Lack of insight or impaired awareness of deficits in persons with dementia is a relatively neglected area of study (McDaniel et al., 1995). Most of the current research on dementia focuses primarily on biological issues, like etiology or pathogenesis, and more recently on behavioral and therapeutic aspects. Little attention has been paid to the phenomenology of the demented individual's subjective experience, or self-perception of illness (Babinski, 1914; Bahro, Silber, & Sunderland, 1995). It is therefore not surprising that insight is a concept lacking precise operational definition (Mullen, Howard, David, & Levy, 1996). The terms insight or awareness of deficits have been used interchangeably, referring to lack of knowledge or recognition of one's deficits (McGlynn & Schacter, 1989). Anosognosia similarly means lack of knowledge of disease, but has been used more often to describe a failure to acknowledge a particular deficit, usually the motor (McGlynn & Schacter, 1989; Babinski, 1914). Babinski first used the term in 1914 to describe an absence of awareness in a hemiplegic patient who had suffered a stroke (Prigatano & Schacter, 1991). However, the term is now used more generally to include all neuropsychological and neurological deficits (Cotrell, 1997). Some authors use the terms anosognosia and unawareness interchangeably (McGlynn & Schacter, 1989). Recently, David (1990), analyzing the association between insight and psychosis, has promoted a complex concept of insight as an amalgam of three constructs: the ability to identify certain mental events as pathological, the recognition by the individual that he or she has a mental illness, and the degree of compliance with treatment. Insight was also defined as the ability to judge the presence and the severity of dementia (DeBettignies, Mahurina, & Pirozzolo, 1990) and, more recently, as the awareness of and attitudes toward one's mental symptoms (Mullen et al., 1996). A practical definition considers insight as the ability to judge both the presence (symptoms) and the severity (functional impairment) of illness (Babinski, 1914; Critchley, 1953; DeBettignies et al., 1990; Fisher, 1989; Gainotti, 1972; Mangone et al., 1991). Foley (1992) defines awareness or insight as "the capacity to discern the true nature of the situation, or as applied to dementia, the recognition of the fact, degree, and implications of one's own illness."

The mechanism of insight in demented patients is still unknown (Mullen et al., 1996). Attempts to define the causative mechanisms of insight have shifted from the initial focus on the biological explanation to a psychodynamic interpretation; recently, interest has shifted back to awareness deficits as a neuropsychological problem (Prigatano & Schacter, 1991). Several studies showed that patients with Alzheimer's disease (AD) and poor insight had significantly more severe deficits on a frontal lobe-related neuropsychological test (Auchus, Goldstein, Green, & Green, 1994; Lopez, Becher, Sumsk, & Dekosky, 1994; Mangone et al., 1991; Michon, Deweer, Pillon, Agid, & Dubois, 1994; Ott et al., 1996; Starkstein, Federoff, Price, Leiguarda, & Robinson, 1992). Other studies did not replicate these findings, suggesting the main involvement of right hemisphere dysfunction (Migliorelli et al., 1995; Reed, Jagust, & Coulter, 1993). Usually, impaired insight due to frontal lobe dysfunction is termed confabulation whereas impaired insight after right hemisphere dysfunction is termed anosognosia. Both con-
Insight in Dementia

Fabulation and anosognosia may contribute to the impaired insight in AD (Mangone et al., 1991).

Schacter and Prigatano (1991) warn that unawareness is not a unitary entity but probably consists of various forms or types. Recently, Starkstein, Sabe, Chemeriniski, Jason, and Leiguarda (1996) have suggested that insight may be a complex function: Unawareness of cognitive deficits and unawareness of behavioral problems may constitute independent phenomena in Alzheimer’s disease, the former related to the severity of intellectual impairment and the latter probably associated with the disinhibition syndrome.

The level of insight has been shown to be significantly associated with the severity of dementia. A number of studies, in fact, confirm the generally accepted belief that patients with Alzheimer’s disease experience a progressive loss of insight as the severity of dementia increases (Mangone et al., 1991; McDaniel et al., 1995; Starkstein et al., 1996). However, as insight is not an “all-or-nothing” phenomenon, little is known about the shape and the kind of relationship between insight and degree of cognitive impairment. The aim of this study was to evaluate the level of insight in a group of demented patients with two assessment scales, one (Verhey, Rozaental, Ponds, & Jolles, 1993) specifically targeted to memory deficits, the other (Ott & Fogel, 1992) evaluating a broader spectrum of insight, and to examine their relationship with the level of cognitive impairment.

Methods

Sixty-nine patients affected by Alzheimer’s disease (AD) and vascular dementia (VD) according to DSM-IV criteria (American Psychiatric Association, 1994) were consecutively recruited at the Alzheimer Dementia Unit of Sacco-Cuore Fatebenefratelli Institute of Brescia, Italy. Thirty-seven patients were affected by AD probable or possible according to NINCDS-ADRDA criteria (McKinnon et al., 1984) and 32 were affected by VD probable or possible according to NINDS-AIREN criteria (Roman et al., 1993). Laboratory and neuroimaging evaluation (e.g., computed tomographic scan, thyroid hormones, folate and vitamin B12 levels, syphilis serology) were conducted to rule out specific neurology, neoplastic, infectious and metabolic causes of dementia. Patients with delirium, aphasia, or comprehension deficits that might compromise the administration of insight rating scales were excluded. Patients with history of severe head injury, alcoholism, major psychiatric illness, and epilepsy were also excluded from the study.

Patients underwent a multidimensional assessment of cognitive, physical, and social health; for the present study, the following variables were assessed:

1. Sociodemographic variables (gender, age, education) were recorded.

2. Cognitive status was measured with the Mini-Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975).

3. Clinical Dementia Rating scale (CDR; Hughes, Berg, Danziger, Coben, & Martin, 1982) was used to provide a score ranging from 0 to 3 (0 = normal, 0.5 = questionable dementia, 1 = mild, 2 = moderate, 3 = severe dementia), which is based on combined ratings of psychic, social, and functional aspects of the patient by a clinician and give a global dementia severity level.

4. Functional status: patients underwent indirect assessment of their functional competence. The indirect assessment included six basic and eight instrumental activities of daily living (BADL and IADL), assessed with the Katz index (Katz, Ford, Moskowitz, & Jackson, 1963) and the Lawton and Brody (1969) scale, respectively. Dependency was defined as the inability to carry out activities of daily living without regular help of another person. Information was collected from the primary caregiver.

5. Behavioral disturbances were evaluated with the Neuropsychiatric Inventory Scale (NPI; Cummings et al., 1994).

6. Depressive symptoms were assessed using the Geriatric Depression Scale (GDS; Yesavage et al., 1983).

7. Assessment of insight was done by means of two assessment instruments: the Guidelines for the Rating of Awareness Deficits (GRAD; Verhey et al., 1993; Verhey, Ponds, Rozenendaal, & Jolles, 1995) and the Clinical Insight Rating scale (CIR; Ott and Fogel, 1992; Ott et al., 1996). Both scales are in a semistructured interview format, and are preceded by an interview with the patient’s primary caregiver during which the reason of visit, duration of illness, rate of progression of cognitive deficits, functional impairment (BADL and IADL), and behavioral disturbances (NPI) are investigated. Before insight assessment, the clinician evaluates the patient’s global disease severity (MMSE and CDR). Insight scores are derived by the comparison of the patient’s responses and the clinical information gathered with the help of the caregiver.

The GRAD is composed of the following four questions: (a) “Please tell me about the problems you are here for.” (b) When the patient has other complaints, not directly related to dementia: “Do you have other complaints?” (c) When the patient has no spontaneous complaints about his or her cognitive functions: “How is your memory functioning? Do you think you have a poor memory?” (d) When the patient denies deficits of memory or other cognitive functions: “So, there are no memory problems at all? Is everything going all right for you?” After these questions the complaints are discussed more extensively in an open interview, in which the clinician tries to get an impression of the degree and the nature of cognitive symptoms. Scoring is made directly after the interview. Awareness is judged to be intact (score = 4) when the cognitive problems were mentioned spontaneously by the patient in reply to the opening question and when history of the caregiver corresponds to that of the patient. When the patient commented spontaneously about his or her memory in reply to the opening question, but there were apparent discrepancies between the patient’s and caregiver’s anamnesis, awareness was scored as mildly impaired (score = 3). Awareness was scored as 2 (severely impaired) when the patient uttered no complaints in response to the opening question, and when there were clear discrepancies between the patient’s and the caregiver’s history. When the patient denied any explicit awareness, insight was scored as 1 (absent).

The CIR is a scale that assesses the patient’s awareness regarding the following aspects: (a) the reason for the visit to see doctor; (b) his or her cognitive deficits; (c) his or her functional deficits; and (d) his or her perception of the progression of the disease. Each item is ranked from 0 to 2, yielding a total rating that ranges from 0 (insight fully preserved) to 8 (insight totally absent). Ratings on the insight scales were carried out by a clinician (B.V.) based on her judgement of the patient’s degree of awareness on each item after an interview with the patient and the primary caregiver.

The Italian version of the two scales has been previously validated in a group of 20 demented subjects, 10 affected by AD and...
10 affected by VD (Vallotti, Zanetti, Bianchetti, & Trabucchi, 1997). The interrater intra-class correlation coefficient was .73 for the GRAD and .80 for the CIR. The test-retest coefficient was .73 for GRAD and .89 for CIR. Both scales proved to be reliable for the rating of insight.

8. A subgroup of 36 participating patients underwent an extensive neuropsychological assessment (for details of the tests, see Binetti et al., 1993). Short-term memory was assessed by auditory-verbal forward digit span and visuospatial span (Corsi’s block-tapping test). Episodic memory was tested with the logical memory test (recall of a short story) and with the 20-minutes delayed recall of the Rey complex figure. A 30-item version of the Boston naming test provided a measure of naming and semantic memory. The copy of the Rey figure was used to assess visuospatial abilities. The Raven’s colored progressive matrices test, the attentional matrices test, and the token test were also included in the neuropsychological battery. “Executive” function was evaluated by the Wisconsin Card-Sorting Test (WCST), and PFL verbal fluency test. The WCST is a problem-solving task that measures the ability to identify abstract categories and shift cognitive set. A shortened version of WCST with 64 cards was adopted, computing an index of perseveration (number of errors/number of perseveration). The verbal fluency for letters (PFL) was assessed by recording the number of words produced in the course of one minute for each letter.

Statistical Analysis
Descriptive and correlation analyses were carried out with SPSS Software (version 5.0). The relationships among variables were assessed with Pearson’s r and the Spearman correlation coefficient. The associations between neuropsychological tests and insight as measured with GRAD and CIR have been corrected for Bonferroni multiple (n = 10) comparisons test, and the critical p value for statistical significance was set at p = .005. The following statistical analysis was carried out with S+ (version 4) for Windows. The relationship of insight scales with cognition was explored with cubic spline smoothers ( Hastie & Tibshirani, 1990). A smoother is a tool for summarizing the trend of a dependent variable (in the present case, insight scales) as a function of one or more predictors (here cognitive performance). Smoothers produce an estimate of the trend that is less variable than the dependent variable itself (Hastie & Tibshirani, 1990). In the case of spline smoothers, points called knots divide the “real” shape of the association, and a number of cubic functions are fitted between the knots. The algorithm identifies where the knots that allow maximization of the fitting lie. The higher the number of knots, the higher the fitting of the resulting function, but the more uneven its shape. The lower the number of knots, the lower the fitting of the function but the smoother its shape. The exploration process of the relationship between two variables consists of finding out the number of knots that gives, at the same time, the highest possible fitting with the smoothest function. Similarly to the usual generalized linear models, spline smoothers allow one to test the effect of covariates on the relationship between the dependent and the independent variables.

The effect of diagnosis (AD or VD) on the shape of the relationship between insight scales and MMSE was assessed in a multivariate generalized additive model with a spline smoother of MMSE, diagnosis (coded as a dichotomous variable), and their interaction as independent variables. Spline smoothers can be compared to conventional linear models by usual methods (testing the significance of the increase of fitting, i.e., the decrease of deviance, by chi-square test). In the present study, we compared spline smoothers with piecewise linear models. Different piecewise linear models were also compared. The optimal point of discontinuity in piecewise linear models was chosen on the basis of the best-fit, that is, the lowest deviance. In this analysis the level of statistical significance was set at p = .05.

RESULTS
Table 1 shows the clinical and sociodemographic characteristics of the sample. No statistical differences were found between the AD and the VD patients, except for age (p < .05). In particular, no significant differences were found for the GRAD and the CIR in the two groups. The great majority of patients (94%) were in the mild to moderate stage of dementia severity.

The goal of the first step of the analysis was to confirm the association of insight with disease severity and with psychological variables. This preliminary data analysis was performed assuming a linear association between insight and cognitive impairment.

In the whole sample, the level of insight as measured by the GRAD was significantly associated with dementia severity as measured by the MMSE (Spearman’s coefficient = .51, p < .001) and the CIR (Spearman’s coefficient = -.57, p < .001). The CIR scores also showed a good correlation with disease severity (r = -.55, p < .001 and r = .57, p < .001, respectively). No relationship was found between insight and the presence of depressive symptoms with both the GRAD (r = .15, p = .24) and the CIR (r = -.22, p = .09) scales.

After Bonferroni correction for multiple comparisons, both the GRAD and CIR scales showed a significant correlation (p < .005) with tests measuring planning and abstract thinking (Wisconsin Card-Sorting Test), and language comprehension (Token test). Moreover, the CIR was significantly associated with attentional matrix score (r = -.40) and constructional apraxia (Rey’s figure; r = .41), and the GRAD was significantly associated with the Boston Naming Test score (r = .50).

Table 1. Sociodemographic and Clinical Characteristics of Alzheimer’s Disease (AD) and Vascular Dementia (VD) Patients

<table>
<thead>
<tr>
<th>Table 1. Sociodemographic and Clinical Characteristics of Alzheimer’s Disease (AD) and Vascular Dementia (VD) Patients</th>
<th>AD (n = 37)</th>
<th>VD (n = 32)</th>
<th>Total (n = 69)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>74.8 ± 8.5</td>
<td>78.8 ± 6.1</td>
<td>76.7 ± 7.8</td>
</tr>
<tr>
<td>Education (years)</td>
<td>6.2 ± 3.9</td>
<td>5.2 ± 2.7</td>
<td>5.7 ± 3.4</td>
</tr>
<tr>
<td>Disease duration (months)</td>
<td>33.4 ± 22.5</td>
<td>30.3 ± 16.9</td>
<td>32.0 ± 2.0</td>
</tr>
<tr>
<td>Mini-Mental State Examination</td>
<td>16.1 ± 6.2</td>
<td>18.0 ± 6.7</td>
<td>17.0 ± 6.4</td>
</tr>
<tr>
<td>BADL (functions lost)</td>
<td>1.2 ± 1.7</td>
<td>1.7 ± 1.6</td>
<td>1.4 ± 1.7</td>
</tr>
<tr>
<td>JADL (functions lost)</td>
<td>3.9 ± 2.7</td>
<td>4.7 ± 2.5</td>
<td>4.3 ± 2.6</td>
</tr>
<tr>
<td>Neuropsychiatric Inventory Scale</td>
<td>23.1 ± 22.8</td>
<td>30.4 ± 22.3</td>
<td>26.5 ± 22.7</td>
</tr>
<tr>
<td>Geriatric Depression Scalea</td>
<td>8.1 ± 5.2</td>
<td>10.1 ± 5.7</td>
<td>9.1 ± 5.5</td>
</tr>
<tr>
<td>GRADb</td>
<td>2.7 ± 1.1</td>
<td>2.5 ± 1.1</td>
<td>2.6 ± 1.1</td>
</tr>
<tr>
<td>CIRc</td>
<td>3.1 ± 2.6</td>
<td>2.9 ± 2.4</td>
<td>3.0 ± 2.5</td>
</tr>
<tr>
<td>Clinical Dementia Rating Scale</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>24 (64.9)</td>
<td>17 (53.2)</td>
<td>41 (59.4)</td>
</tr>
<tr>
<td>2</td>
<td>11 (29.7)</td>
<td>13 (40.5)</td>
<td>24 (34.8)</td>
</tr>
<tr>
<td>3</td>
<td>2 (5.4)</td>
<td>2 (6.3)</td>
<td>4 (5.8)</td>
</tr>
</tbody>
</table>

Note: Data are means ± and SD or n (%).
aPerformed in 30 AD and 28 VD patients.
bGuidelines for the Rating of Awareness Deficits.
cClinical Insight Rating Scale.
However, as shown in Figures 1A and 1B, the association between insight and cognitive status was not linear. An exploratory analysis with spline smoothers showed that the relationship was roughly trilinear, with no association between insight and cognition at both ends of the MMSE distribution, and a linear association in between.

The GRAD scale scores distribution into only 4 levels prevented any further analysis assuming a normal distribution of the response variable. However, the CIR scale scores distribution, albeit into 9 levels, could be better approximated to a normal distribution. Therefore, the following analysis was carried out on the CIR scale only.

A multivariate generalized additive model with the spline smoother of MMSE and diagnosis (AD or VD) as the independent variable indicated that the relationship was not different in the two subgroups (difference of deviances = 1.5; df = 1; \( p = .23 \)), indicating that the intercept of the smoother was not different in the two groups. The addition in the model of the interaction between the spline smoother and MMSE also failed to reach significance (difference of deviances = 2.2; df = 2; \( p = .33 \)), indicating that the shape of the smoother was not different in the two groups. These observations supported the following joint analyses of the two groups. The fitting of piecewise linear models of MMSE on CIR was tested and models of increasing complexity and descriptiveness of the data were compared.

The cutoff points of 12 and 24 for the MMSE were chosen by comparing two-segment piecewise linear models with cutoffs ranging from 9 to 15 and from 21 to 27, and by choosing the cutoff associated with the lowest deviance (Figure 2). Deviance ranged between 249.3 and 268.5 for MMSE scores between 9 and 15, with the lowest deviance (247.3) being observed for the MMSE score of 12. Deviance ranged between 256.6 and 249.6 for MMSE scores between 21 and 27, with the lowest deviance (242.7) being observed for the MMSE score of 24.

Table 2 shows fittings of linear and spline smoothers. The first model assumes a linear relationship between MMSE and CIR scales. The second and third models assume that the leftmost and rightmost portions of the MMSE distribution (MMSE <12 and MMSE >24, respectively) are flat and that the remaining portion of the MMSE distribution has a linear relationship with the CIR scale. Both the second and third models had a significantly lower deviance (i.e., better fit) than the first one. The fourth model was built to compound the second and third ones, and assumes that the relationship between MMSE and CIR scales is flat at both ends of the MMSE distribution and is linear in between. Table 2 shows that this trilinear model has a significantly better fit than both previous models. The last two to be tested were generalized additive models with a spline smoother. Generalized additive models often have a better fit than linear models because no a priori assumption regarding the shape of the relationship is made. Indeed, the fifth model, in which a spline is fitted, has lower deviance than the trilinear model, which, however, was not significant. This indicates that the latter does not perform significantly worse than the best possible model.

**DISCUSSION**

This study demonstrates that the association of disease insight with cognitive functions follows a nonlinear pattern and MMSE cutoff points can be identified between preserved, moderately impaired and absent insight. The trilinear model describes the association between insight and cognition as proceeding through three periods: an initial period of stability before detectable decline, a period of decline, and a final period of stability during
which there is no further detectable decline. Our data confirm previous findings by Brooks, Kraemer, Tanke, and Yesavage (1993) who suggested that the trilinear model for analyzing longitudinal data in a sample of Alzheimer’s is superior to the commonly used linear model that includes the flawed assumption that decline is uniform throughout the course of the disease.

Following a simple correlation analysis and considering an a priori linear association between insight and cognition led to a confirmation of previous research findings (Mangone et al., 1993; Lopez et al., 1994; Ott et al., 1996). Decreased level of insight was significantly associated with severity of dementia as measured by MMSE and CDR, irrespective of its etiology (Verhey et al., 1995). Some studies, however, have failed to show a significant relationship between dementia severity and reduced awareness of deficits (DeBettignies et al., 1990; Fehrer, Mahurin, Inbody, Crook, & Pirozzolo, 1991; Reed et al., 1993).

However, the main results of our study suggest that the a priori assumption of a linear association between insight and cognition, or disease severity, cannot be the correct one, and suggest that this association follows a trilinear pattern. The trilinear model reflects more closely the observable decline of insight. The second advantage is that the trilinear model can provide estimates of when the decline of insight begins and ends.

Insight as measured with CIR is nearly preserved in the initial stages of disease; afterwards, between MMSE scores of 24 and 12, insight shows a linear progressive decay, followed by a plateau, at MMSE scores of 12 and less, of severe impaired insight. Interestingly, the cutoff associated with preserved insight is set at MMSE score of 24 or more. A score of 23 or less—a cutoff score evolving from research findings recommended in the original article—has generally been accepted as indicating the presence of cognitive impairment (Tombaugh & Mcintyre, 1992). However, it should be emphasized that, although persons with MMSE scores between 24 and 12 are impaired, these demented patients preserve some degree of disease insight. On the other hand, CIR scores between 0 and 1 can be associated with good insight, CIR scores between 2 and 4 with relatively impaired insight, and CIR scores higher than 4 are associated with poor insight.

These findings could have important implications for research with cognitively impaired subjects and the emerging problem of patient autonomy and decisional capacity. The criteria for informed consent for medical research that could be beneficial for the patient imply a demanding test of capacity because they envision a fully informed and reasoned decision by the subject. However, many demented subjects do not have the capacity to satisfy this heroic standard (Bonnie, 1996), and investigators are left without a realistic standard of decisional capacity that can be used in cases involving subjects with cognitive impairment.

From a clinical perspective, knowledge of the point at which decline of insight may begin would allow health care professionals and patients’ families to plan for the future course of a patient’s disease (Brooks et al., 1993; Mullen et al., 1996).

Our data confirm that the level of depressive symptoms and lack of insight occur in AD and VD with comparable frequency. Depression did not contribute independently to disease insight, confirming previous findings by Cummings, Ross, Absher, Gornbein, and Hadjiaghai (1995) and Ott and colleagues (1996), who suggested that depression in AD is unrelated to patient self-awareness of illness. Our data confirm previous findings of Verey and colleagues (1995), who evaluated 48 AD patients and 48 VD patients, suggesting that depression, insight, and personality do not favor etiology of AD over that of VD. On the contrary, comparing AD, VD, and controls, Wagner, Spangenberg, Bachman, & O’Connel (1997) suggest that, independent of dementia severity, unawareness of cognitive deficits is disease specific. Wagner and colleagues suggest that there is a disproportional degree of unawareness associated with AD when compared with VD.

The main result of our study—the nonlinear pattern of the association between disease insight and cognitive functions—might explain some of the discordant findings of previous research carried out with correlation analysis assuming an a priori linear association.

Meanwhile, some limitations of the instruments for insight

---

**Table 2. Comparisons of Models Describing the Association Between Mini-Mental State Examination and Clinical Insight Rating Scale Scores in 69 Dementia Patients**

<table>
<thead>
<tr>
<th>Model</th>
<th>Shape</th>
<th>Deviance</th>
<th>$r^2$</th>
<th>df</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Linear</td>
<td></td>
<td>251.4</td>
<td>.3986</td>
<td>67</td>
<td>-</td>
</tr>
<tr>
<td>2. Linear</td>
<td></td>
<td>247.3</td>
<td>.4084</td>
<td>67</td>
<td>- .0002</td>
</tr>
<tr>
<td>3. Linear</td>
<td></td>
<td>244.5</td>
<td>.4151</td>
<td>67</td>
<td>- .001</td>
</tr>
<tr>
<td>4. Linear</td>
<td></td>
<td>230.6</td>
<td>.4483</td>
<td>65</td>
<td>- n.s.</td>
</tr>
<tr>
<td>5. Additive</td>
<td></td>
<td>228.9</td>
<td>-</td>
<td>64</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: Higher $r$ squares indicate better model fitting.

---

**Figure 2. Identification of the two cutoff scores with the best piecewise linear fitting of Mini Mental State Examination score on Clinical Insight Rating scores.**

*Note: Higher $r$ squares indicate better model fitting.*
assessment used in the present study need to be addressed. Although the GRAD appears to be a measure of awareness of memory, given the restricted range of scores, the observed pattern of relationship with MMSE might be related to ceiling and floor effects; moreover, the restricted range of scores makes this tool not sensitive enough to detect small changes. On the other hand, the CIR, although less prone to ceiling or floor effects, is a general measure of awareness because responses to questions regarding a number of different areas (reason for the visit, cognitive and functional deficits, and perception of the progression of the disease) are collapsed into a single score.

Schacter and Prigatano (1991) warn that unawareness is not a unitary entity but probably consists of various forms or types. Loss of awareness for various skills may decline at different rates and may be associated with loss of specific cognitive abilities. This is consistent with the finding that individuals are often aware of some deficits but not others; moreover, patients may be aware of the existence of a deficit but unaware of the consequences of the deficit (Feher et al., 1991; Schacter & Prigatano, 1991). Along the same line, Kotler-Cope and Camp (1995) suggest that awareness of behavioral problems may be relatively preserved compared with awareness of cognitive problems. Recently Starkstein and colleagues (1996) demonstrated the presence of two domains of insight, one related to cognitive deficits and the other related to behavioral problems. Starkstein and colleagues (1996), along with Vasterling, Seltzer, Foss, and Vanderbrook (1995), suggest that insight may be a complex multifaceted function. The different pattern of association found in our study, which was obtained assuming a linear association between insight and cognitive impairment, supports the view that insight might not be a unitary entity (Schacter, 1991; Schacter & Prigatano, 1991). In fact, poor insight was associated (in both scales) with frontal lobe dysfunction, but the GRAD also showed association with naming and semantic memory and the CIR with visuospatial abilities (right parietal dysfunction), which suggests the presence of different domains of insight for memory and insight related to other aspects of disease such as functional impairment, or awareness of disease progression. Other authors, however, demonstrated that patients with AD have impaired awareness of both memory and functional deficits and suggested that there may be a close relationship between these two aspects. Ott and colleagues (1996) suggest the presence of a common cognitive deficit of self-monitoring that accounts for the reduced-awareness phenomenon.

Further studies into the relationship between insight and localizing neuropsychological measures with functional brain imaging are needed in order to better identify the nature of neuropsychopathology involved in reduced insight in demented patients (Ott et al., 1996). Certainly we still need "reliable information concerning the degree and the quality of awareness in various patient groups" (McGlynn & Schacter, 1989). As suggested by Neundorfer (1997), more attention should be paid to the variability in awareness within individuals and within diagnostic groups.

In conclusion, our data suggest that the shape of the association between insight and cognitive impairment is not a linear one but, on the contrary, follows a trilinear pattern with preserved insight in the mild stages of the dementia, followed by a progressive loss of insight, and finally by a plateau of severe insight impairment in the latest stages of dementia. Our findings suggest the presence of MMSE cutoff points that can be used in association with insight scales, in order to differentiate full insight from declining to absent insight. The trilinear model of the association between insight and cognitive status reflects more closely the observable decline of insight and can provide estimates of when the decline of insight begins and ends. These results could be useful in developing instruments devised to assess patient autonomy.

ACKNOWLEDGMENTS

Address correspondence to Orazio Zanetti, MD, Alzheimer Disease Unit I.R.C.C.S. "S. Giovanni di Dio" - "S. Cuore - Fatebenefratelli" Hospital, Via Pilastrioni, 4, 25123 Brescia, Italy. E-mail: ozanetti@master.cci.unibs.it

REFERENCES

Alzheimer Disease and Associated Disorders, 9, 52-56.

and instrumental activities of daily living. The Gerontologist, 9, 179–186.

Awareness of cognitive deficits and anosognosia in probable Alzheimer's disease. 
Neuropsychology, 34, 277–282.

Mangone, C. A., Hier, D. B., Gorelick, P. B., Ganellen, R. J., Langerberg, P., 

Relationship between level of insight and severity of dementia in Alzheimer's disease. 
Alzheimer Disease and Associated Disorders, 9, 101–104.


Neurology, 34, 939–944.

Michon, A., Deweer, B., Pillon, B., Agid, Y., & Dubois, B. (1994). Relation of 
anosognosia to frontal lobe dysfunction in Alzheimer's disease. Journal of 


Alzheimer Disease and Associated Disorders, 11, 121–122.


Alzheimer Disease and Associated Disorders, 10, 68–76.


Journal of Clinical and Experimental Neuropsychology, 15, 231–244.


Received February 6, 1998
Accepted October 27, 1998