

Dimensions of Agitation Based on the Cohen-Mansfield Agitation Inventory in Patients with Dementia



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SUMMARY

Objective: The aim of this study was to investigate the dimensions of agitation in dementia patients using the Turkish version of the Cohen-Mansfield Agitation Inventory (CMAI-T).

Materials and Method: The study included 100 patients diagnosed as dementia, according to the DSM-IV-TR. The CMAI-T was administered to the patients' caregivers via face-to-face interviews. The Standardized Mini Mental State Examination (SMMSE) was used to assess cognitive functions. The severity of depression and the functional state of the patients were assessed using the Cornell Scale for Depression in Dementia (CSDD) and the Functional Activities Questionnaire (FAQ). Principal component analysis and varimax rotation were used to determine the factor structure of the CMAI-T.

Results: Factor analysis of the CMAI-T indicated a 3-factor structure: physically aggressive agitation, verbal agitation, and physically non-aggressive agitation. In 92% of the patients there was ≥ 1 agitation behavior during the previous 2 weeks. The CMAI-T total and factor scores were negatively correlated with the SMMSE scores, and positively correlated with the CSDD and the FAQ scores.

Conclusions: The CMAI-T yielded 3 factors (physically aggressive agitation, verbal agitation, and physically non-aggressive agitation), which indicated the scale had construct validity. Agitation behaviors were associated with cognitive dysfunction, symptoms of depression and general level of functioning. Additional research is necessary to identify the predictors of these dimensions in different dementia samples, and to determine the efficacy of therapeutic interventions.

Keywords: Dementia, aggression, psychomotor agitation

INTRODUCTION

As in Turkey, the elderly population worldwide is rapidly increasing (Mandıracioğlu 2010). Alzheimer disease (AD) and other neurodegenerative dementias are becoming more common as the world's population ages (Ganguli 2011). It is estimated that there are 32 million patients with dementia worldwide (Alzheimer's Disease International 2012), and the number is predicted to reach 65 million by the end of 2030 and 130 million by 2050 (Brodaty et al. 2011). The results of an epidemiological study from Turkey reported that in the elderly population (≥ 70 years) the prevalence of AD is 11% and the prevalence of all dementias is 20% (Gürvit et al.

2008). According to current data from Turkey, 7.5% of the Turkish population is aged ≥ 70 years (SAT 2012). The prevalence of dementia is expected to increase in the coming years in Turkey, as the elderly population continues to increase.

It is known that behavioral and psychological symptoms frequently accompany cognitive symptoms in patients with dementia (Zuidema et al. 2007a; Lyketsoet al. 2000). One of the most frequently encountered behavioral/psychological symptoms is agitation. Agitation is inappropriate verbal, vocal, and motor behavior not explained by any apparent unmet needs or confusion (Cohen-Mansfield and Billig 1986). Agitation behaviors were reported to occur in 45%-99% of

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patients with dementia (Zuidema et al. 2007a; Tractenberg et al. 2002; Mega et al. 1996). Observable behaviors, such as repetitive movements (pacing, repetition of words, etc.), socially inappropriate behaviors (going into someone else's room, undressing in public, etc.), and/or aggressive behaviors directed toward self or others are examples of agitation (Cohen-Mansfield 2003).

Agitation impairs patient and caregiver quality of life (Shin et al. 2005), and increases caregiver burden (Matsumoto et al. 2007). Furthermore, it causes an increase in medication use (especially antipsychotics) (Selbaek et al. 2008), early institutionalization (Kunik et al. 2010; Yaffe et al. 2002), and the frequency of hospitalizations (Wetterling et al. 2008). As such, in recent years the importance of the assessment and effective management of agitation in dementia patients, as well as cognitive symptoms, has increased (Cohen-Mansfield et al. 2010).

The Cohen-Mansfield Agitation Inventory (CMAI) is one of the most frequently used instruments for measuring agitation behaviors in dementia (Weiner et al. 2002). The CMAI is a 29-item Likert-type scale used to assess the frequency of such behaviors as pacing, aimless wandering, cursing, screaming, kicking, and repetitive speech and questions during the previous 2 weeks. Each item is scored between 1 (never) and 7 (a few times an hour) (Cohen Mansfield et al. 1989). The CMAI was reported to be valid and reliable in many cultures (Zuidema et al. 2007b; Suh 2004; Choy et al. 2001; Schreiner et al. 2000), and the Turkish version was reported to be valid and reliable for use in Turkey by Ozel-Kizil et al (2012).

Earlier studies on the factor structure of the CMAI in different cultures indicate there are 3 or 4 behavioral dimensions (Zuidema et al. 2007b; Rabinowitz et al. 2005; Suh 2004; Weiner et al. 2002; Choy et al. 2001; Miller et al. 1995; Cohen Mansfield et al. 1989). The samples used in these studies were very heterogenous and most were performed in nursing homes (Zuidema et al. 2007b; Suh 2004; Miller et al. 1995; Cohen-Mansfield et al. 1989). Diagnosis of dementia was not an inclusion criterion in all studies (Miller et al. 1995; Cohen-Mansfield et al. 1989), whereas others included only patients with dementia and behavioral disturbances (Suh 2004; Weiner et al. 2002). Most of the studies reported that CMAI had a 3-factor structure (physically aggressive agitation, physically non-aggressive agitation, and verbal agitation) (Zuidema et al. 2007b; Choy et al. 2001; Miller et al. 1995; Cohen Mansfield et al. 1989). On the other hand, some studies reported it has a 4-factor structure—hiding/hoarding behavior is the 4th behavioral dimension (Rabinowitz et al. 2005; Suh 2004).

Investigation of the factor structure of the CMAI is important for determining the clustering features of agitation behaviors, and for planning and monitoring the efficacy of therapeutic interventions specific to each subtype of agitation. The aim of the present study was to investigate the dimensions of

agitation in dementia patients based on the Turkish version of CMAI (CMAI-T).

MATERIALS and METHOD

Participants

The study included 100 patients that were admitted to a university hospital geriatric psychiatry outpatient clinic with their caregivers (all relatives) and were diagnosed with dementia according to *the Diagnostic and Statistical Manual of Mental Disorders-4th Rev. Ed* (DSM-IV-TR) criteria (American Psychiatric Association 2000). Dementia was diagnosed by an experienced geriatric psychiatrist. Exclusion criteria were physical and/or visual disability that could interfere with administration of assessment questionnaires, an additional neurological or psychiatric disorder—except depression, admissions without a caregiver, and having a caregiver that knew the patient <10 years. The study protocol was approved by the Ankara University School of Medicine Ethics Committee, and written informed consent was provided by all the participants.

Administration of the assessment questionnaires

The Standardized Mini Mental State Examination (SMMSE) was used to assess cognitive functions in the patients. A sociodemographic data form, the Cornell Scale for Depression in Dementia (CSDD), the Functional Activities Questionnaire (FAQ), and the CMAI-T were administered to the patients' caregivers to assess the severity of depression and agitation, and functional status of the patients.

Cognitive functions, including orientation, registration, attention, recall, and language, were evaluated via the SMMSE (Folstein et al. 1975). The Turkish form of the SMMSE was reported to be valid and reliable for use in Turkey by Güngen et al (2002). The SMMSE is widely used as a screening tool for cognitive functions, because it is practical and easy to administer.

The level of patient dependency to complete daily activities was assessed via FAQ, which was administered via an interview with the caregiver. The FAQ is widely used to screen dementia. The FAQ total score range is 0 (normal)-30 (totally dependent). The Turkish version of the FAQ was reported to be valid and reliable based on a study that included a Turkish population aged ≥50 years (Selekler et al. 2004).

The CSDD was used to determine the severity of the symptoms of depression in the patients. The CSDD was developed specifically to assess the signs and symptoms of major depression in patients with dementia; the Turkish version was reported to be valid and reliable for use in Turkey (Amuk et al. 2003). CSDD was administered by a clinician via combined interviews with patients and their caregivers. The scale has 5

subscales (mood-related signs, behavioral disturbances, physical findings, cyclic functions, and ideational disturbances) and composed of 19 items. Each item is scored between 0 and 2; scores ≥ 8 and are highly indicative of depression.

The frequency of observable agitation behaviors during the previous 2 weeks was assessed using the CMAI-T. The 29-item CMAI-T was administered by a geriatric psychologist (SK) via face-to-face interviews with the patients' caregivers. Each item on the Likert-type scale is scored between 1 and 7 (1: never; 2: less than once a week; 3: once or twice a week; 4: a few times a week; 5: once or twice a day; 6: a few times a day; 7: a few times an hour) and the total score ranges between 29 and 203. The CMAI-T was reported to be valid and reliable for use in Turkey, based on a study that included elderly dementia patients (Ozel-Kizil et al. 2012).

Statistical analysis

Principal component analysis was used to determine the factor structure of the CMAI-T. Kaiser criteria were used for the number of factors, and to render the factor structure more apparent varimax rotation was performed. The highest factor loading for a particular item determined which factor the item was assigned to, and factors were named according to the inclusive items.

Cronbach's α was calculated to determine the internal reliability of the CMAI-T and its factors. Parametric tests were used for normally distributed data and non-parametric tests were used for data not normally distributed. Correlations between the CMAI-T, factors, and the SMMSE, the CSDD, and the FAQ were assessed via Spearman's test. The Mann-Whitney U test was used to assess differences between the male and female patients, in terms of the CMAI-T total score and factor scores. The frequency of each item was defined as the frequency of scores >1 and the overall factor frequency was defined as the frequency of ≥ 1 items within a factor with a score >1 . All statistical analyses were performed using SPSS for Windows, and the level of statistical significance was set at $p < 0.05$.

RESULTS

Among the 100 patients in this study, 49 (49%) were female and 51 (51%) were male. Median age of the patients was 77 years (range: 50-94 years). Mean duration of education was 4.4 ± 3.6 years (range: 0 to 15 years). In total, 74 (74%) of the patients were diagnosed as dementia due to AD, whereas 26 (26%) had vascular or mixed type dementia. The patients' caregivers were their spouses ($n = 31$ [31%]), or their children and/or daughter-in-law ($n = 69$ [69%]). None of the patients resided in a nursing home. The SMMSE, the CSDD, the FAQ, and the CMAI-T scores are shown in Table 1; mean values are shown for normally distributed scores, versus median

Table 1. Mean $\pm$ SD or median scale scores

	Patients with dementia (n = 100)
SMMSE (mean $\pm$ SD)	15 $\pm$ 6.9
CSDD (mean $\pm$ SD)	9.9 $\pm$ 7.6
FAQ (median)	20 (range: 0-30)
CMAI (median)	53 (range: 29-148)

values for scores not normally distributed. The patients' severity of dementia was categorized according to the SMMSE scores, as follows: severe (0-9, $n = 23$), moderate (10-18, $n = 40$), and mild (19-29, $n = 37$) (Cockrell and Folstein 1988).

CMAI-T factor analysis that included all items yielded 9 factors (eigenvalues >1) that explained 73.6% of the variance with a Keiser-Meyer-Olkin value of 0.794. The prevalence of 7 behavioral symptoms (items 14, 17, 20, 21, 25, 27, and 28) was $<10\%$; therefore, these items were excluded from subsequent analyses. CMAI-T factor analysis of the remaining 22 items yielded a 6-factor structure (eigenvalues >1) that explained 70.5% of the variance with a Kaiser-Meyer-Olkin value of 0.86; these factors were physically aggressive agitation (6 items), verbal agitation (4 items), physically non-aggressive agitation (5 items), hiding/hoarding/negativism (3 items), purposeless hand movements (2 items), and inappropriate behavior (2 items). It was suggested that the number of items for each factor should be ≥ 3 (Kline 1994), because it would be difficult for a structure composed of many factors with a few items to explain clinically relevant behavioral dimensions; therefore, number of factors was limited to 3 based on scree plot results (Figure).

This 3-factor structure explained 54.7% of the variance with a Kaiser-Meyer-Olkin value of 0.86. Eigenvalues, explained variances, frequencies, and median values for this 3-factor model are presented in Table 2. Items loaded on the first factor (physically aggressive agitation, which explained 20.2% of the variance) were kicking, hitting, throwing things, pushing,

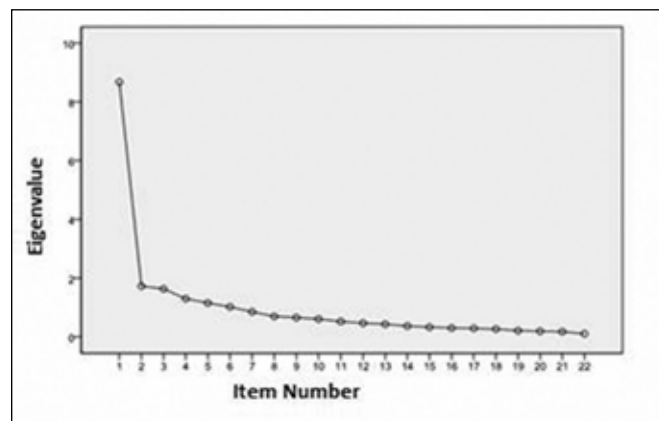


Figure. Scree plot of the CMAI-T factor analysis (22 items).

Table 2. CMAI-T factor analysis results (limited to 3 factors)

Items	Factor 1 (physically aggressive agitation)	Factor 2 (verbal agitation)	Factor 3 (physically non-aggressive agitation)
8. Kicking	0.839		
7. Hitting	0.808		
11. Throwing things	0.741		
10. Pushing	0.683	0.422	
13. Screaming	0.566	0.435	
4. Cursing or verbal aggression	0.539	0.521	
2. Inappropriate dressing or undressing	0.498		
5. Constant unwarranted requests for attention or help		0.804	
18. Complaining		0.715	
12. Uttering strange sounds		0.684	
29. General restlessness		0.650	
19. Negativism		0.552	0.546
6. Repetitive speech or questions		0.512	
26. Performing repetitious mannerisms		0.452	
24. Hoarding			0.817
23. Hiding objects			0.786
15. Scratching			0.642
16. Trying to get to a different place	0.494		0.518
1. Pacing/aimless wandering			0.487
22. Handling things inappropriately	0.409		0.463
Explained Variance (%)	20.2	18.5	16
Eigenvalue	4.460	4.068	3.511
Cronbach's α	0.868	0.835	0.802
Frequency (%)*	62	88	62
Median	10	19.5	10

n = 100 patients with dementia.

Items with a factor loading >0.40 are shown.

*Frequency of ≥ 1 item within a factor with a score >1.

screaming, cursing/verbal aggression, and inappropriate dressing/undressing. Items loaded on the second factor (verbal agitation, which explained 18.5% of the variance) were constant unwarranted requests for attention/help, complaining, uttering strange sounds, general restlessness, negativism, repetitive speech or questions, and repetitious mannerisms. Items loaded on the third factor (physically non-aggressive agitation, which explained 16% of the variance) were hoarding/hiding, scratching, trying to get to a different place, pacing/aimless wandering, and handling things inappropriately. 'Spitting' and 'grabbing on to people or things inappropriately' did not

load on any of the factors. 'Spitting' spread into the physically aggressive agitation and physically non-aggressive agitation, whereas 'grabbing on to people or things inappropriately' spread into the all three factors.

In all, 92% of the patients exhibited ≥ 1 agitation behaviors during the previous 2 weeks. The most common agitation behavior according to the CMAI-T was repetitive speech or questions (item 6 [65%]), followed by general restlessness (item 29 [57%]), negativism (item 19 [55%]), cursing/verbal aggression (item 4 [47%]), constant unwarranted requests for attention/help (item 5 [46%]), complaining (item 18 [45%]). The least frequent items were biting (item 14 [2%]), harming self or others (item 21 [3%]), physical sexual aggression (item 28 [4%]), tearing things or destroying property (item 25 [5%]), intentional falling (item 17 [6%]), eating/drinking inappropriate substances (item 20 [6%]), verbal sexually aggression (item 27 [9%]). Verbal agitation (88%) was the most prevalent agitation behavior, followed by physically aggressive

Table 3. Correlations between the CMAI-T total and factor scores, and the SMMSE, CSDD, and the FAQ scores

Scales	SMMSE	CSDD	FAQ
CMAI-T total score	R = -0.3 p = 0.001*	R = 0.4 p < 0.001*	R = 0.5 p < 0.001*
Factor 1 (physically aggressive agitation)	R = -0.26 p = 0.009*	R = 0.36 p < 0.001*	R = 0.3 p = 0.002*
Factor 2 (verbal agitation)	R = -0.3 p = 0.007*	R = 0.4 p = 0.001*	R = 0.5 p < 0.001*
Factor 3 (physically non-aggressive agitation)	R = -0.3 p = 0.004*	R = 0.4 p < 0.001*	R = 0.5 p < 0.001*

*p < 0.05

agitation (62%), and physically non-aggressive agitation (62%). Cronbach's α for the CMAI-T (29 items) was 0.92.

Correlations between the CMAI-T total and factors scores, and the SMMSE, FAQ, and the CSDD scores are shown in Table 3. There was a significantly negative correlation between the CMAI-T total score and all 3 factor scores, and the SMMSE scores, versus a significantly positive correlation with the FAQ and the CSDD scores. There wasn't a significant difference in the CMAI-T total score or factor scores between the male and female patients (p > 0.05 for all).

DISCUSSION

The present study investigated the construct validity of the CMAI-T (Turkish version of the CMAI) in a sample of dementia patients that presented to an outpatient clinic, and the findings show that agitation in the dementia patients could be evaluated via 3 behavioral dimensions: physically aggressive

agitation, verbal agitation, and physically non-aggressive agitation. The present findings are in accordance with those of earlier studies (Zuidema et al. 2007b; Choy et al. 2001; de Jonghe and Kat MG 1996; Miller et al. 1995; Cohen Mansfield et al. 1989). The internal consistency of the CMAI-T and its 3 factors was high. Previous studies on the CMAI have been conducted at nursing homes (Zuidema et al. 2007b; Miller et al. 1995; Cohen Mansfield et al. 1989), in clinical samples (Choy et al. 2001), and at psychiatric observation services for the elderly (de Jonghe and Kat MG 1996). The diagnosis of dementia was not an inclusion criterion in some of these earlier studies (Miller et al. 1995; Cohen-Mansfield et al. 1989), whereas others included only patients with severe dementia (Zuidema et al. 2007b). Despite the differences in study samples, a similar factor structure was observed, which supports the construct validity of the CMAI. Nevertheless, some items loaded on different factors in different studies. For instance, cursing or verbal aggression loaded on verbal agitation in Choy et al.'s (2001) study, whereas in the present study and in an earlier one it loaded on physically aggressive agitation (Zuidema et al. 2007b). It could be considered compatible with the estimation of the scale's authors that screaming should be included in the verbal agitation dimension (Cohen Mansfield 1991); however, screaming loaded on the verbal agitation dimension in one study (Suh 2004), and on physically aggressive agitation in the present study and earlier ones (Zuidema et al. 2007b; Rabinowitz et al. 2005; Choy et al. 2001). To be brief, these findings indicate that symptoms that accompany each dimension of agitation can differ according to study population.

Cultural factors also might affect which symptoms accompany dimensions of agitation. For example, spitting was not analyzed because it was very rare in the Korean sample (Suh 2004) and it loaded on the physically aggressive agitation in a Dutch sample (Zuidema et al. 2007b). Choy et al. (2001) posited that as spitting is a common behavior in China, it loaded on the physically non-aggressive agitation dimension. Spitting was very rare in the present study (16%) and loaded on the physically aggressive agitation and physically non-aggressive agitation dimensions.

Non-restricted factor analysis of the CMAI-T in the present study yielded 6 behavioral dimensions, including hiding-hoarding/negativism. Hiding/hoarding was a fourth factor in some studies (Rabinowitz et al. 2005; Suh 2004). Although hiding/hoarding is thought to have a different neurobiological origin than other physically non-aggressive behaviors, the relationship between dementia and hiding/hoarding remains unclear (Rosso et al. 2001). Additional research is required to determine if hiding/hoarding is exhibited before or after the onset of dementia and if its severity changes as dementia progresses.

Agitation behaviors in dementia patients were common (92%) in the present study, which is similar to the findings

of earlier community-based studies, as follows: 88% (Haupt et al. 2000) and 99.1% (Tractenberg et al. 2002). Although verbal agitation (80%) was the most common type of agitation in the present study, physically aggressive (62%) and physically non-aggressive (62%) agitation were not uncommon. Earlier studies reported that the frequency of physically aggressive agitation was 45.7%, 28.6%, and 62.4%, the frequency of verbal agitation was 55.5%, 76.3%, and 61.6%, and that the frequency of physically non-aggressive agitation was 68.9%, 61.5%, and 66.6%, respectively (Majic et al. 2012; Zuidema et al. 2007b; Choy et al. 2001). It was reported that physically non-aggressive agitation and verbal agitation were more common in patients with dementia in community-based samples than in patients that reside in nursing homes (Choy et al. 2001).

It is known that agitation behaviors increase in patients with dementia as cognitive functions deteriorate and the severity of depression increases (Leonard et al. 2006; Majić et al. 2012; Menon et al. 2001). Majić et al. (2012) reported that cognitive decline in dementia patients was associated with the 3 dimensions of agitation, and that symptoms of depression were associated with physically aggressive agitation and verbal agitation, independent of the severity of dementia. In the present study CMAI-T total score and all 3 factor scores were associated with the severity of cognitive decline and the severity of depression. Additionally, patient functionality decreased as agitation increased. These findings support the validity of the CMAI-T.

In summary, the present study's findings show that agitation behaviors evaluated via CMAI-T were common in the patients with dementia that presented to an outpatient clinic, and that these behaviors could be assessed according to 3 dimensions (physically aggressive agitation, verbal agitation, and physically non-aggressive agitation). It was also observed that agitation behaviors increased as the severity of cognitive decline and depression increased, and that functionality decreased as agitation increased. It is necessary to assess the dimensions of agitation in dementia patients in an effort to more clearly delineate the pathophysiologic processes that underlie each dimension, and to provide the most efficacious therapeutic interventions possible. As such, additional studies should investigate the predictors of the dimensions of agitation that can be assessed using the CMAI-T in different samples of dementia patients, as well as the efficacy of biopsychosocial therapeutic interventions that target agitation behaviors. An important limitation of the present study is that the sample was composed primarily of patients with mild-moderate dementia, and therefore the findings might not be generalizable to all dementia patients. We think that additional research on the construct validity of the CMAI-T is warranted, especially in populations of moderate-severe dementia patients that reside in nursing homes.

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