleagues (2004) developed the 28-item Behavioral Response to Stress Scale to measure premorbid response to stress by adding verbal and aggressive behavior subscales to Monsour’s (1980) interview guide on motor responses to stress. Internal consistency was established at 0.68 with Monsour’s seven-item scale. The responses were obtained by an in-person or telephone interview with the same person interviewed for the NEO-FFI. Scores were summed for each of the three categories of verbal, motor, and aggressive responses to stress.

Proximal Variables

Physiological Needs.—An investigator-developed instrument, the Physiological Need State Assessment, was used to evaluate four need states. We asked participants at the end of each videotaped observation if they were hungry or thirsty, and if so, the intensity; if they were in pain, and if so, the location of the pain and the intensity; and if they needed to urinate or have a bowel movement (elimination status), and if so, the level of urgency. Prior to filming, we asked the direct caregiver if the resident was usually incontinent of bowel or bladder. Participants with known incontinence were not asked the questions about voiding. When privacy was available and assent was obtained, the RA checked the undergarments for residents identified as incontinent to record current continence status. The count of affirmative responses to each of the four categories served as a discomfort index for each video observation. If a participant reported hunger, thirst, pain, a need to void, or any other need during any portion of taping or data collection, the RAs notified the direct caregiver or charge nurse.

Sleep Disturbance.—We placed the MiniMotionlogger Actigraph (ambulatory monitoring) on the nondominant wrist of the participant, and it recorded continuously for one week prior to and throughout the videotaping. It was used to measure the minutes of wake and sleep based on the average number of participant movements per 1-min epoch. Amounts of sleep during the first seven days were averaged to establish baseline sleep data. Nighttime sleep was defined as the time between 6 p.m. and 6 a.m.. Sleep characteristics for the night immediately prior to each videotaped observation were compared with other variables. Actigraph data correlations with polysomnography and observation have ranged from 0.90 to 0.93 (Ancoli-Israel, Clopton, Klauber, Fell, & Mason, 1997; Sadeh, Sharkey, & Carskadon, 1994,).

Temperature and Humidity.—Using an indoor humidity gauge thermometer (RadioShack; Tandy Corp., Fort Worth, TX), the RAs recorded three ratings of temperature and humidity for each videotaped observation period—at the onset of taping, at 10 min, and at 20 min. Scores were averaged to provide readings for each observation. Each instrument was routinely calibrated as per the manufacturer’s instructions, and RAs were trained and periodically observed for protocol compliance.

Affect.—The Observable Displays of Affect Scale (Vogelpohl & Beck, 1997) was used to measure
positive and negative affect in three categories: facial display, vocalizations, and body movement. Trained raters viewed digital video recordings of each observation to compute rate of occurrence (count/time) of facial display and body movements. Test–retest reliability of 0.97 was noted in an earlier study (Vogelpohl & Beck, 1997). Because affect included vocalizations, we did not include this category when calculating the affect score (a sum of the categories).

**Statistical Methods**

**PV Model Selection Strategy**

We were unable to obtain complete data sets on all participants due to illness, equipment malfunction, staff error, nursing home schedules, and/or lack of cooperation from the participant or informant. Of the 142 eligible participants, 4 were eliminated because of refusal to be filmed (n = 2) or because none of the filmed observations were viewable (n = 2) due to mechanical filming errors.

Four PV outcomes were examined: nonaggressive VBS, aggressive VBS, total VBS (the sum of the VBS subscales), and the verbally agitated (nonaggressive) section of the CMAI. Each was dichotomized to indicate the presence or absence of PV. We used logistic regressions, allowing for repeated measures from an individual, to model the dichotomized PV outcomes. In all models, we assumed all pairs of observations coming from a person had the same correlation (i.e., the “compound symmetric” correlation structure in SAS).

For each PV outcome, we selected a background model, a proximal model, and a model with both background and proximal covariates (note: by covariates, we mean variables that are found to be significantly related to PV). Table 2 lists the variables, their type (background or proximal), and their abbreviations. None of the sleep variables contributed significantly to the models (all p > .10); hence, we did not consider these variables in the combined models. For the background and proximal models, we entered all the variables, and, one by one, using a backwards selection strategy, removed those with the smallest effect (largest p value), leaving those covariates significant at the 0.10 level. When selecting covariates in the combined background and proximal model, those variables remaining in the background and proximal models were entered and subjected to further backwards elimination. The history of PV was automatically included (i.e., forced to remain) in the background and combined models because it was a study variable. We report estimates of the conditional odds ratios (ORs) and their 95% confidence intervals (CIs) from the final models. Because the study was designed to identify potential covariates of PV, the error of missing a covariate would be more serious than falsely identifying a variable as a potential covariate. For this reason, no adjustments were made to final p values, which would increase the probability of missing a covariate.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior history of problematic vocalizations</td>
<td>Background</td>
<td>PVHX</td>
</tr>
<tr>
<td>Gender</td>
<td>Background</td>
<td>GENDER</td>
</tr>
<tr>
<td>Number of years at last birthday</td>
<td>Background</td>
<td>AGE</td>
</tr>
<tr>
<td>Categories of education level</td>
<td>Background</td>
<td>ED</td>
</tr>
<tr>
<td>Cognitive status</td>
<td>Background</td>
<td>MMSE</td>
</tr>
<tr>
<td>General health status</td>
<td>Background</td>
<td>GHS</td>
</tr>
<tr>
<td>Motor ability</td>
<td>Background</td>
<td>MA</td>
</tr>
<tr>
<td>History of motor response to stress</td>
<td>Background</td>
<td>RSS MOTOR</td>
</tr>
<tr>
<td>History of verbal response to stress</td>
<td>Background</td>
<td>RSS VERB</td>
</tr>
<tr>
<td>History of aggressive response to stress</td>
<td>Background</td>
<td>RSS AGGR</td>
</tr>
<tr>
<td>History of neuroticism</td>
<td>Background</td>
<td>NEO NEURO</td>
</tr>
<tr>
<td>History of extraversion</td>
<td>Background</td>
<td>NEO EXTRA</td>
</tr>
<tr>
<td>History of openness</td>
<td>Background</td>
<td>NEO OPEN</td>
</tr>
<tr>
<td>History of agreeableness</td>
<td>Background</td>
<td>NEO AGREE</td>
</tr>
<tr>
<td>History of conscientiousness</td>
<td>Background</td>
<td>NEO CONSC</td>
</tr>
<tr>
<td>Positive facial and body affect</td>
<td>Proximal</td>
<td>ODAS POS</td>
</tr>
<tr>
<td>Negative facial and body affect</td>
<td>Proximal</td>
<td>ODAS NEG</td>
</tr>
<tr>
<td>Hungry, thirsty, in pain, need to urinate, or defecate</td>
<td>Proximal</td>
<td>DISCOMFORT INDEX</td>
</tr>
</tbody>
</table>

*Note:* GHS = general health state.
Results

Of the 138 participants, 74.6% were female, 93.5% were White, and their average age was 85.3 (SD = 7.0) years. The median educational level was high school graduate (interquartile range [IQR]: junior high school, high school graduate). Summary statistics for other background variables are given in Table 3. The median number of taped observations for each participant was 14 (IQR: 14–14); only 6 of the 138 participants had fewer than 10 taped observations. These tapes were used to compute values for the proximal variables (discomfort index and positive or negative affect) and for the dependent variables. We computed for each participant the proportion of observations in which a PV event occurred (as classified by the different instruments). Table 4 provides summary statistics on the proportions of VBS nonaggressive, VBS aggressive, VBS total, and the verbally agitated section of the CMAI. Figure 1 shows histograms of their distributions. For each participant, the proportion of PV observations (out of the total number of observations) was weighted by the number of observations taken from the individual. That is, the proportions of those providing more observations received more weight than those providing fewer observations.

VBS Nonaggressive

Among background variables, we found only agreeableness and conscientiousness to predict nonaggressive vocalizations, at the 0.10 significance level. Of the proximal variables, positive affect and the discomfort index remained in the final model. Table 5 gives the OR estimates of the covariates in the background and proximal models. The combined model kept all the variables from the background model and positive affect from the proximal model. A one-unit increase in positive affect and agreeableness, respectively, corresponded to increases of 1.097 (95% CI: 1.010–1.191, \( p = .0285 \)) times and 1.099 (95% CI: 1.001–1.206, \( p = .0472 \)) times in the odds of nonaggressive PV. A one-unit increase in conscientiousness tended to decrease the odds of nonaggressive PV (OR = 0.938, 95% CI: 0.883–0.996, \( p = .0358 \)). Though not significant at the .05 level, those with a history of PV had odds of nonaggressive PV that were 1.696 (95% CI: 0.921–3.122) times the odds for those having no such history (\( p = .0890 \)).

Table 3. Summary Statistics of Participants’ Background Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMSE</td>
<td>112</td>
<td>6.60</td>
<td>5.21</td>
<td>0</td>
<td>19</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>GHS</td>
<td>132</td>
<td>0.89</td>
<td>0.27</td>
<td>0.29</td>
<td>1.5</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MA</td>
<td>137</td>
<td>1.74</td>
<td>1.50</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>RSS motor</td>
<td>106</td>
<td>16.50</td>
<td>6.60</td>
<td>0</td>
<td>36</td>
<td>0</td>
<td>44</td>
</tr>
<tr>
<td>RSS verbal</td>
<td>110</td>
<td>6.96</td>
<td>5.43</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>RSS aggressive</td>
<td>110</td>
<td>2.41</td>
<td>3.83</td>
<td>0</td>
<td>21</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>NEO neuro</td>
<td>110</td>
<td>15.86</td>
<td>6.86</td>
<td>1</td>
<td>33</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>NEO extra</td>
<td>107</td>
<td>24.42</td>
<td>6.43</td>
<td>5</td>
<td>35</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>NEO open</td>
<td>107</td>
<td>15.58</td>
<td>4.33</td>
<td>4</td>
<td>24</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>NEO agree</td>
<td>106</td>
<td>17.92</td>
<td>4.00</td>
<td>2</td>
<td>24</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>NEO Consc</td>
<td>110</td>
<td>27.17</td>
<td>5.94</td>
<td>8</td>
<td>34</td>
<td>0</td>
<td>40</td>
</tr>
</tbody>
</table>

Notes: High scores = high cognitive skills—MMSE; Serious health problems—GHS; Serious problems with ambulation—MA; frequent reaction to stress—RSS (three variables); Strong personal trait—NEO (five variables). GHS = general health state; MMSE = Mini-Mental State Examination; NEO = Neuroticism Extroversion Openness.

Table 4. Summary Statistics of the Participants’ Proportions of Observations That Included PV Behaviors

<table>
<thead>
<tr>
<th>PV outcome</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>Percent of 0s(^a)</th>
<th>Percent of 1s(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBS nonaggressive</td>
<td>106</td>
<td>0.327</td>
<td>0.336</td>
<td>27.4</td>
<td>2.8</td>
</tr>
<tr>
<td>VBS aggressive</td>
<td>127</td>
<td>0.186</td>
<td>0.206</td>
<td>31.5</td>
<td>2.4</td>
</tr>
<tr>
<td>VBS total</td>
<td>106</td>
<td>0.372</td>
<td>0.326</td>
<td>19.8</td>
<td>3.8</td>
</tr>
<tr>
<td>CMAI (verbally agitated)</td>
<td>103</td>
<td>0.347</td>
<td>0.316</td>
<td>21.4</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Notes: PV = problematic vocalization; VBS = Verbal Behavior Scale.

\(^a\)A proportion of 0 (1) means that none (all) of the observations from the participant had PV behaviors.
VBS Aggressive

The background variables selected at the .10 level in backward steps as being predictive of aggressive PVs were general health state (GHS) and age. Among the proximal variables, negative and positive affect were significantly associated with aggressive PV. Estimates of conditional ORs for these models are shown in Table 5.

All these background and proximal variables remained in the combined model. A 0.1-unit increase in GHS multiplied the odds of aggressive PV by 1.159 (95% CI: 1.068–1.257, \( p = .0005 \)). An increase of one unit in negative and positive affect also increased the odds of aggressive PV by 1.438 (95% CI: 1.113–1.859, \( p = .0055 \)) and 1.197 (95% CI: 1.083–1.322, \( p = .0004 \)), respectively. Unlike the other covariates, an increase in age, by five-year increments, decreased the likelihood of aggressive PV (OR = 0.837, 95% CI: 0.716–0.980, \( p = .0274 \)). A history of PV was not found to predict this type of PV (OR = 1.361, 95% CI: 0.874–2.121, \( p = .1708 \)).

VBS Total

In addition to a history of PV that was retained in the model by design, agreeableness, conscientiousness, and gender remained in the background model for the dichotomized VBS total. The first two were also in the background model for the VBS nonaggressive subscale, however, gender was not. The select proximal model kept positive affect (common to the proximal models for the two subscales) and negative affect (common to the VBS aggressive subscale).

The combined model for nonaggressive and aggressive vocalizations retained all the covariates in both the background and proximal models. A one-unit increase in the agreeableness and positive affect scores increased the odds of nonaggressive and aggressive vocalizations by 1.110 (95% CI: 1.016–1.213, \( p = .0215 \)) times and 1.143 (95% CI: 1.047–1.248, \( p = .0029 \)) times, respectively; The odds went down as the conscientiousness score increased a unit (OR = 0.944, 95% CI: 0.892–0.998, \( p = .0439 \)). Though just over the 0.05 significance level, the odds of nonaggressive and aggressive vocalizations for women were nearly twice that for men (OR = 1.959, 95% CI: 0.993–3.867, \( p = .0439 \)). Higher negative affect scores and a history of PV increased the odds of nonaggressive and aggressive vocalizations more than lower scores (OR = 1.231, 95% CI: 0.965–1.570) and no PV history (OR = 1.614, 95% CI: 0.919–2.833), but not significantly so (\( p = .0938 \) and \( p = .0947 \), respectively).

CMAI

The background variables with predictive utility for PV assessed by CMAI were gender, agreeableness...
The proximal covariates were the same as those for VBS total: positive and negative affect. Table 4 gives the estimated ORs.

The model combining background and proximal covariates retained all the final covariates from the background and proximal models, except for age. The odds of PV as assessed by CMAI increased as positive affect increased (OR = 1.234, 95% CI: 1.123–1.355, p < .001) and were greater for women when compared with men (OR = 2.222, 95% CI: 1.106–4.462, p = .0253). Odds also tended to increase with increases in agreeableness (OR = 1.081, 95% CI: 0.998–1.170, p = .0545), negative affect (OR = 1.259, 95% CI: 0.983–1.612, p = .0682), and GHS (OR = 2.752, 95% CI: 0.918–8.251, p = .0703).

Discussion

A substantial portion of PVs occur when care does not address the underlying causes of the behavior. Therefore, a better understanding of the potential causes of the behavior, potential covariates and risk factors, and unmet needs is important in preventing and reducing PVs. However, the multidimensional nature of potential needs, covariates, or risk factors complicates this understanding.

We recognize that the cross-sectional nature of our study limits the predictive value of the background variables. Nonetheless, two background factors were consistently associated with an increase in PVs: female gender and positive history of agreeableness. Studies have been mixed regarding the relationship with gender, so our findings are not surprising, but do lend support to the several studies finding female gender predicting PVs (Burgio et al., 2000; Cohen-Mansfield & Libin, 2005; Vance et al., 2003). The finding regarding agreeableness is not consistent with the findings of studies that have reported on agreeableness and problem behaviors in general (Kolanowski et al., 1997) but is consistent with a smaller study by Low and colleagues (2002). Our finding that history of conscientiousness predicted a decrease in PVs makes intuitive sense, and the finding that deterioration of GHS was predictive of increased PVs is consistent with most of the literature. Poorer general health predicted an increased likelihood of aggressive PVs, which is consistent with previous studies (Cohen-Mansfield et al., 1990; Cohen-Mansfield et al., 2003). Increased age tended to decrease aggressive PV incidence. This finding is consistent

(bold also in the background model for VBS total), GHS, and age. The proximal covariates were the same as those for VBS total: positive and negative affect. Table 4 gives the estimated ORs.

The model combining background and proximal covariates retained all the final covariates from the background and proximal models, except for age. The odds of PV as assessed by CMAI increased as positive affect increased (OR = 1.234, 95% CI: 1.123–1.355, p < .001) and were greater for women when compared with men (OR = 2.222, 95% CI: 1.106–4.462, p = .0253). Odds also tended to increase with increases in agreeableness (OR = 1.081, 95% CI: 0.998–1.170, p = .0545), negative affect (OR = 1.259, 95% CI: 0.983–1.612, p = .0682), and GHS (OR = 2.752, 95% CI: 0.918–8.251, p = .0703).

Discussion

A substantial portion of PVs occur when care does not address the underlying causes of the behavior. Therefore, a better understanding of the potential causes of the behavior, potential covariates and risk factors, and unmet needs is important in preventing and reducing PVs. However, the multidimensional nature of potential needs, covariates, or risk factors complicates this understanding.

We recognize that the cross-sectional nature of our study limits the predictive value of the background variables. Nonetheless, two background factors were consistently associated with an increase in PVs: female gender and positive history of agreeableness. Studies have been mixed regarding the relationship with gender, so our findings are not surprising, but do lend support to the several studies finding female gender predicting PVs (Burgio et al., 2000; Cohen-Mansfield & Libin, 2005; Vance et al., 2003). The finding regarding agreeableness is not consistent with the findings of studies that have reported on agreeableness and problem behaviors in general (Kolanowski et al., 1997) but is consistent with a smaller study by Low and colleagues (2002). Our finding that history of conscientiousness predicted a decrease in PVs makes intuitive sense, and the finding that deterioration of GHS was predictive of increased PVs is consistent with most of the literature. Poorer general health predicted an increased likelihood of aggressive PVs, which is consistent with previous studies (Cohen-Mansfield et al., 1990; Cohen-Mansfield et al., 2003). Increased age tended to decrease aggressive PV incidence. This finding is consistent

Table 5. Predictors Selected for Background and Proximal Models are Presented With Their Conditional Odds Ratios and 95% Confidence Intervals

<table>
<thead>
<tr>
<th>PV type</th>
<th>Background predictors</th>
<th>Proximal predictors</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBS nonaggressive</td>
<td>NEO Consc (0.98–1.00)</td>
<td>ODAS positive (0.93)</td>
</tr>
<tr>
<td>VBS aggressive</td>
<td>NEO agree (1.01–1.02)</td>
<td>ODAS negative (1.19)</td>
</tr>
<tr>
<td>VBS total</td>
<td>GHS (1.00–1.01)</td>
<td>CMAI (1.17–5.29)</td>
</tr>
</tbody>
</table>

Notes: GHS = general health status. ODAS was not subject to selection because it was a design variable.
with the finding of Zeisel and colleagues (2003). Contrary to earlier findings by Meddaugh (1990), we found no relationship of premorbid behavioral response to stress and PVs. Ours was the first study to explore the relationship of education or premorbid stress response to PV, and it is interesting that neither showed an association to PVs.

The proximal factors that consistently were associated with PV were positive and negative affect, with increases in these two corresponding to an increase in PVs. The association of positive affect with PV tended to be stronger than the association with negative affect. This finding could seem counterintuitive. However, we found that positive and negative affect were correlated (Spearman correlation: .230, 95% CI: 0.065–0.382, n = 138), lending weight to the idea that those who emote tend to do so for both positive and negative feelings. Thus, if someone frequently emotes, whether negative or positive emotions, they may be at increased risk of PV. This was the first study to examine the relationship of temperature and humidity to PVs, and it was surprising that there was no relationship.

Following a thorough review of the literature on PVs, von Gunten and colleagues (2008) observed that the study of PV among individuals with dementia is hampered by the fact that a matrix of factors contribute to this behavior. The multiplicity of these factors and the potential interactions among them suggest that treatment of PVs will require understanding of complex dimensions and consideration of multiple interventions for each individual.

von Gunten and colleagues (2008) suggest that PVs should be further assessed in terms of their quality (type, intensity, and repetitiveness). Our study was the first to separately address the type of PV (i.e., nonaggressive or aggressive). A limitation of our study is that it addressed only the presence or absence of PVs not their intensity or repetitiveness.

von Gunten and colleagues (2008) also suggest that PVs be assessed in terms of their context (etiological and teleological characteristics). By examining proximal variables, we did address a portion of the etiological context. However, the teleological characteristics remain to be examined.

It is also possible that the measures used to assess each variable may have affected the ability to detect a relationship to PVs. For example, using the presence or absence of a history of PVs may not provide enough variance to find a relationship. Likewise, the assessment of the history of PV could be specific to the type of PV, that is nonaggressive or aggressive, in future studies. In addition, a cognitive measure that is more sensitive than the MMSE, particularly in those with advanced dementia, could be used. Future studies should also further explore our new findings regarding agreeableness and conscientiousness, as well as additional environmental factors such as noise or crowding.

Clearly, there is a need for better specification of the multiple factors and their interactions that contribute not only to PVs but to other behavioral symptoms of dementia. More work needs to be done to understand the specific behavior subtypes and the different correlates and needs that may be related to each subtype. In addition, this research needs to be expanded to a more diverse population in terms of race, ethnicity, and socioeconomic status. Such specification is essential to quality care for persons with dementia and for designing interventions studies. The Need-Driven Dementia-Compromised Behavior model (Algase et al., 1996) provides a useful framework for examining these factors in future studies.

**Funding**

This study was one of three in an Interactive Research Project Grant (IRPG) funded by the National Institute of Nursing Research and the National Institute on Aging. The study was supported by IRPG R01-NR04570 (PVs: background and proximal factors, C. Beck, Principal Investigator). The other two studies within this group were IRPG R01-NR04568 (aggression: background and proximal factors; A. Whall, Principal Investigator) and IRPG R01-NR4569 (wandering: background and proximal factors; D. Algase, Principal Investigator). The study was also supported by U1ULRR029884 from the National Center For Research Resources. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Center for Research Resources or the National Institutes of Health.

**Acknowledgments**

We wish to acknowledge the Need-Driven Dementia-Compromised Collaborative Research Group, the joint work of all of these individuals and groups made this study and the IRPG possible.

**References**


Potentially modifiable resident characteristics that are associated with physical or verbal aggression among nursing home residents with dementia. Archives of Internal Medicine, 166, 1295–1300.


