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Behavioral Symptoms in Community-dwelling Elderly Nigerians with Dementia, Mild Cognitive Impairment, and Normal Cognition

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Abstract

Background—Few studies have examined the neuropsychiatric status of patients with dementia and cognitive impairment in the developing world despite the fact that current demographic trends suggest an urgent need for such studies.

Objective—To assess the level of neuropsychiatric symptoms in community-dwelling individuals with dementia, cognitive impairment no dementia and normal cognition.

Methods—Subjects were from the Ibadan site of Indianapolis–Ibadan Dementia Project with stable diagnoses of normal cognition, Cognitive Impairment No Dementia/Mild Cognitive Impairment (CIND/MCI), and dementia. Informants of subjects made ratings on the Neuropsychiatric Inventory (NPI) and Blessed Dementia Scale; subjects were tested with the Mini-mental State Examination (MMSE).

Results—108 subjects were included in the analytic sample, 21 were cognitively normal, 34 were demented, and 53 were CIND/MCI. The diagnostic groups did not differ in age, percent female, or percent with any formal education. The most frequent symptoms among subjects with CIND/MCI were depression (45.3%), apathy (37.7%), night time behavior (28.3%), appetite change (24.5%), irritability (22.6%), delusions (22.6%), anxiety (18.9%), and agitation (17.0%). Depression was significantly more frequent among the CIND/MCI and dementia (44.1%) groups compared to the normal cognition group (9.5%). Distress scores were highest for the dementia group, lowest for the normal cognition group, and intermediate for the CIND/MCI group.

Conclusion—Significant neuropsychiatric symptomatology and distress are present among cognitively impaired persons in this community-based study of older adults this sub-Saharan African country. Programs to assist family members of cognitively impaired and demented persons should be created or adapted for use in developing countries.

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Keywords

Nigerians; Mild Cognitive Impairment; Dementia; Behavioral Symptoms

INTRODUCTION

Current conceptions of cognitive impairment, no dementia (CIND) (Graham et al., 1997; Unverzagt et al., 2001) and mild cognitive impairment (MCI) (Winblad et al., 2004; Petersen, 2004) are very similar in describing a borderland syndrome between normal cognitive aging and dementia that encompasses a broad array of cognitive and behavioral symptoms that are presumed to have multi-factorial causation (Unverzagt et al., 2007).

The study of CIND/MCI is important because these patients develop dementia (Unverzagt et al., 2001), enter nursing homes (Tuokko et al., 2003), and die (Tuokko et al., 2003; Bennett et al., 2002; Guehne et al., 2007; Hunderfund et al., 2006) at higher rates than cognitively normal elders. Behavioral abnormalities are present in 43% of subjects in population-based studies with the most common individual symptoms being apathy (32%), depression (16–20%), irritability (15%), and anxiety (10%) (Apostolova and Cummings, 2008). CIND/MCI patients with behavioral symptoms are more likely to experience cognitive and functional decline and to progress to dementia (Apostolova and Cummings, 2008). In addition, presence of behavioral symptoms in CIND/MCI patients is related to caregiver distress and burden (Bruce et al., 2008).

Distress experienced by caregivers of demented subjects is an important factor in nursing home placement in western societies (Lyketsos et al., 2002). In societies where nursing homes are few and family members take care of the demented, distress so experienced becomes very important, as it increases caregiver depression as well as potential for abuse or neglect of the impaired care recipient. A few recent studies have pointed out that distress experienced by caregivers of patients with CIND/MCI and behavioral symptoms produces some degree of burden and it is probably necessary to begin to think of service provision for these subjects and their caregivers as it is presently done for subjects with dementia (Bruce et al., 2008; Austrom and Lu, 2009). Thus it would be helpful to quantify the severity of distress caused by behavioral symptoms in cognitively impaired individuals.

There are few studies on dementia and cognitive disorders in Africa despite the fact that the expected demographic transition in developing countries will lead to a rapidly increasing numbers of elderly and a corresponding increase in age-related disorders like dementia and CIND/MCI (Ferri et al., 2005). In this paper, we examine the frequency and severity of behavioral symptoms and the caregiver distress caused by those symptoms in normal elders and patients with CIND/MCI and dementia among the Yoruba being followed in the Indianapolis-Ibadan Dementia Project (IIDP).

METHODS

Design and Participants

Participants came from the Ibadan site of the IIDP which is a longitudinal study of aging and dementia (see (Hendrie et al., 1995; Hendrie et al., 2001) for details). In brief, a total population survey was conducted in 1992–1993 in the Idikan area and adjacent wards of Ibadan and all residents with self-reported African ethnicity and age 65 years and older were eligible resulting in an initial cohort of 2,486 persons. A two-stage design was used so that at baseline, and every three years thereafter, all subjects were screened and a subset received clinical assessment and diagnosis. The sample was enriched with 1939 new participants

aged 70 years and older in 2001. Subjects for this analysis are from the 2001 and 2004 assessment waves and were included as follows: dementia diagnosis in 2001, or normal cognition diagnosis in both 2001 and 2004, or CIND/MCI diagnosis in both 2001 and 2004. This project was approved by the institutional review board of the College of Medicine at the University of Ibadan. All subjects provided informed consent to participate.

Procedures

In the screening phase, the Community Screening Interview for Dementia (CSI-D) (Hall et al., 1993) was used and based upon the cognitive and informant scores, subjects were classified into good, intermediate and poor performance groups. All subjects in the poor performance group, 75% of those in the intermediate performance group and 5% of those in the good performance group were selected for the second clinical assessment stage. The clinical assessment consisted of examination by a clinician (physician or nurse), structured informant interview, and cognitive testing. The clinician examination included physical, neurological, mental status examinations, and functional assessment. The informant interview is adapted from the CAMDEX (Hendrie et al., 1988). It was conducted by a research nurse with a family member or informant and records cognitive symptoms and current performance in daily functioning. Participants were assessed with a modified version of the Consortium to Establish a Registry for Alzheimer Disease (CERAD) neuropsychological battery (Gureje et al., 1995) which included: Mini-mental State Examination, Animal Fluency, 15-item Boston Naming Test, Stick Design (Baiyewu et al., 2005), Word List Learning and Delayed Recall, and Indiana University Token Test (Snitz et al., 2009; Jones and Ayers, 2006; Yamamoto et al., 2003). A separate sub-study was conducted to generate age- and education-adjusted normative tables (Gureje et al., 1995) for use in the consensus diagnosis panel.

All clinically assessed participants were diagnosed using a consensus panel approach composed of geriatric psychiatrists, neurologists, and neuropsychologist. Diagnosis of dementia was made according to DSM-III-R criteria (American Psychiatric Association, 1987). Criteria for CIND/MCI have been used by our group and others (Unverzagt et al., 2001; Baiyewu et al., 2002; Plassman et al., 2008) and are as follows: informant-reported or clinician-detected impairment in cognition; or cognitive test scores 1.5 standard deviation units below the mean of the normative reference sample; and normal activities of daily living. All subjects not meeting criteria for dementia or CIND/MCI were diagnosed as normal cognition.

Measures

The measures below were taken between the 2001 and 2004 clinical assessments, about 17 months after the clinical assessment of 2001. The Neuropsychiatric Inventory (NPI) (Cummings et al., 1994) was completed by the informant. It measures the frequency, severity, and stress caused by the subject's display of 12 behavioral symptoms. Caregivers rate the frequency of behavioral symptoms that occurred in the preceding four weeks (0 = not present, 1 = occasionally, 2 = often, 3 = frequent, 4 = very frequent). Severity was scored as 1 = mild, 2 = moderate, and 3 = marked. Because it is possible for a symptom to be present many times without being severe or occur occasionally with high severity, a severity score consisted of the product of the frequency and severity. Distress was measured as follows: 0 = not at all, 1 = minimal, 2 = mild, 3 = moderate, 4 = severe, and 5 = very severe. The NPI has previously been used in the Nigerian elderly with good reliability (Cronbach alpha ranged from .73–.80, test retest reliability ranged from .81–.97 and inter-rater reliability from .99–1.0). There were good correlations with cognitive and functional markers of dementia (Baiyewu et al., 2003). After the NPI, informants completed the Blessed Dementia Scale (BDS) (Blessed et al., 1968), an 11-item questionnaire capturing the

patient's ability to perform household tasks (score range 0–17 with higher scores indicating greater impairment). Research examiners read the NPI and BDS items to the informants and recorded the scores. While the NPI and BDS were completed with informants, patients were administered the MMSE by a research technician.

Statistical Analysis

Descriptive statistics were calculated for all variables. For continuous variables, means, ranges and standard deviations were calculated. Descriptive statistics for categorical variables included proportions for binary data and the number and frequency in each category. The number of months between the NPI and the initial clinical assessment was calculated for all subjects. The NPI frequency of symptoms was dichotomized (present or not) and compared between the three groups with a Fisher's exact test. Following a significant p-value, Fisher's exact tests were also used to conduct pairwise adjusted for multiple comparisons using the Bonferroni formula. Total severity scores were calculated as the product of frequency and severity for each symptom. Total NPI severity and distress scores for each subject were calculated as the sum of the scores for each symptom. Total severity scores and distress scores both for each symptom and overall were compared between the three groups using one-way analysis of variance (ANOVA) models. MMSE and BDS scores were also compared among the three groups using ANOVA models. Following a significant overall p-value, Bonferroni multiple comparisons tests were used for pairwise comparisons. Pearson correlation coefficients were calculated between the total severity and distress scores and the MMSE and BDS scores.

RESULTS

There were 213 subjects with NPI measured after the 2001 wave. This included subjects previously diagnosed with dementia and subjects clinically assessed in 2001 that were available during the NPI data collection period. Of these, 108 with a consistent diagnosis in both 2001 and 2004 or a diagnosis of dementia in 2001 were included in this analysis. One hundred and five subjects changed diagnosis from either normal cognition or CIND/MCI to another diagnosis between the two waves and were excluded from the current analysis. Included in the analysis were twenty-one subjects (19.4%) diagnosed as cognitively normal at both 2001 and 2004 evaluations, 34 (31.5%) diagnosed as demented at the 2001 evaluation (including 29 AD), and 53 (49.1%) diagnosed as CIND/MCI at both evaluations. The time interval between the 2001 diagnosis and NPI-MMSE-BDS assessment was about 17 months ($M = 16.8$, $SD = 6.5$) with no differences between the diagnostic groups ($p = 0.36$). Those diagnosed with dementia were not re-diagnosed a second time by design.

Table 1 shows demographic and clinical characteristics of the subjects by diagnostic group. On average, subjects were over 80 years of age, were over-represented with women (over 85%), and had essentially no formal schooling. There were no significant differences among the groups on these demographic variables. Clinically, there were group differences in MMSE as subjects with normal cognition scored significantly better than the subjects with CIND/MCI and dementia, and participants with CIND/MCI scored significantly higher than those with dementia. In terms of daily function as measured by the BDS, the demented subjects had significantly more impairment than subjects with CIND/MCI and subjects with normal cognition, the latter groups not differing significantly from each other.

Table 1 also shows the demographic characteristics of the informants by subject diagnostic group. Informants were about 40 years of age, were over-represented with women (70%), and about half in each group had formal schooling. There were no significant differences among informants on these variables.

Table 2 and figures 1, 2 & 3 show the NPI frequency, severity, and distress scores by subject diagnostic group. Table 2 is restricted to the summary scores, while the figures only include each of the individual items. Looking at the frequency of symptoms, 61.9% of subjects with normal cognition experienced any NPI symptom within the past 4 weeks compared to 79.4% of the dementia group and 90.6% of the CIND/MCI group.

Significantly more of the CIND/MCI group had symptoms than those in the normal cognition group. The most frequent symptoms among subjects with CIND/MCI were depression (45.3%), apathy (37.7%), appetite change (24.5%), night time behavior (28.3%), irritability (22.6%), delusions (22.6%), anxiety (18.9%), and agitation (17.0%). Depression was significantly more frequent among the CIND/MCI (45.3%) and dementia (44.1%) groups compared to the normal cognition group (9.5%). Only subjects with dementia had hallucinations (17.6%, see Figure 1).

Informants rated the total symptom severity as significantly greater for subjects with dementia ($M = 17.5$) compared to subjects with CIND/MCI ($M = 9.9$) or normal cognition ($M = 6.1$). The symptoms with the greatest severity discrepancy across groups were hallucinations, depression, and apathy. In all cases, the severity among the dementia group was significantly greater than the normal cognition group. In general, the severity scores of the CIND/MCI group were intermediate between the other two groups but not significantly different (see Figure 2).

Informants rated the total symptom distress as significantly greater for subjects with dementia ($M = 6.24$) compared to with normal cognition ($M = 2.67$), and greater but not significantly compared to subjects with CIND/MCI ($M = 3.57$). The only symptoms with a significant distress discrepancy across groups were hallucinations with the demented group producing higher distress than both the CIND/MCI and normal cognition groups, and aberrant motor behavior where there was insufficient power to detect pairwise differences. The diagnostic groups did not differ significantly on any of the other individual symptom distress ratings, but the scores tended to be highest among the demented, lowest among the normal, and intermediate among the CIND/MCI (see Figure 3).

Behavioral symptoms were correlated with activities of daily living and cognitive function. The Pearson correlation coefficient between the NPI severity score and the Blessed measure of daily function was $r = 0.40$ ($p < 0.0001$) while between the NPI Distress score and Blessed was $r = 0.36$ ($p < 0.001$). Likewise, the MMSE was significantly inversely correlated with the NPI severity score ($r = -0.22$; $p < 0.05$) and marginally with NPI distress score ($r = -0.17$; $p = 0.07$).

DISCUSSION

To our knowledge, this is the first examination of behavioral symptoms and caregiver distress in subjects with CIND/MCI and dementia in sub-Saharan Africa. We found that CIND/MCI subjects had more NPI symptoms than their cognitively normal counterparts. The most frequent symptoms among subjects with CIND/MCI were depression (45.3%) and apathy (37.7%) with about 1 in 5 displaying delusions and 1 in 6 agitation. Depression was significantly more frequent among subjects with CIND/MCI and dementia than among older adults with normal cognition. Night-time behaviors and appetite changes occurred at about the same rate across the three diagnostic groups suggesting that these items of the NPI may be tapping more general age-related as opposed to disorder-related changes. Overall, informants of dementia patients had higher total distress scores and this was driven to large degree by presence of hallucinations in the dementia group (none noted at all in CIND/MCI and normal groups).

The results of our study are similar to those of Lyketsos (Lyketsos et al., 2002), Geda (Geda et al., 2008), and Okura (Okura et al., 2010) despite methodological differences. In these studies, behavioral symptoms tended to be most common among subjects with dementia, least common in older adults with normal cognition, and at intermediate levels among subjects with CIND/MCI. For example, Okura examined NPI scores in a representative cohort of community and nursing home residents diagnosed as dementia, CIND/MCI, and normal cognition, found that prevalence of behavioral symptoms increased from normal cognition to CIND/MCI through mild, moderate and severe dementia. The total number of behavioral symptoms was related to increased limitation in functioning in CIND/MCI and dementia subjects. In comparing prevalent NPI symptoms of community dwelling subjects diagnosed with CIND/MCI and those with normal cognition, Geda reported that there were higher number of NPI symptoms in CIND/MCI group compared to the normal group. Apathy, agitation, anxiety, irritability, depression, and delusions were the most common symptoms reported. Lyketsos reported that subjects with dementia had significantly more behavioral symptoms than subjects with CIND/MCI. Eighty percent of demented individuals compared with 50% of MCI had at least one NPI symptom. Common symptoms included apathy, depression, agitation and aggression.

Another notable finding here is the relatively high rate of NPI symptoms in the past 4 weeks among older adults with normal cognition with almost 62% so affected. This rate is considerably higher than the 5–25% reported in large community-based studies of normal older adults in America (Geda et al., 2004; Lyketsos et al., 2002) and 12% in Brazil (Tatsch et al., 2006). The much higher rates of neuropsychiatric disturbance in our sample, may relate to the high levels of physical and sensory infirmity among the very old adults in our study. The difference between the overall mean severity scores for normal cognition and dementia (6.1 to 17.5) is another pointer to the fact that though these symptoms are presenting in those with normal cognition, they are not severe.

International studies and studies involving minority groups report similar results. Hinton et al. (Hinton et al., 2003) in a study of community dwelling Latino elders found more NPI symptoms in demented compared with CIND/MCI subjects. Depressive symptoms in caregivers as measured by the Center for Epidemiological Studies Depression Scale (Radloff, 1977) were related to NPI symptoms in the subjects. Muangpaisan et al. (Muangpaisan et al., 2008) in their Thailand study using the NPI reported that patients with CIND/MCI had higher incidence of behavioral symptoms compared with normal cognition. Common NPI symptoms included anxiety, dysphoria, sleep problems and hallucinations.

We also found a significant relationship between NPI symptoms and cognitive function and functional impairment. Symptom distress tended to be most closely related to scores of functional impairment. These results are consistent with findings from Feldman et al. (Feldman et al., 2004) and Stepaniuk et al. (Stepaniuk et al., 2008) where persons with CIND/MCI and behavior disorders had higher levels of cognitive impairment than those without behavioral symptoms.

One issue which this study addresses is the level of distress experienced by informants and caregivers of subjects diagnosed with dementia and CIND/MCI in Africa where the impaired elderly are cared for by family. Informants from the dementia group reported the highest distress and this was mainly driven by distress from hallucinations. The distress level among informants of CIND/MCI subjects was intermediate between the other two groups but not significantly different. Though distress levels in CIND/MCI are midway between dementia and normal cognition, it would be helpful in this cohort where homecare is all that is available for the demented, to start attending to the needs of caregivers of

CIND/MCI before dementia sets in. This will prepare the family for the difficulties that may accompany the onset of dementia.

Though limitations in sample size may have contributed to the lack of significant difference, but as suggested by Bruce et al. (Bruce et al., 2008) and Austrom and Lu (Austrom and Lu, 2009), there may be a need for intervention in the behavior symptoms in CIND/MCI and certainly this is so when these patients convert to dementia as roughly 25% will over the course of 2 years (Baiyewu et al., 2002).

Another important factor related to this study is the perception of caregivers. Wu et al (2009) in a comparison of caregivers of demented patients in Sydney (Australia) and Shanghai (China), reported that depression in caregivers was related to education, health status of the caregivers, and some cultural values. Romeo-Moreno et al (2011) pointed out that family members with obligatory motives for caring may experience more stress; motives however may be influenced by culture. These studies (Bruce et al 2008, Austrom and Lu, 2009, Wu et al 2009, and Remero-Moreno et al 2011) have implications for the outcome in the present study. First there is little information on the attitude and coping styles of Nigerian caregivers regarding dementia. Second, the behavior issues in those with CIND/MCI raise the question of a possible need for an intervention in CIND/MCI subjects. However, research questions about such needs can only be answered in future. A third issue, actually an unexpected finding, is the relatively high levels of agitation, irritability, and appetite change among subjects with normal cognition. This may in part be related to high rates of physical (severe arthritis, pain, immobility) and sensory (blindness) limitations in this cohort. Okura and Geda also reported behavioral symptoms among their normal controls.

Our study has strengths including comprehensive clinical assessments, consensus panel approach to diagnosis, and inclusion of subjects with stable diagnoses at two points in time. The value of this is to eliminate the possibility mild infective processes or other mild illnesses, affecting classification as normal cognition or CIND/MCI albeit temporarily. There are also limitations. Although the NPI is a sensitive and reliable instrument for measurement of behavior symptoms, it is possible that the caregiver might not recall all the symptoms or, because of stigma, minimize their ratings. This may be particularly true in this African cohort where reverence for older adults tends to be high and knowledge about dementia relatively low. Finally, the sample size is relatively small and we may have had power to detect only the most robust differences.

In conclusion, we found that older adults in Nigeria have relatively high levels of neuropsychiatric symptoms and that the frequency of these symptoms and the distress they cause are greatest in the persons with dementia and intermediate in persons with CIND/MCI. The development of interventions to assist family members of these persons in coping with distressing symptoms would be a worthwhile goal for developing societies.

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Figure 1.
NPI presence of individual symptoms in past 4 weeks by subject diagnostic group.

Figure 2.
NPI symptom severity scores by symptom by subject diagnostic group.

Figure 3.
NPI mean distress scores by symptom by subject diagnostic group.

Table 1

Participant and informant characteristics by diagnostic group.

	Normal Cognition (n=21)	CIND/MCI (n=53)	Dementia (n=34)	p-value
Participants				
Age, years, M $\pm$ SD	82.8 $\pm$ 5.3	80.9 $\pm$ 5.6	83.3 $\pm$ 9.2	0.2630
Female gender, n (%)	17 (81.0%)	49 (92.5%)	28 (82.4%)	0.2094
Attended school, n (%)	1 (4.8%)	4 (7.5%)	1 (2.9%)	0.8558
MMSE, M $\pm$ SD	20.9 $\pm$ 3.3	17.3 $\pm$ 3.0	12.8 $\pm$ 3.3	<0.0001 ^{a,b,c}
Blessed Dementia Scale, M $\pm$ SD	1.5 $\pm$ 1.2	2.2 $\pm$ 2.0	5.9 $\pm$ 3.8	<0.0001 ^{a,c}
Informants				
Age, years, M $\pm$ SD	44.3 $\pm$ 19.7	42.5 $\pm$ 18.4	47.0 $\pm$ 19.5	0.6420
Female gender, n (%)	16 (76.2%)	36 (67.9%)	24 (70.6%)	0.7877
Attended school, n (%)	12 (57.1%)	36 (67.9%)	17 (50.0%)	0.2465

Notes: MMSE = Mini-mental State Examination.

^aSignificant Bonferroni adjusted p-value comparing CIND/MCI vs. Dementia^bSignificant Bonferroni adjusted p-value comparing CIND/MCI vs. Normal Cognition^cSignificant Bonferroni adjusted p-value comparing Normal Cognition vs. Dementia

Table 2

NPI scores (overall and individual symptoms) by subject diagnostic group

	Normal Cognition (n=21)	CIND/MCI (n=53)	Dementia (n=34)	p-value
Presence of symptoms in past 4 weeks, n (%)				
Delusions	1 (4.8%)	12 (22.6%)	8 (23.5%)	0.1523
Hallucinations	0 (0.0%)	0 (0.0%)	6 (17.6%)	0.0017 ^a
Agitation/Aggression	4 (19.0%)	6 (17.0%)	10 (29.4%)	0.4071
Depression/Dysphoria	2 (9.5%)	24 (45.3%)	15 (44.1%)	0.0078 ^{b,c}
Anxiety	2 (9.5%)	10 (18.9%)	5 (14.7%)	0.6505
Elation/Euphoria	0 (0.0%)	0 (0.0%)	1 (2.9%)	0.5093
Apathy/ Indifference	3 (14.3%)	20 (37.7%)	13 (38.2%)	0.1155
Disinhibition	3 (14.3%)	8 (15.1%)	10 (29.4%)	0.2602
Irritability/Lability	4 (19.0%)	12 (22.6%)	11 (32.4%)	0.5167
Aberrant motor behavior	0 (0.0%)	2 (3.8%)	6 (17.6%)	0.0276
Night time behavior	6 (28.6%)	15 (28.3%)	10 (29.4%)	1.0000
Appetite/ Eating change	4 (19.0%)	13 (24.5%)	11 (32.4%)	0.5198
Any symptom	13 (61.9%)	48 (90.6%)	27 (79.4%)	0.0155 ^b
Severity of symptoms, M ± SD				
Delusions	0.19 ± 0.87	0.57 ± 1.28	1.50 ± 3.34	0.0510
Hallucinations	0.00 ± 0.00	0.00 ± 0.00	1.00 ± 2.32	0.0016 ^{a,c}
Agitation/Aggression	1.14 ± 2.57	0.87 ± 2.69	1.32 ± 2.80	0.7380
Depression/Dysphoria	0.29 ± 0.96	1.26 ± 2.04	2.24 ± 3.50	0.0181 ^c
Anxiety	0.38 ± 1.36	0.92 ± 2.34	0.82 ± 2.47	0.6363
Elation/Euphoria	0.00 ± 0.00	0.00 ± 0.00	0.12 ± 0.69	0.3400
Apathy/ Indifference	0.57 ± 1.57	1.72 ± 3.32	3.18 ± 4.62	0.0274 ^c
Disinhibition	0.48 ± 1.44	0.75 ± 2.28	1.53 ± 2.99	0.2122
Irritability/Lability	0.86 ± 1.96	0.87 ± 2.19	1.88 ± 3.44	0.1757
Aberrant motor behavior	0.00 ± 0.00	0.15 ± 0.77	0.71 ± 1.95	0.0583
Night time behavior	1.38 ± 2.62	1.45 ± 2.58	1.50 ± 2.56	0.9863
Appetite/ Eating change	0.81 ± 1.89	1.34 ± 2.79	1.74 ± 2.67	0.4414
Total severity score	6.10 ± 9.69	9.91 ± 9.65	17.53 ± 17.75	0.0032 ^{a,c}
Distress, M ± SD				
Delusions	0.10 ± 0.44	0.13 ± 0.59	0.44 ± 1.05	0.1202
Hallucinations	0.00 ± 0.00	0.00 ± 0.00	0.32 ± 0.84	0.0055 ^{a,c}
Agitation/Aggression	0.52 ± 1.12	0.28 ± 0.86	0.50 ± 1.05	0.4870
Depression/Dysphoria	0.19 ± 0.68	0.79 ± 1.29	0.88 ± 1.47	0.1153
Anxiety	0.24 ± 0.77	0.47 ± 1.03	0.35 ± 0.92	0.6139

	Normal Cognition (n=21)	CIND/MCI (n=53)	Dementia (n=34)	p-value
Elation/Euphoria	0.00 ± 0.00	0.00 ± 0.00	0.06 ± 0.92	0.3400
Apathy/ Indifference	0.19 ± 0.68	0.28 ± 0.79	0.71 ± 1.36	0.0904
Disinhibition	0.29 ± 0.78	0.36 ± 1.00	0.62 ± 1.21	0.4144
Irritability/Lability	0.43 ± 0.98	0.30 ± 0.77	0.79 ± 1.37	0.0967
Aberrant motor behavior	0.00 ± 0.00	0.06 ± 0.30	0.35 ± 0.92	0.0270
Night time behavior	0.48 ± 0.98	0.49 ± 0.91	0.71 ± 1.17	0.5792
Appetite/ Eating change	0.24 ± 0.70	0.40 ± 0.88	0.50 ± 0.90	0.5466
Total distress score	2.67 ± 4.78	3.57 ± 4.24	6.24 ± 6.75	0.0247 ^c

Notes: NPI = Neuropsychiatric Inventory.

^aSignificant Bonferroni adjusted p-value comparing CIND/MCI vs. Dementia

^bSignificant Bonferroni adjusted p-value comparing CIND/MCI vs. Normal

^cSignificant Bonferroni adjusted p-value comparing Normal vs. Dementia