Psychiatric Symptoms in Adults With Down Syndrome and Alzheimer’s Disease

Tiina K. Urv
National Institute of Child Health and Human Development

Warren B. Zigman
New York State Institute for Basic Research in Developmental Disabilities

Wayne Silverman
Kennedy Krieger Institute

Abstract
Changes in psychiatric symptoms related to specific stages of dementia were investigated in 224 adults 45 years of age or older with Down syndrome. Findings indicate that psychiatric symptoms are a prevalent feature of dementia in the population with Down syndrome and that clinical presentation is qualitatively similar to that seen in Alzheimer’s disease within the general population. Psychiatric symptoms related to Alzheimer’s disease vary by the type of behavior and stage of dementia, but do not seem to be influenced by sex or level of premorbid intellectual impairment. Some psychiatric symptoms may be early indicators of Alzheimer’s disease and may appear prior to substantial changes in daily functioning. Improvements in understanding the progression of dementia in individuals with Down syndrome may lead to improved diagnosis and treatment.

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The life expectancy of adults with Down syndrome has increased dramatically in recent years, forcing individuals and their caregivers to face the many challenges that accompany aging. Perhaps the most significant challenge that many individuals with Down syndrome will face is Alzheimer’s disease, a prevalent neurological condition that produces severe dementia in old age. High densities of β-amyloid plaques and neurofibrillary tangles, hallmarks of Alzheimer’s disease, have been found in virtually all autopsied brains of individuals with Down syndrome who died in middle age and later (Malamud, 1972; Wisniewski, Wisniewski, & Wen, 1985), documenting a greater age-specific risk for developing the disease compared to other individuals with intellectual disabilities or the general population (Lai, 1999; Silverman, Zigman, Kim, Krinsky-McHale, & Wisniewski, 1998; Zigman et al., 2004).

The course of cognitive and adaptive changes, the clinical hallmark of Alzheimer’s disease, has been examined in some detail for adults with Down syndrome/Alzheimer’s disease (Dalton & Janicki, 1999; Devenny, Krinsky-McHale, Sersen, & Silverman, 2000; Krinsky-McHale, Silverman, & Devenny, 2002; Prasher, 1996; Prasher & Chung, 1996; Rasmussen & Sobsey, 1994; Röden & Zitman, 1997; Silverstein et al., 1988; Silverstein, Herbs, Nasuta, & White, 1986; Silverman et al., 2004; Strauss & Zigman, 1996; Zigman, Schupf, Haverman, & Silverman, 1997; Zigman, Schupf, Urv, Zigman, & Silverman, 2002; Zigman, Silverman, & Wisniewski, 1996; Zigman et al., 2004). However, neuropsychiatric
Psychiatric symptoms in adults with Down syndrome

T. K. Urv, W. B. Zigman, and W. Silverman

Symptoms can dominate concerns of caregivers (Sink, Holden, & Yaffe, 2005), and these have not been examined as thoroughly for this population.

The most common types of neuropsychiatric symptoms in Alzheimer’s disease in the general population are (a) delusions, (b) hallucinations, (c) agitation, (d) aggression, (e) depression, and (f) anxiety. Although cognitive and adaptive behaviors decline during the course of Alzheimer’s disease in both individuals with and without Down syndrome, neuropsychiatric symptoms appear to be more heterogeneous in their presentation (Bolger, Carpenter, & Strauss, 1994; Devanand, 1999; Hope, Keene, Fairburn, Jacoby, & McShane, 1999; McCarty, Roth, Godde, & Owen, 2000; Mohs, Schmeidler, & Aryan, 2000; Teri, Larson, & Reifler, 1988). In the general population with Alzheimer’s disease, specific types of behavior may increase, decrease, or be intermittent during the course of progression. In addition, the point at which specific behaviors may first become concerns may vary. For example, behaviors such as anxiety, agitation, and various symptoms of depression are more likely to emerge in the early stages of dementia, whereas delusions and hallucinations are more likely to occur in mid to late stage dementia (Devanand, 1999). Finally, the persistence of a behavior varies by type of behavior. Behaviors such as verbal and physical aggression tend to persist until death once they appear, whereas others, such as wandering away from home, may appear as a single discrete episode (Hope et al., 1999).

Although the significance of neuropsychiatric symptoms in individuals with Down syndrome/Alzheimer’s disease has been noted in the literature (Aylward, Burt, Thorpe, Lai, & Dalton, 1997; Moss & Patel, 1995, 1997), empirical data documenting the specific types and frequencies of symptoms or their relationship to progression of dementia are quite sparse. In general, individuals with intellectual disabilities, including Down syndrome (see Dykens, 2007), are known to experience a full spectrum of psychiatric disorders (Reiss, 1994). Vulnerability to both psychiatric and neuropsychiatric symptoms is increased compared to the general population (Thorpe, Davidson, & Janicki, 2001), and this increased risk occurs at all ages (Borthwick-Duffy & Eyman, 1990; Rojhan & Tassé, 1996; Thorpe et al., 2001). Neuropsychiatric symptoms in adults with Down syndrome have been estimated to occur in approximately 26% of individuals, with conduct disorder, aggression, stereotypies, and attention deficit disorder as the most prevalent symptoms (Collacott, Cooper, & McGrother, 1992; Meyers & Pueschel, 1991).

Only a handful of researchers have specifically examined neuropsychiatric symptoms associated with dementia in adults with Down syndrome. When comparing individuals with Down syndrome to individuals with intellectual disability without Down syndrome, Cooper and Prasher (1998) reported that dementia was associated with more restlessness and excessive overactivity, disturbed sleep, uncooperative behavior, and auditory hallucination. Converging findings were reported by Prasher and Hall (1996) and Prasher and Filer (1995). Huxley, Van-Schaik, and Witts (2005) reported significant differences between groups of individuals with Down syndrome with and without dementia; adults with dementia had more lethargy and hyperactivity than those without dementia. Cosgrave, Tyrell, McCarron, Gill, and Lawlor (1999) found no relationship between dementia and the prevalence of behavior disturbances, although self-abusive behavior appeared to be elevated in dementia. However, Ball et al. (2006) reported early presentation of personality and behavioral changes in individuals with Alzheimer’s disease and Down syndrome.

Descriptions of neuropsychiatric symptoms related to Alzheimer’s disease in individuals with intellectual disability both with and without Down syndrome have been somewhat inconsistent for several reasons. Measures were often embedded within larger studies examining adaptive behavior related to Alzheimer’s disease, and compromises in the depth of detail may have sometimes prevented the complex nature, variety, and patterns of neuropsychiatric symptoms associated with the progressive course of dementia to be fully appreciated. Most studies included individuals with pre-existing dementia of uncertain severity (prevalent cases) within their samples (along with “incident” cases, who had just developed Alzheimer’s disease) and were, therefore, imprecise in documenting the stage of dementia. The majority of studies also employed cross-sectional designs that did not allow direct observations of individual change over time. In addition, some researchers described the presence of the behaviors, but not their frequency, severity, or predementia history of neuropsychiatric symptoms.

The dearth of information specific to individuals with Down syndrome/Alzheimer’s disease...
leaves caregivers to base decisions for service provision for these individuals on recommendations targeting individuals with Down syndrome or Alzheimer’s disease, but not with the complicated service needs of individuals with both Down syndrome and Alzheimer’s disease. Knowledge about the special requirements of this population needs to be expanded to aid caregivers in providing early diagnosis, proper care, and appropriate planning for the future. We previously addressed this issue by using the Reiss Screen for Maladaptive Behavior (Reiss, 1994) to evaluate changes in behavior and psychiatric concerns associated with the progression of dementia (Urv, Zigman, & Silverman, 2008). Although the Reiss Screen was never intended for this purpose, we found that it was useful for detecting dementia-related changes, even at relatively early stages of Alzheimer’s disease. Our main purpose in this study was to verify that a pattern of dementia-associated psychiatric symptoms comparable to that described by Urv et al. (2008) can be inferred employing a different assessment instrument.

## Method

### Participants

We conducted this study of psychiatric and behavioral symptoms in adults with Down syndrome as part of an ongoing longitudinal project examining many aspects of aging in adults with Down syndrome (Silverman et al., 2004; Urv et al., 2008). Participants included in the present analyses (N = 224), both male and female, ranged in age from 45 to 82 at their time of testing. Programs providing services to adults with Down syndrome were identified within New York State and the New York City metropolitan area, and recruitment was then conducted for all eligible adults served by those agencies. Recruitment efforts targeted the region within 150 miles of Staten Island, New York, but some participating sites were scattered throughout northern and western New York. Because our broader goals include studies explicitly focused on women’s health, women were oversampled. Diagnoses of Down syndrome were confirmed cytogenetically for 87% of the participants and by medical record review and direct observation of physical characteristics of Down syndrome for the remainder of the sample. Table 1 provides a general description of participants.

## Measures

### Dementia classification measures

The dementia status of all participants was classified using a core battery of assessments that was developed as part of the larger project; the specific tests and procedures are described in detail elsewhere (e.g., Silverman et al., 2004). The battery used is consistent with guidelines recommended by the Working Group for the Establishment of Criteria for the Diagnosis of Dementia in Individuals With Developmental Disability (Aylward et al., 1997). These core assessments are comprised of a comprehensive clinical record review, direct cognitive testing, and informant interviews.

### Psychiatric symptoms

We assessed psychiatric symptoms related to Alzheimer’s disease using the Columbia University Scale for Psychopathology in Alzheimer’s Disease—CUSPAD (Devanand, 1997). The scale is a brief and clear informant questionnaire developed for use with individuals who have Alzheimer’s disease within the general population. It can be administered by a trained layperson. The measure takes approximately 20 min. to complete and has been used successfully in both cross-sectional and longitudinal research studies in the general population (Albert et al., 2001; Devanand, 1999; Rapoport et al., 2001). Interrater reliability ranged between $0.74 \leq \kappa \leq 1.0$ for the main symptom categories in conjoint interviews and $0.54 \leq \kappa \leq 0.73$ for independent interviewers (Devanand, 1997). The scale consists of five sections: (a) delusions, (b) hallucinations, (c) illusions, (d) behavioral disturbances, and (e) depression.

**Delusions** are false beliefs that are persistent, cannot be changed with contrary evidence, and are not in keeping with an individual’s cultural/social background. These are measured within four categories: (a) paranoid (general, stealing, unfaithful spouse, unfounded suspicions), (b) abandonment, (c) somatic, and (d) misidentification syndromes (people in the house, someone in the mirror, caregiver is an imposter, house is not their home, TV characters are in the house, other). Respondents report the occurrence (yes/no), frequency (sometimes/most of the time) and persistence of the delusion (more/less than three times a week), as well as willingness to accept the truth when corrected (yes/no).

**Hallucinations** are sensory perceptions that occur with no eliciting sensory stimulus and are measured within five categories: (a) visual, (b) auditory, (c) tactile, (d) olfactory, and (e) other.
Respondents report the occurrence (yes/no) and clarity (vague/clear) of the hallucination. Illusions are misperceptions of a real sensory stimulus and are reported in the same manner.

The occurrence of behavioral disturbances typical of Alzheimer’s disease is measured within five categories: (a) wandering, (b) verbal outbursts, (c) physical threats, (d) agitation, and (e) sundowning (i.e., worsening of symptoms toward late afternoon or evening). Symptoms of depression are measured using three categories: (a) sadness, (b) sleeping, and (c) eating.

Minor adaptations were made to reflect our use with the older population. The question regarding an unfaithful spouse was dropped because the vast majority of adults with Down syndrome in our target cohorts will never have been married. Also, information regarding delusions, hallucinations, and illusions were collected only from informants of individuals who were verbal (n = 188, 84% of our sample). Information regarding behavioral disturbances and symptoms of depression was obtained for all participants.

**Procedure**

Consent was obtained from each participant, regardless of the severity of intellectual disability or dementia, as well as from a correspondent prior to collection of his or her data. Because the procedures we employed in this study represented minimal risk, this two-tiered consent procedure provided participants with proper and appropriate protections. Participants with the capacity to provide their own consent did so, and a correspondent with no affiliation with our Aging Research Program acted on behalf of participants with capacity limitations. In addition, assent was a necessary condition for participation, and our staff members, as well as service provider agency staff members, were on site during all assessment procedures to ensure that the preferences of our volunteers were honored.

Participants were evaluated using the measures described above following procedures described elsewhere (e.g., Silverman et al., 2004). Most relevant for the current focus, interviews for informant-based assessments, including the CUS-PAD, were conducted with a close caregiver of the participant, usually at the individual’s residence. This caregiver was identified for each participant by agency administrators or the residence manager as the person who best knew the individual in question and interacted with them daily. An informant had to have known the participant for at least 8 months, but in the vast majority of cases, the relationship existed for a year or more. Informant interviews were conducted at the

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No dementia (n = 125)</th>
<th>Questionable (n = 44)</th>
<th>Possible dementia (n = 25)</th>
<th>Definite dementia (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>54.01 5.02</td>
<td>56.65 6.72</td>
<td>57.90 5.39</td>
<td>60.03 6.83</td>
</tr>
<tr>
<td>Mean IQ</td>
<td>33.05 10.25</td>
<td>33.11 8.90</td>
<td>33.04 8.95</td>
<td>34.90 8.80</td>
</tr>
<tr>
<td>Sex (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>15.9 25</td>
<td>16.8 25</td>
<td>22.0 25</td>
<td>20 20</td>
</tr>
<tr>
<td>Female</td>
<td>84.1 75</td>
<td>83.2 75</td>
<td>78.0 75</td>
<td>80 80</td>
</tr>
<tr>
<td>Mean length of relationship b</td>
<td>8.5 6.7</td>
<td>7.0 5.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*IQ was classified by using historical IQs based upon testing that precede the onset of dementia. In a previous study we found that individuals with Stanford-Binet (SB) FSIQs seemed to be performing relatively better on various cognitive measures than their FSIQ matched peers assessed with a WAIS (the two tests employed most frequently for our participants). We have been able to resolve this apparent discrepancy because 61 of our participants were assessed with both tests, and we found that FSIQs on the WAIS were consistently and substantially higher (see Silverman et al., 2010) for similar observations. We found that the correlation between SB and WAIS FSIQs was reasonably high, r = .73, and, therefore, we could deal with this quite simply by converting WAIS FSIQs to an estimated SB FSIQ (SB IQ = -1.6 + .728 × WAIS IQ) when necessary. Either the obtained or this estimated SB FSIQ is reported. bIn years.
participant’s residence whenever possible because the behaviors being assessed were most likely to be observed in residential settings (e.g., eating, sleeping, night time waking). (Informants for individuals who did not live in a professionally run community residence were selected in consultation with agency staff.)

We completed a full clinical records review following a standard protocol. Records included information on developmental history, annual physical examinations, reports of visits to specialty clinics (e.g., vision and hearing), clinical blood and urine chemistry, medication schedules and reports from medication reviews, nursing notes, and psychometric assessments.

All assessments were repeated at 14- to 18-month intervals within the context of our larger prospective study. For the present analyses, data were available for the CUSPAD on one occasion and for the other assessments, from three to four occasions.

**Dementia classification.** Upon completion of each cycle of data collection, we evaluated results of the assessments to determine dementia status (see Krinsky-McHale, Devenny, Kittler, & Silverman, 2008; Silverman et al., 2004; Urv et al., 2008). Profiles of performance and changes over time were carefully considered, and based upon results of all measures and clinical judgments, each participant in the study was classified into one of the following categories: (a) no dementia, indicating that International Classification of Diseases–ICD-10 (World Health Organization, 1992) criteria for dementia were definitely not met; (b) questionable, indicating substantial uncertainty regarding dementia status, although some indications of mild functional and cognitive declines were present; (c) possible dementia, indicating that ICD-10 criteria were met but evidence of progressive decline over an extended period of time was limited; (d) definite dementia, indicating that ICD-10 criteria were met, and there was evidence of substantial progressive decline over time; (e) uncertain with complications, indicating that criteria for possible or definite dementia were met but that symptoms might have been caused by some other substantial concern, usually a medical condition unrelated to dementia (e.g., loss of vision, poorly resolved hip fracture, loss of social support network due to relocation); and (f) undeterminable, indicating that preexisting impairments were so severe that detection or interpretation of declines indicative of dementia was not possible. (Sixteen individuals classified as uncertain with complications or undeterminable were excluded from further analyses.)

Individuals who were suspected of possible or definite dementia were then referred to the project neurologist for evaluation and differential diagnosis. Alzheimer’s disease was indicated in the vast majority of cases after other conditions were ruled out (e.g., stroke, Parkinson’s disease). If indications of other possible causes for dementia were present, the case was classified as dementia due to multiple causes, and these cases were also excluded from analyses reported below (n = 3).

**Results**

Our primary purpose in the present study was to determine whether responses to items included in the CUSPAD would be influenced by dementia status of adults with Down syndrome. Given the number of items in the CUSPAD and their qualitative scoring, we selected initial omnibus tests to determine whether such an overall association existed. For this analysis, we employed binary scoring, with presence of any of the four types of delusions (paranoid, abandonment, somatic, and misidentification) indicating a positive case. Similarly, we scored hallucinations, behavioral disturbances, or depression as “present” if symptoms were reported in any category, but only a single item indicated the presence of illusions. We used a canonical correlation to examine the strength of association between this set of five binary scores and dementia status (four groups dummy coded as three binary variables). (Individuals who were nonverbal were excluded in this omnibus analysis as well as the subsequent analyses of delusions, hallucinations, and illusions, but they were included in analyses of behavioral disturbances and symptoms of depression.) The resulting canonical correlation was significant, Wilks Λ = .73, p ≤ .001, canonical correlation = .50. Additional graphic analyses similar to those described by Schweder and Spjøtvoll (1982) verified that dementia status was significantly related to CUSPAD results for the overall set of 26 individual items. This strategy, also used by Urv et al. (2008), avoids the substantial loss of power associated with Bonferroni correction, yet addresses concerns associated with potential inflation of type 1 error probability. Here again, clear indications of significant group differences were found.
With significant overall group differences established, we employed chi-square analyses to examine relationships among dementia status and occurrence of delusions, hallucinations, illusions, behavioral disturbances, and depression individually. Although there were no significant effects associated with dementia status for illusions, effects were found for (a) delusions, $\chi^2(3, N = 188) = 17.26, p < .001$; (b) hallucinations, $\chi^2(3, N = 188) = 7.8, p < .05$; (c) behavioral disturbances, $\chi^2(3, N = 224) = 17.79, p < .001$; and (d) symptoms of depression, $\chi^2(3, N = 188) = 24.25, p < .001$. As indicated in Table 2, the largest proportion of individuals with some type of delusion was in the group with definite dementia, followed by individuals with possible dementia, and then with questionable status. The group with no dementia had the smallest proportion, and similar patterns were found for symptoms of behavioral disturbances. Hallucinations were less frequent overall and were more prevalent only for individuals with definite dementia. Thus, the results of several converging analyses indicate that the CUSPAD does indeed detect relationships between psychiatric status and dementia status.

We conducted additional analyses to determine whether these findings were sensitive to sex, age, or severity of premorbid intellectual impairment. (These analyses were conducted to determine whether these factors might need to be considered in clinical contexts.) To examine effects of age and intellectual functioning, we divided individuals into two groups using median splits ($54.6 \leq \text{age} < 54.6$; and $35 \leq \text{IQ} < 35$). No differences were found for the overall occurrence of delusions, hallucinations, illusions, behavioral disturbances, and depression related to sex, age, or level of functioning. Older individuals did have more delusions (38% vs. 23%) than did younger individuals, $\chi^2(1) = 5.6, p < .05$, but this most likely reflected the fact that there was a relationship between dementia status and age, $F(3, 240) = 11.56, p < .001$.

Urv et al. (2008) described more detailed analyses relating dementia status to specific behavioral/psychiatric concerns, and comparable analyses were conducted for CUSPAD items. Canonical correlation was again employed for these analyses.

No significant differences in the various types of hallucinations were associated with dementia status. Specific categories of delusions/misidentifications were associated with dementia status (four groups dummy coded as three binary variables), Wilks $\Lambda = .68$, $p = .001$, canonical correlation = .45. To examine delusions in more detail, we considered each category type (general delusions, the paranoid delusions of stealing and unfound suspicions, abandonment, somatic delusions and the misidentifications of people in the house, faces in mirrors, caregiver is a stranger, house not a home, and a television character being a real person). The severity of the behavior was compared across groups (absent, transient, or persistent), as was willingness to accept correction. Results of chi-square analyses of the different types of delusions are summarized in Table 3.

Individuals with possible, definite, and questionable dementia status were more likely to have paranoid delusions of things being stolen from them than those individuals with no dementia. The delusions of stealing in individuals with possible, definite, and questionable dementia status were more persistent and less likely to change with correction than those of individuals with no dementia. Delusions of abandonment were more persistent and less likely to change in individuals with possible dementia than in the other groups. Significant differences by dementia status were also found for the misidentifications of people in the house and the house not being his or her home. Individuals with definite dementia

### Table 2. Participants Within the Dementia Status Categories With at Least One Indication of Delusions, Hallucinations, Behavioral Disturbance, or Symptoms of Depression (in %)

<table>
<thead>
<tr>
<th>Neuropsychiatric symptom</th>
<th>$\chi^2$</th>
<th>No dementia</th>
<th>Questionable</th>
<th>Possible dementia</th>
<th>Definite dementia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delusions</td>
<td>17.26***</td>
<td>19.6</td>
<td>31.4</td>
<td>45.5</td>
<td>58.3</td>
</tr>
<tr>
<td>Hallucinations</td>
<td>7.8*</td>
<td>19.6</td>
<td>31.4</td>
<td>45.5</td>
<td>58.3</td>
</tr>
<tr>
<td>Behavioral disturbance</td>
<td>17.79***</td>
<td>28</td>
<td>47.7</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Depression</td>
<td>24.25***</td>
<td>18.4</td>
<td>25</td>
<td>44</td>
<td>60</td>
</tr>
</tbody>
</table>

*p < .05. ***p < .001.
had more of these delusions than did individuals in the other groups. These behaviors were also more persistent and less likely to be influenced by correction in the group with definite dementia than in the other three groups, which did not differ from each other.

Behavioral disturbances were associated with dementia status, Wilks $\Lambda = .77$, $p \leq .001$, canonical correlation = .39, and, as indicated in Table 4, specific behavioral disturbances (wandering, verbal outbursts, violence, agitation/restlessness, and sundowning) were systematically related to stage of dementia. Behavior that was most prevalent in individuals with definite dementia included wandering, agitation/restlessness, and violence. Sundowning was most prevalent in individuals with possible and definite dementia. Violence was most prevalent for individuals of questionable and possible dementia status, and these concerns reflected both threatening behavior and actual physical violence to approximately equal degrees. However, threats were four times more prevalent than actual violence for adults with definite dementia.

The set of specific symptoms of depression were also associated with dementia status, Wilks $\Lambda = .77$, $p \leq .001$, canonical correlation = .46. Chi-square analyses used to examine specific symptoms of depression showed associations with dementia status for sleeping and eating difficulties (see Table 5). Although there was no significant difference by dementia status for sadness overall, closer examination revealed that sadness for individuals with no dementia was event-related and appropriate in 81% of the cases (e.g., someone died, staff left). In contrast, sadness reported in the three other groups was often described as “sad for no reason.” When individuals with event-related sadness were excluded from the analysis, sadness was reported more often for adults having definite or possible dementia than for those of questionable status. Individuals with no dementia presented with the least amount of sadness.

Individuals with possible and definite dementia also had significantly more difficulties related to eating than did individuals with no dementia or of questionable status. With more advanced cognitive decline, individuals had a poor appetite and some needed persuasion to eat. However, sleeping problems became more likely even for individuals of questionable status and possible dementia and then continued to increase in

<table>
<thead>
<tr>
<th>Delusion</th>
<th>No dementia (n = 107)</th>
<th>Questionable (n = 35)</th>
<th>Possible dementia (n = 22)</th>
<th>Definite dementia (n = 27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stealing</td>
<td>11 (10.5%)</td>
<td>10 (28.6%)</td>
<td>12 (54.5%)</td>
<td>13 (48.1%)</td>
</tr>
<tr>
<td>Misidentification</td>
<td>6 (5.6%)</td>
<td>10 (28.6%)</td>
<td>9 (40.9%)</td>
<td>4 (14.8%)</td>
</tr>
<tr>
<td>People in house</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Caregiver a stranger</td>
<td>2 (1.9%)</td>
<td>2 (5.7%)</td>
<td>3 (13.6%)</td>
<td>1 (3.7%)</td>
</tr>
<tr>
<td>House not home</td>
<td>1 (0.9%)</td>
<td>2 (5.7%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

| $\chi^2$                 | 11.36***             | 21.36***              | 14.75**                  | 11.28*                    |

* $p < .05$, ** $p < .01$, *** $p < .001$. 

Prop. = proportion of individuals.Persistent $= \geq 3$ times per week.Transient $= < 3$ times per week.
Discussion

Our purpose in conducting this study was to verify findings from our earlier examination of neuropsychiatric symptoms associated with Alzheimer’s disease in the adult population with Down syndrome. Previously, we found that items from the Reiss Screen were sensitive to dementia status in older adults with Down syndrome, with profiles of symptoms generally similar to those found for adults without developmental disability (Urv et al., 2008). However, given that the Reiss Screen was developed for completely other purposes, we evaluated a second instrument for assessing neuropsychiatric symptoms in order to provide a set of converging findings. The CUSPAD was chosen for this purpose because its items were generally applicable for this target population, and it was developed explicitly to study clinical progression of Alzheimer’s disease (Devanand, 1997). These results confirmed that psychiatric symptoms are a prevalent feature of dementia in the population with Down syndrome and that clinical presentation is qualitatively similar to that seen in Alzheimer’s disease within the general population.

In general, adults with Down syndrome and no signs or symptoms of dementia have a low prevalence of delusions, hallucinations, behavior problems, or symptoms of depression, and, when sadness is present, it tends to be situational and appropriate. Perhaps most importantly, results showed that some neuropsychiatric symptoms may be early indicators of Alzheimer’s disease and may appear prior to substantial changes in adaptive functioning. Individuals in our questionable status group seemed similar, at least in some respects, to individuals in the general population with mild cognitive impairment (see Krinsky-McHale et al., 2008). Mild cognitive impairment has been proposed to be a transitional state between the cognitive changes of normal aging and early dementia (Grundman et al., 2004; Lyketsos et al., 2002; Morris et al., 2001), and individuals with mild cognitive impairment convert to definite Alzheimer’s disease at a rate of approximately 10% to 15% per year (Grundman et al., 2004). Individuals of questionable dementia status in our study were twice as likely as those with no dementia to have delusions about others stealing from them, although prevalence was still

<table>
<thead>
<tr>
<th>Behavioral disturbance</th>
<th>No dementia (n = 125)</th>
<th>Questionable (n = 44)</th>
<th>Possible dementia (n = 25)</th>
<th>Definite dementia (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wandering</td>
<td>17.29***</td>
<td>2.3</td>
<td>8</td>
<td>16.7</td>
</tr>
<tr>
<td>Violence</td>
<td>7.85*</td>
<td>7.9</td>
<td>20.5</td>
<td>24</td>
</tr>
<tr>
<td>Threatening behavior</td>
<td>50</td>
<td>56</td>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>Physical violence</td>
<td>50</td>
<td>44</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>Agitation/restlessness</td>
<td>15.256***</td>
<td>16.7</td>
<td>31.8</td>
<td>8</td>
</tr>
<tr>
<td>Night confusion</td>
<td>21.301***</td>
<td>3.2</td>
<td>2.3</td>
<td>20</td>
</tr>
</tbody>
</table>

*p < .05. ***p < .001.
only 14% to 15%. These delusions appeared to be more persistent in frequency and less likely to change with correction than for individuals with no dementia. Another early indicator of dementia may be violent outbursts. Verbal and physical violence was 2.6 times as prevalent in individuals of questionable dementia status compared to individuals with no dementia; but, here again, only a minority of individuals (20.5%) were reported to have relevant concerns.

Delusions about items being stolen continued to increase in prevalence and become more persistent in frequency and less likely to change with correction as dementia developed and progressed, as did wandering and sundowning. Individuals with dementia were also more likely to be sad for no apparent reason and had more sleeping and eating difficulties.

In the later stages of dementia (definite dementia), delusions were still prevalent but appeared to be less persistent in frequency. However, visual hallucinations were twice as likely to be apparent for individuals with definite dementia than for the other groups, and various types of misidentifications (e.g., people in the house, caregiver a stranger, house not their home) became more prevalent, more persistent, and less amenable to correction. Symptoms of depression were most prevalent in individuals with definite dementia, with sleeping difficulties increasing and encouragement often needed to eat.

Despite limitations to this study associated with reliance on caregiver reports (e.g., Finlay & Lyons, 2001) and the relatively small number of participants at each specific stage of dementia exhibiting each specific profile of symptoms, the results reported herein provide a convincing validation of our previous analyses (Urv et al., 2008). Clear associations were found between the type and frequency of behaviors, the period during the progression of dementia that behaviors may appear, and the persistence of episodes of specific behaviors should they appear. Further, these associations did not seem to be modified by factors such as sex, level of intellectual disability, and age, suggesting that interpretation of results from the CUSPAD in clinical settings need not be concerned with these factors.

Taken together with earlier findings, the present results indicate that a standardized evaluation of behavioral/psychiatric concerns would help to clarify the status of individuals for whom preexisting maladaptive behaviors may be exacerbated by declining cognitive capacities. Also, because some older individuals with Down syndrome can be difficult to assess using tests of cognition, changes in behavior, both adaptive and maladaptive, may be the most valid and reliable indicators of status. Subtle changes in various maladaptive behaviors may very well be among the earliest symptoms caregivers are likely to notice. Improvements in the understanding of the progression of dementia in individuals with Down syndrome may lead to improved diagnosis and treatment and, in turn, contribute to a better quality of life for the affected individuals and those concerned about them.

References


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T. K. Urv, W. B. Zigman, and W. Silverman


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