

Concepts and objects of awareness in Alzheimer's disease: an updated systematic review

Conceitos e objetos da consciência na doença de Alzheimer: uma revisão sistemática atualizada

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ABSTRACT

Objectives: To compare and discuss the objects of awareness in Alzheimer's disease (AD): awareness of cognitive deficits, of functional activities, of social-emotional functioning and behavioral impairment. **Methods:** A search in the PsycINFO, Pilots, PubMed/Medline and ISI electronic databases according to Prisma methodology was performed. We included studies about awareness in people with AD published between 2010 and 2015, with the combination of keywords: "Alzheimer AND awareness of deficits", "Alzheimer AND anosognosia", "Alzheimer AND insight", "dementia AND awareness of deficits", "dementia AND anosognosia", "dementia AND insight". The articles were categorized according to the specific object of awareness. **Results:** Seven hundred and ten records were identified and, after application of the exclusion criteria, 191 studies were retrieved for potential use. After excluding the duplicates, 46 studies were included. Most studies assessed the cognitive domain of awareness, followed by the functional, social-emotional, and behavioral impairment domains. Memory deficits were not sufficient to explain impaired awareness in AD. Longitudinal studies did not find discrepancies between patients and caregivers' reports, indicating that awareness is not related to cognition. Conflicting findings were observed, including the relation between awareness, mood, severity of disease, and personal characteristics. **Conclusions:** The studies show lack of conceptual consensus and significant methodological differences. The inclusion of samples without differentiation of dementia etiology is associated to symptomatic differences, which affect awareness domains. Awareness in AD is a complex and multidimensional construct. Different objects elicit different levels of awareness.

Keywords

Awareness, objects of awareness, anosognosia, dementia, Alzheimer.

RESUMO

Objetivos: Comparar e discutir os objetos de consciência na doença de Alzheimer (DA): consciência dos déficits cognitivos, das atividades funcionais, do funcionamento socioemocional e prejuízos comportamentais. **Métodos:** Realizou-se uma busca nas bases de dados PsycINFO, Pilots, PubMed/Medline e ISI de acordo com a metodologia do Prisma. Os artigos incluídos, publicados entre 2010 e 2015, avaliavam a consciência na DA com as combinações de palavras-chave: "Alzheimer AND consciência do déficit", "Alzheimer AND anosognosia", "Al-

Received in
9/25/2015
Approved in
1/11/2016

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zheimer AND insight”, “demência AND consciência do déficit”, “demência AND anosognosia”, “demência AND insight”. Os artigos foram categorizados conforme os objetos específicos da consciência. **Resultados:** Setecentos e dez estudos foram identificados e, após a aplicação dos critérios de exclusão, 191 foram selecionados. Após a exclusão dos duplicados, 46 estudos foram incluídos. A maioria dos estudos avaliou o domínio cognitivo da consciência, seguido do funcional, do funcionamento socioemocional e prejuízos comportamentais. Déficits na memória não se mostraram suficientes para explicar o prejuízo da consciência na DA. Os estudos longitudinais não encontraram discrepâncias entre os relatos de pacientes e cuidadores, indicando que a consciência não está relacionada à cognição. Observaram-se controvérsias nos resultados na relação entre consciência, humor, gravidade da doença e características pessoais. **Conclusões:** Os estudos demonstraram falta de consenso conceitual e diferenças metodológicas significativas. A inclusão de amostras sem diferenciação da etiologia demencial está associada a diferenças sintomáticas que afetam os domínios da consciência. A consciência na DA é um constructo complexo e multidimensional. Diferentes objetos suscitam diferentes níveis de consciência.

Palavras-chave

Consciência, objetos da consciência, anosognosia, demência, Alzheimer.

INTRODUCTION

Empirical research has recently focused on exploring awareness in people with dementia (PwD)^{1,2}. Awareness is the recognition of changes caused by the deficits related to the disease process. It includes three dimensions: the ability to recognize a specific deficit, the emotional response to the difficulties and the ability to understand the impact of the impairment in the functional activities^{3,4}. This construct integrates biological, psychological and social levels and is not simply as a symptom of illness³.

Awareness may be considered a relational concept. It can only be expressed in its relation to something, such as to the pathological state or non-morbid experience⁵. Three main factors determine clinical phenomena of awareness: the underlying concept selected by the clinician/researcher, the measure used to elicit it, and the specific object of awareness chosen^{6,7}. These factors may be particularly variable in dementia research.

The objects of awareness may range from physical attributes of the environment or internal states to factors of one's own functioning or situation, external events, mental representations and aspects of self⁸. Therefore, awareness cannot be isolated from its object. This complexity is captured because different 'objects' will determine different kinds of judgments⁶.

Impaired awareness is a complex and multidimensional phenomenon, commonly reported as a clinical feature of dementia, and can range from mild to severe stages². Studies focusing on clinical correlates and predictors of unawareness have produced inconclusive findings. Probably, the several conceptual models of awareness and methodological differences, such as heterogeneity of sample and level of disease severity may explain these uncertain findings⁹.

It is essential to understand the differences between each object of awareness and of their specific traits, as it may be helpful for the improvement of strategies focused on the manage-

ment of PwD^{1,6,10}. In this context, this systematic review is aimed at exploring the different objects of awareness in Alzheimer's disease (AD). We consider that different objects of awareness raise different phenomena. Our primary goal is to systemize the results of the researches involving awareness according to each specific object. We proposed to discuss the concepts and domains used to evaluate types of awareness, such as awareness of cognitive deficits, of social-emotional status and behavioral impairment and awareness of functional activities.

METHODS

This systematic review is according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)¹¹. The search for literature was undertaken on April 5th, 2015, using PsycINFO, Pilots, PubMed/Medline and ISI electronic databases. The search keywords included “Alzheimer”, “dementia”, “awareness of deficits”, “insight” and “anosognosia” in the following combinations: “Alzheimer AND awareness of deficits”, “Alzheimer AND anosognosia”, “Alzheimer AND insight”, “dementia AND awareness of deficits”, “dementia AND anosognosia”, “dementia AND insight”.

Inclusion criteria were: (1) original cross-sectional or longitudinal quantitative researches, (2) studies on participants with AD diagnosis, (3) reports written in English or Portuguese and (4) publications from January 2010 to April 2015. The exclusion criteria were: (1) opinion papers or reviews, (2) participants with pre-clinical dementia conditions, other dementia or clinical pathologies and psychiatric comorbidities, (3) other impairments not related to awareness, (4) studies focused only on pharmacologically interventions or rehabilitation issues and (5) studies without full text.

Two authors (RLS and MLN) independently screened titles and abstracts to identify eligible papers. When the information was not enough to identify the inclusion and/or

exclusion criteria, we retrieved the full text paper. We excluded all studies that clearly did not meet all inclusion criteria or that met at least one of the exclusion criteria. Afterwards, two authors (RLS and MCND) independently reviewed the full publications of the remaining papers and held consensus meetings to discuss any disagreement and to reach a consensus about inclusion. When necessary, a third co-author of this paper (MFBS) clarified study eligibility.

RESULTS

Initially, 710 records were identified through database searching: 13 in PsycINFO, 1 in Pilots, 247 in PubMed/Medline and 449 in ISI. The 191 studies that remained after application of the exclusion criteria were retrieved for potential use and the information of the full-text version of each study was evaluated. Cross-referencing of reference lists of all selected papers was undertaken. After duplicates were removed, the total number of studies was reduced to 46. The flow diagram about the different phases of the systematic review is shown in Figure 1.

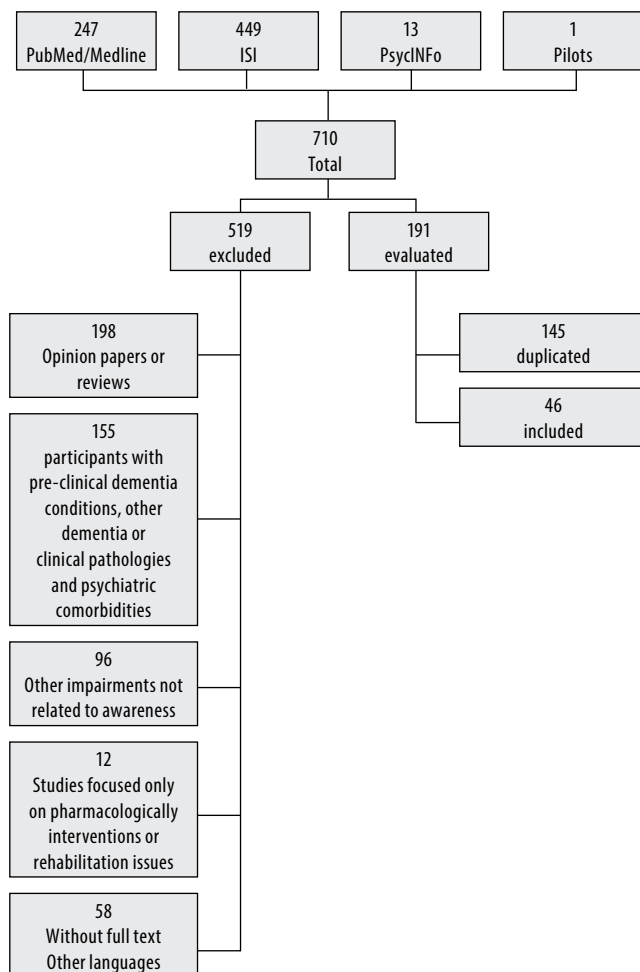


Figure 1. Flow of information through the different phases of a systematic review.

The selected studies were organized in Table 1.

Different concepts were used to define the construct of awareness¹²⁻²⁰, anosognosia²¹⁻³², self-awareness^{33,34}, self-appraisal³⁵, insight^{36,37}, cognitive insight³⁸, metacognition³⁹⁻⁴¹, unawareness of deficits⁴², awareness of deficit^{43,44}, awareness of disease^{1,45}, awareness of functioning⁴⁶, awareness of cognitive deficits⁴⁷, awareness of disabilities⁴⁸, awareness of performance⁴⁹, unawareness of memory^{42,50-52}, anosognosia of memory⁵³, awareness of memory deficits^{54,55}, awareness of memory function and functional abilities⁵⁶, unawareness of psychosis or behavioral problems⁴².

Awareness was defined as the capability of an individual to accurately evaluate and report about his abilities and limitations¹². *Awareness of disease* was defined as the ability to perceive changes in oneself and/or in functional activities caused by deficits associated with the disease process⁴⁵. *Self-awareness* referred to the capacity to reflect upon and identify with one's own abilities, attitudes and behavior³³. *Self-appraisal* was related to impaired awareness of one's own abilities³⁵. *Cognitive insight* was defined as a PwD current capacity to evaluate his or her anomalous experiences and atypical interpretations of events³⁸. *Metacognition* was the knowledge about cognition, including the ability to think about one's own basic cognitive abilities (such as episodic memory or executive functions)⁴¹. It was also defined as a process by which we understand and alter our own thinking³⁹.

Some concepts were used to define impairment in awareness, which may range from general to specific impairments, such as anosognosia of memory. Thus, *loss of insight* was defined as a lack of awareness of mental symptoms, which could be either frank denial or unconcern about consequences³⁷. Meanwhile, *Anosognosia* was defined as an inability of patients to appreciate or recognize their own deficits in sensory, perceptual, motor, behavioral, or cognitive functioning³². In a strict sense, it referred to inability to recognize deficits or realize their extent²⁹. *Reduced awareness* about cognitive deficits or illness, was also termed anosognosia, and ranges from the diagnosis and the condition itself to reduced awareness of deficits in specific abilities⁴⁹. Moreover, *unawareness of deficits* was defined as inability to recognize the presence or appreciate the severity of deficits in sensory, perceptual, motor, affective, or cognitive functioning⁴².

Most of the studies assessed awareness of cognitive deficits. Among them, 13 evaluated only this domain^{20,23,27,38,39,41,44,47,50-53,55}. Ten studies evaluated awareness of cognitive and functional deficits domains^{1,18,20,33-35,40,45,46,54}, nine assessed cognitive and social-emotional functioning domains^{12,13,17,24,28,30,36,37,49}, and three focused on cognitive and behavioral impairment domains^{14,16,42}. Three researches compared awareness of cognitive, functional and behavioral impairment domains^{22,25,32} and four studied the recognition of cognitive, functional, and social-emotional

functioning^{15,19,29,43}. Two studies assessed only awareness of social-emotional functioning^{21,26}, one evaluated only beha-

vioural impairment³¹, and the other one just assessed awareness of functional deficits⁴⁸.

Table 1. Selected studies

Author/year	Term used	Participants	Study Design	Domains	Awareness measurement	Results
1) Lehrner <i>et al.</i> , 2015 ⁴	Awareness of memory deficits	280 SCD 137 aMCI 181 naMCI 43 AD 28 PD-ch 29 PD-aMCI 58 PD-naMCI 211 HC	Cross-sectional	Cognition Functional	VSRT Delayed Recall scores from FAI scores	The strongest associations were observed between awareness and the domain memory. Further small but significant correlations were also observed for the domains attention, language and executive function
2) Mograbi <i>et al.</i> , 2015 ⁵⁰	Unawareness of memory	829 AD	Cross-sectional	Cognition	Discrepancies between Self-rating and informant rating, and between people self-rating and their performance	The self-report/actual performance variable showed a relationship with cognitive impairments, such as fluency in China and visuospatial abilities in Latin America and India, and behavioral symptoms, such as mania in Latin America and hallucinations in China
3) Vogel <i>et al.</i> , 2015 ¹⁴	Awareness	95 AD	Longitudinal	Cognition Behavioral	AQ-D	Despite overall cognitive decline, awareness was stable over three years in many cases and in some cases even improved awareness was found
4) Sousa <i>et al.</i> , 2015 ¹	Awareness of disease	69 AD (baseline) 55 AD (follow-up)	Longitudinal	Cognition Functional	AISPDD	The first moment of evaluation showed that impairment in awareness was associated to deficits in ADL, cognitive impairments, and higher PwD quality of life ratings. At follow up, impaired awareness was associated to deficits in ADLs, and caregivers' QoL
5) Mak <i>et al.</i> , 2015 ³⁰	Anosognosia	36 AD 20 MCI 30 HC	Cross-sectional	Cognition Social-emotional	AQ-D	Anosognosia was associated with reduced global cognition and increased apathy in the AD group
6) Chen <i>et al.</i> , 2014 ⁴²	Unawareness of deficits unawareness of memory deficits and unawareness of psychosis or behavioral problems	55 AD	Cross-sectional	Cognition Behavioral	GRAD	Apathy was associated with neither unawareness of memory deficits nor unawareness of psychosis and behavioral problems. Depression was correlated only with unawareness of memory deficits
7) Clare <i>et al.</i> , 2012 ²⁰	Awareness of memory function and functional abilities	101 AD	Cross-sectional	Cognition Functional	MARS-MFS	Two areas of awareness – evaluative judgements of memory function and evaluative judgements of functional abilities show small to medium bivariate correlations with self-reported QoL-AD, with greater awareness related to lower QoL
8) Horning <i>et al.</i> , 2014 ³⁶	Insight	107 AD	Cross-sectional	Cognition Social-emotional	NRS	Insight over and above cognitive functioning appears to play a role in an AD patient's experience of depressed mood, anxiety, and apathy
9) Conde-Sala <i>et al.</i> , 2014 ²²	Anosognosia	141 AD	Cross-sectional	Cognition Behavioral Functional	AQ-D	Patients with mild deterioration presented less anosognosia, more depression and a QoLp rating that was closer to that of caregivers. Among patients the presence of anosognosia was associated with better ratings of QoLp and with greater severity. Depression and anosognosia were inversely correlated among patients
10) Conde-Sala <i>et al.</i> , 2014 ²³	Anosognosia	119 AD	Longitudinal	Cognition	CAMDEX	Anosognosia was associated with cognitive impairment, and was associated with better perceived QoL-p in moderate dementia, whereas cognitive status did not influence the ratings of these patients, moreover anosognosia and cognition act as independent variables in relation to perceived quality of life
11) Rosen <i>et al.</i> , 2014 ³⁹	Metacognition	12 bvFTD 14 AD 35 HC	Cross-sectional	Cognition	20-item paired associates learning paradigm	Significant impairments in feeling of knowing accuracy in bvFTD and AD

Author/year	Term used	Participants	Study Design	Domains	Awareness measurement	Results
12) Gambina <i>et al.</i> , 2014 ⁴⁷	Awareness of cognitive deficits	79 AD	Cross-sectional	Cognition	AQ-D	Cognitive deficits in executive function, memory and language may mediate the association between capacity and awareness
13) Marková <i>et al.</i> , 2014 ¹⁹	Awareness	101 PwD	Cross-sectional	Cognition Social-emotional Functional	MARS FAQ SEQ	Awareness of memory shows the greatest proportion of negative discrepancies (overestimation of function). Awareness of ADL also shows that a large proportion of negative discrepancies are obtained but in contrast to awareness of memory there is greater variation between individuals and more concordant responses. Awareness of socio-emotional in comparison with the other awareness phenomena shows a higher proportion of positive discrepancies observed in a substantial number of participants
14) Lindau and Bjork, 2014 ²⁸	Anosognosia	9 AD 12 MCI	Cross-sectional	Cognition Social-emotional	A&A	AD patients rated lower cognitive disabilities relative to the MCI patients, which is here interpreted as one sign of anosognosia in AD
15) Degirmenci <i>et al.</i> , 2013 ³⁸	Cognitive insight	30 AD 15 HC	Cross-sectional	Cognition	BCIS	Self-reflectiveness and self-certainty scores were significantly lower than the controls in patients with AD
16) Zamboni <i>et al.</i> , 2013 ³³	Self-awareness	17 MCI 17 AD 17 HC	Cross-sectional	Functional Cognition	Discrepancies between Self-rating and informant rating	Dysfunction of a network involving medial prefrontal and anterior temporal cortices is associated with the failure in mechanisms necessary for correct and updated self-awareness
17) Massimo <i>et al.</i> , 2013 ³⁵	Self-appraisal	49 bvFTD 73 AD	Cross-sectional	Functional Cognition	Discrepancies between Self-rating and informant rating, and between people self-rating and their performance	BvFTD show significant deficits in self-appraisal across multiple cognitive domains, suggesting a fundamental impairment in self-evaluation and self-monitoring. Observed impaired self-appraisal only for episodic memory in the AD group, suggesting a domain-specific impairment for these patients
18) Amanzio <i>et al.</i> , 2013 ⁴³	Awareness of deficits	117 AD 117 HC	Cross-sectional	Cognition Social-emotional Functional	AQ-D	There is a role for subcomponents of executive functions in impaired awareness of deficits such as inhibition, self-monitoring and set-shifting
19) Mårdh <i>et al.</i> , 2013 ⁴⁰	Metacognition Awareness of disease	15 AD 15 HC	Cross-sectional	Cognition Functional	Self-rating and informant rating	Although patients were aware of their disease, they were not able to realize the practical consequences of their deficit
20) Verhülsdonk <i>et al.</i> , 2013 ²⁴	Anosognosia	49 AD	Cross-sectional	Cognition Social-emotional	AQ-D	Patients had depressive symptoms but were unaware of them in the sense of an "affective" anosognosia. The phenomenon of anosognosia affects not only deficits in cognition and daily functioning, but that it can also manifest itself as non-recognition of affective symptoms
21) Conde-Sala <i>et al.</i> , 2013 ²⁵	Anosognosia	164 AD	Cross-sectional	Cognition Behavioral Functional	AQ-D	More symptoms on the NPI, less depression and greater deficits in ADL, are the most relevant variables that may predict anosognosia. Greater awareness of deficits is related to a reactive depressive mood, especially in the early stages of dementia
22) Van Vliet <i>et al.</i> , 2013 ¹²	Awareness	142 YO-AD 126 LO-AD	Longitudinal	Cognition Social-emotional	GRAD	Patients with YO-AD have higher levels of awareness compared with LO-AD. Intact awareness was associated with depressive symptoms, and this effect was more pronounced in YO-AD compared with LO-AD
23) Maki <i>et al.</i> , 2012 ³⁴	Self-awareness	12 AP 23 AD mild 18 AD moderate 53 caregivers	Cross-sectional	Cognition Functional	AQ-D	Mild AD were generally aware of their deficits even if their assessment was insufficient. In moderate AD, insufficient awareness of deficits was related to memory, and time and spatial orientation
24) Mograbi <i>et al.</i> , 2012 ⁵²	Unawareness of memory	15,022 PwD	Cross-sectional	Cognition	Discrepancies between Self-rating and informant rating, and between people self-rating and their performance	Unawareness should be seen not only as a common neurobiological feature of dementia, increasing with severity of dementia, but also as a phenomenon influenced by social and cultural factors

Author/year	Term used	Participants	Study Design	Domains	Awareness measurement	Results
25) Clare <i>et al.</i> , 2012 ¹³	Awareness	101 PwD	Longitudinal	Cognition Social-emotional	Discrepancies between Self-rating and informant rating	Stability in awareness for the PwD was observed despite increases in dementia-related symptoms and worsening of cognitive impairment, and in the context of no change in psychological or social well-being
26) Mograbi <i>et al.</i> , 2012 ⁴⁹	Awareness of performance	23 AD 21 HC	Cross-sectional	Cognition Social-emotional	Success-failure manipulation	There is dissociation between impaired performance judgement and preserved emotional reactivity to failure in AD
27) Clare <i>et al.</i> , 2012 ²⁰	Awareness	101 PwD	Cross-sectional	Cognition	Discrepancies between Self-rating and informant rating	Indices of awareness and the ratings contributing to these indices are associated with a range of PwD factors, as well as being influenced by carer well being and carer perceptions of PwD
28) Gallo <i>et al.</i> , 2012 ⁴¹	Metacognition	18 AD 18 HC	Cross-sectional	Cognition	AQ-D	AD have relatively preserved metacognitive monitoring abilities on episodic memory tests, at least when the task is relatively well constrained
29) Gilleen <i>et al.</i> , 2012 ¹⁵	Awareness	27 AD	Cross-sectional	Cognition Social-emotional Functional	MARS	Little relationship between awareness and personality scores, but modest associations between awareness and mood, age, and age of onset of first symptoms
30) Martyr <i>et al.</i> , 2012 ⁴⁶	Awareness of functioning	50 AD 29 VaD 17 MD	Cross-sectional	Functional Cognition	Discrepancies between Self-rating and informant rating	Patients with reduced awareness of iADL ability performed better at letter fluency, indicating that awareness of functional deficits may be influenced by letter fluency
31) Spalletta <i>et al.</i> , 2012 ³¹	Anosognosia	103 AD 52 a-MCI 54 md-MCI	Cross-sectional	Behavioral	AQ-D	In the mild AD group, unawareness of behavioral deficits was related to agitation and apathy, whereas global level of anosognosia, was related to aberrant motor behaviors
32) Arseneault-Lapierre <i>et al.</i> , 2012 ²¹	Anosognosia	20 MCI 29 AD 20 HC	Cross-sectional	Social-emotional	AQ-D PSS	Anosognosia for dementia has an impact on psychological markers of stress, but not on physiological markers of stress in AD
33) Mendez and Shapira, 2011 ³⁷	Loss of insight	12 bvFTD 12 AD	Cross-sectional	Cognition Social-emotional	Self-rating performance	Compared to AD patients, those with bvFTD initially deny the presence of their disorder
34) Ohman <i>et al.</i> ; 2011 ⁴⁸	Awareness of disabilities	8 MCI 18 AD 5 VaD 4 Other dementias	Cross-sectional	Functional	Client-centred assessment	Participants with the same diagnosis and similar ADL process ability measures demonstrated major differences concerning their awareness of disability
35) Amanzio <i>et al.</i> , 2011 ⁴⁴	Reduced awareness of deficits	29 AD 29 HC	Cross-sectional	Cognition	AQ-D	Unaware patients are more impaired in flexible thinking and demonstrate more pronounced behavioural disinhibition and apathy with respect to aware ones
36) Galeone <i>et al.</i> , 2011 ⁵¹	Unawareness for memory deficit	25 MCI 15 AD 21 HC	Cross-sectional	Cognition	Discrepancies by comparison of participants self-report with either participant performance or informant report	Unawareness for memory deficit in AD is an early symptom of their memory disorder and can be seen even in the MCI
37) Schmitter-Edgecombe and Seelye, 2011 ⁵⁵	Awareness of memory deficits	20 AD 20 HC	Cross-sectional	Cognition	Discrepancies between Self-rating and informant rating	Impaired awareness of memory problems but intact memory-monitoring abilities in an AD population
38) Al-Aloucy <i>et al.</i> , 2011 ²⁷	anosognosia	65 AD	Cross-sectional	Cognition	Mac nair Questionnaire FBI	Anosognosia of memory deficit may be viewed as a generator of other behavioral abnormalities contributing to professional caregivers' burden
39) Sousa <i>et al.</i> , 2011 ⁴⁵	Awareness of disease	25 AD	Longitudinal	Cognition Functional	AISPDD	As the severity of dementia increases, there is also impaired awareness of disease, together with cognitive and functional deficits
40) Nelis <i>et al.</i> , 2011 ¹⁷	Awareness	51 AD 29 VaD 17 MD	Cross-sectional	Cognition Social-emotional	SEQ	Unawareness of socio-emotional functioning was related to poorer cognitive functioning, suggesting a relationship between stage of dementia and degree of awareness
41) Orfei <i>et al.</i> , 2010 ³²	Anosognosia	38 AD 35 a-MCI 38 md-MCI	Cross-sectional	Cognition Functional Behavioral	CIRS AQ-D	In AD, anosognosia was linked to increased age and reduced ADL. Anosognosia may be primarily affected by factors other than neuropsychological, such as neuropsychiatric symptoms

Author/year	Term used	Participants	Study Design	Domains	Awareness measurement	Results
42) Vogel <i>et al.</i> , 2010 ¹⁶	Awareness	321 AD	Cross-sectional	Cognition Behavioral	ARS	Alzheimer's disease patients with very poor insight have significantly more neuropsychiatric symptoms than patients who are fully aware of their cognitive deficits
43) Stewart <i>et al.</i> , 2010 ³³	Anosognosia of memory	23 AD 30 HC	Cross-sectional	Cognition	Measurement of Anosognosia instrument	AD patients were generally less accurate in evaluating the level of their cognitive abilities than healthy older adults
44) Leicht <i>et al.</i> , 2010 ²⁹	Anosognosia	32 AD	Cross-sectional	Cognition Functional Social-emotional	CIRS, discrepancies by comparison of participants self-report with either participant performance or informant report	Discrepancies were especially pronounced for recent memory, followed by ADL, apathy and attention
45) Williamson <i>et al.</i> , 2010 ¹⁸	Awareness/self-awareness	10 AD 10 FTD 10 HC	Cross-sectional	Cognition Functional	discrepancies between Self-rating and informant rating	FTD and AD patients showed impaired self-awareness of cognitive deficits relative to controls. Comparison across domains suggested greater distortions in self appraisal in FTD patients on a task on which they performed slightly better than the AD patients, and also on tasks on which they performed less well
46) Starkstein <i>et al.</i> , 2010 ²⁶	Anosognosia	213 AD (baseline) 154 AD (follow-up)	Longitudinal	Social-emotional	AQ-D	Anosognosia and apathy in AD increased significantly in severity after a mean period of 18 months. Anosognosia is a significant predictor of apathy in AD

AD: Alzheimer disease; ADL: activities of daily living; a-MCI: Amnesic mild cognitive impairment; A&A: Anosognosia and Anosodiaphoria scale; AP: amnesic patients; ARS: Anosognosia Rating Scale; ASPIDD: Assessment Scale of Psychosocial Impact of the Diagnosis of Dementia; AQ-D: Anosognosia Questionnaire for Dementia; BCIS: The Beck Cognitive Insight Scale; bvFTD: behavioral variant of Fronto-Temporal Dementia; CAMDEX: Cambridge Mental Disorders of the Elderly Examination; CIRS: Clinical Insight Rating Scale; FBI: Frontal Behavior Inventory; FTD: Fronto-Temporal Dementia; GRAD: Guidelines for the Rating of Awareness Deficits; HC: Healthy Control; LO-AD: late-onset Alzheimer disease; MARS-MFS: the Memory Awareness Rating Scale Memory Functioning Scale; MCI: Mild Cognitive Impairment; md-MCI: amnesic multidomain Mild Cognitive Impairment; na-MCI: non-amnesic mild cognitive impairment; NPI: Neuropsychiatric Inventory; NRS: Neurobehavioral Rating Scale; PD-aMCI: Parkinson disease with Amnesic mild cognitive impairment; PD-ch: Parkinson disease cognitively healthy; PD-naMCI: Parkinson disease with Amnesic mild cognitive impairment; PSS: Perceived Stress Scale; PwD: People with dementia; QoL: Quality of life; SCD: Subjective cognitive decline; SEQ: Social-emotional Questionnaire; VaD: Vascular Dementia; VSRT: Subtracting Verbal Selective Reminding Test; YO-AD: young-onset Alzheimer disease.

DISCUSSION

The different concepts highlight the lack of clear definitions to its boundaries. They are problematic because they contribute to the variability and inconsistency of findings in the area. The conceptual heterogeneity used to define the awareness phenomenon is caused both by the researcher's theoretical perspectives and by the dementia studies from different fields such as Psychology, Psychiatry and Neurology⁶. Therefore, different perspectives coexist when referring to awareness, and it may explain the use of multiple terms for its definition. The concepts are often nonspecific and do not, consider the possible particularities of each terminology.

There were degrees of awareness across the cognitive domain. Questionnaires of discrepancy between PwD and caregivers reports were especially sensitive for recent memory, followed by functional activities, apathy and attention²⁹. The association of cognitive deficits with both unawareness of memory and behavior problems domains indicated that cognition may be a basis for self-insight and self-awareness. Thus, cognitive deficits may lead to global unawareness⁴².

A negative association between awareness and Mini-Mental State Examination (MMSE) suggested that awareness increased as global cognitive functions declined. This

finding supported the view that low awareness was related to advanced disease stages³⁰. Conversely, a longitudinal assessment of a group of PwD (Alzheimer's disease, vascular dementia and mixed dementia) presented that initial discrepancies were moderate in relation to memory. Surprisingly, there were no changes in discrepancy scores over time. PwD stability in awareness was observed, although the dementia symptoms and the cognitive impairment increase in the context of no change in psychological or social well-being¹³.

Another longitudinal research described that impaired awareness of disease was associated to cognitive and functional deficits at baseline⁴⁵. However, in the second evaluation, awareness remained stable in a proportion of PwD and was followed by a relative decline, which is not only due to the cognitive impairment. Thus, deficits in awareness and cognition seem to be relatively independent, because mild PwD unawareness is mainly manifested by poor recognition on changes in functional activities¹.

Van Vliet *et al.*¹² concluded that memory deficits are unlikely to explain impaired awareness, as mild PwD can display impaired awareness and PwD with severely disturbed memory retention and consolidation may still have intact awareness. Clinically, unawareness of memory deficit among people with AD was associated with lower scores on the

MMSE and higher scores on the Cornell Scale for Depression in Dementia. So, depression may occur among people with higher levels of awareness as an emotional response to cognitive declines⁴².

Awareness of cognitive deficits had association with general neuropsychological variables¹⁵. There were strongest associations with memory, but small significant correlations were also observed for attention, language and executive function. This finding suggested that memory was not the only cognitive domain influencing memory awareness⁵⁴. An important aspect is that unawareness of memory deficit may be understood as an initiator of other behavioral abnormalities contributing to professional caregivers' burden²⁷.

Interestingly, unawareness of memory deficit in AD subjects is an early symptom of their memory disorder, even in mild cognitive impairment (MCI). Thus, unawareness might be considered as a specific marker of the transition from MCI to AD. It is important to note that unawareness for memory deficit may be easily identified in standard clinical setting and used to evaluate the role of unawareness in predicting conversion from MCI to AD⁵¹.

A study⁴⁷ investigated the eventual existence of relationship between awareness and Clinical Competence (CC) in mild to moderate AD. A great proportion of PwD were unaware of cognitive, functional and behavioral deficits, with an increase of severity and prevalence of awareness along the progression of disease. Even people with very mild dementia and great awareness showed substantial deficits in CC. We can assume that deficits in executive function, memory and language may refer to the association between capacity and awareness, suggesting that these two constructs may be differently impaired in PwD⁴⁷.

On self-evaluating their predictions, people with AD were generally less accurate in evaluating the level of their cognitive abilities than healthy older adults, significantly overestimating their performance on the pretest^{19,53,55}. However, immediately after taking the test, people with AD were able to successfully modify their predictions based on task experience, demonstrating self-monitoring memory abilities^{53,55}. Those AD participants who continued to exhibit poorer post experience prediction accuracy also tended to more significantly underestimate the frequency of everyday memory difficulties, when compared to caregivers report⁵⁵. The association of the self-evaluating of actual performance with fluency and visuospatial abilities may reinforce the notion that unawareness is in part a neurocognitive deficit. The frontal lobes may be responsible for important processes in awareness, such as evaluating beliefs, monitoring errors or comparing current with past performance⁵⁰. Thus, participants with mild AD were able to use confidence judgments to track the accuracy of their responses on a recollection test. Confidence-accuracy relationship was not impaired in the early stages of AD as PwD

have relatively preserved metacognitive monitoring abilities on episodic memory tests, at least when the task was relatively well constrained⁴¹.

Quality of life (QoL) is considered an indicator of the effectiveness of both psychosocial and pharmacological interventions. Studies suggested an association between unawareness and QoL. The discrepancy between self-report/caregiver reports showed that higher levels of unawareness led PwD to have a more positive view of their QoL, despite their general deterioration²³. This lack of awareness regarding their actual status suggests that PwD perceptions correspond to a mental image of themselves prior to their deterioration. In addition, Clare *et al.*²⁰ endorse that two domains of awareness – evaluative judgments of memory function and evaluative judgments of functional abilities – show small to medium correlations with self-reported QoL-AD, with higher levels of awareness related to lower QoL.

Awareness of social-emotional functioning elicits quite complex judgments. It occurs because PwD are not asked about a loss or impairment of 'function' as in the case of the memory or activities items; in fact, they are asked about their behaviors, personality, and views of themselves and their perspectives¹⁹. The judgments entailed in awareness of social-emotional functioning included wider-based judgments and perspectives. It is not surprising that higher levels of differences between subjects and carers were obtained, both in over- and under-estimations¹⁹.

Unawareness of social-emotional functioning was related to poorer cognitive performance, suggesting a relationship between dementia severity and degree of awareness in this domain¹⁹. In addition, loss of awareness of social-emotional skills was associated with the presentation and severity of behavioral and psychiatric disturbance in people with AD¹⁷. A significant relationship between self-reported QoL and the level of awareness in the three areas of social-emotional functioning (emotional recognition and empathy, social relationships and prosocial behavior) was also observed¹⁷.

In an assessment of a group of people with AD at three moments over approximately 20 months, discrepancies were initially least pronounced in relation to social-emotional functioning, with no changes over time²⁶. Concerning emotional reactivity, non-conscious processing of emotion might extend to more complex feelings and attributions, such as frustration/disappointment after task failure and satisfaction after task success. However, there was dissociation between impaired performance judgment and preserved emotional reactivity to failure in AD⁴⁹.

The phenomenon of unawareness affects not only deficits in cognition and daily functioning, but it can also manifest itself as non-recognition of affective symptoms. For example, PwD may be unaware of their depressive symptoms or anxiety in the sense of an "affective" unawareness²⁴. Depression and unawareness were inversely correlated

among PwD, as unawareness was associated with a more positive self-appraisal among them and its presence increased with the progression of AD²².

We found only one study of awareness in young onset dementia. Longitudinally, people with young onset AD presented higher levels of awareness compared with late onset AD. A possible explanation was related to the higher levels of environmental demands faced daily by younger people, which may improve awareness of their limitations. Thereby, higher levels of awareness were associated with a higher risk of depressive symptoms and intact awareness was associated with depressive symptoms, an effect more pronounced in young onset compared with late onset dementia¹². It is necessary to improve the studies in this area, to better understand if there are differences in the objects of awareness in young onset when compared to late onset dementia.

In relation to the perceived stress, unawareness had an impact on psychological markers of stress, but not on the physiological one (i.e. cortisol levels). An explanation was the small sample size of the study and the high variability of cortisol measurements across the days and seasons. It also explained the failure to find statistically significant group differences²¹. Thus, a certain level of perceived stress in AD may cause some problems due to the inability of PwD to be aware of their cognitive state²¹.

Neuropsychiatric symptoms are factors that contribute to unawareness, besides the neuropsychological aspects. In people with AD, unawareness of psychosis or behavior problems was related with lower scores on the MMSE and may be more prevalent or more severe as dementia progresses⁴². PwD with very poor awareness had significantly more neuropsychiatric symptoms than people who were fully aware of their cognitive deficits¹⁶. PwD with unawareness presented deficits in functional activities and higher levels of behavioral and psychological symptoms of dementia such as disinhibition, apathy, irritability and anxiety, agitation, and aberrant motor behavior²⁵.

In mild AD, there was a relationship between unawareness of behavioral deficits and agitation and apathy, whereas global level of anosognosia was related to aberrant motor behaviors. The diagnosis of unawareness has been associated with severity of apathy symptoms as well as the categorical diagnosis of the apathy disorder³¹. A longitudinal assessment, during the first year, showed a decline in awareness score, which was not associated with change in any of the studied variables. However, neuropsychiatric symptoms of people with lower awareness after 36 months (as compared to baseline) increased, when compared to individuals with improved or stable awareness¹⁴.

The ability to inhibit a response, self-monitoring, and set-shifting appears to be important executive functions for awareness of functional deficits in AD⁴³. Set-shifting and pro-

cessing speed may have a role in awareness, but are likely to be part of a multicomponent process¹⁵. PwD showed decreased awareness of deficits in activities requiring executive function, such as handling money, practicing favorite hobbies and doing home activities³⁴. In moderate AD, deficits in self-awareness were also apparent in the activities regarding communication and social interaction, such as communicating with people, or understanding conversations, the newspaper and the plot of a movie that involves communication of characters³⁴. Ohman *et al.*⁴⁸ reported individual variations of awareness of disability in participants with the same diagnosis and similar functional activities process skills measures. Several other factors (e.g. denial, or having experienced the problems in functional activities performances over a long period) may also impact on PwD experiences and descriptions of functional activities performance and, hence, may result as well in lower scores in the awareness evaluation⁴⁸.

PwD tend to overestimate the awareness of functional activities¹⁹. Appraisal of daily activities possibly evokes judgments that are more straightforward than those involved in hypothetical memory tasks. The overestimation indicated that participants seemed to show more unawareness in relation to assessing their abilities to do specific tasks than in assessing their abilities to remember particular things¹⁹.

From a discrepancy analysis between PwD and caregivers reports, PwD with reduced awareness of instrumental functional activities ability performed better at letter fluency, indicating that awareness of functional deficits may be influenced by letter fluency⁴⁶.

This systematic review has some limitations. We included studies that were not controlled and randomized. In addition, we selected studies that assessed only people with AD, which unable the observation of the particularities of awareness in different dementia etiologies. Despite these limitations, we add to literature emphasizing that the clinical phenomenon of awareness is determined to some extent by the "object" of awareness assessment. This means that there is a great need for more studies and further researches in this area, especially longitudinal studies that clearly define the assessed object and its specificities.

CONCLUSIONS

Even though many researches investigate the concept of awareness, the results are variable and inconsistent. Awareness is a complex and multidimensional construct, which needs to be carefully defined. Different objects elicit different levels of awareness. Therefore, the findings may change in relation to the chosen concept and according with the specific selected object of awareness.

The comparison between the studies shows the emphasis on cognitive domain in the assessments. Interestingly, the

findings of the cross-sectional studies between awareness and, more specifically, the cognitive domain were not observed in the longitudinal ones. Over time, awareness may improve or may remain stable for a considerable proportion of PwD, suggesting that there is no straightforward relationship with dementia severity or with the progression of cognitive impairments.

Furthermore, there are controversies about the role of the cognitive components in decreased awareness. Memory deficits are not sufficient to explain impaired unawareness, although a strong association has been observed between awareness and the memory domain. The relationship observed between awareness and attention, language and executive function suggests that memory is not the only cognitive domain that influence awareness. In addition, the inclusion of different subtypes of dementias may originate a lack of specificity, since different etiologies may lead to different cognitive and functional symptomatology, in which different domains of awareness may be affected. Moreover, the sociodemographic variables should be observed.

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)⁵⁷ has recently included social cognition as a criterion that composes the basis for the diagnosis of dementia. Awareness of social-emotional functioning and behavioral impairment is a domain, which elicits complex judgements, regarding emotion recognition. Most studies investigate the cognitive and functional domains, but there is a need to further research on the recognition of social-emotional functioning. Lack of awareness of social-emotional functioning may cause relevant implications involving social comprehension and communication that can also lead to higher levels of carer burden and stress.

INDIVIDUAL CONTRIBUTIONS

Isabel B. Lacerda – Performed the literature search and wrote most of the manuscript.

Maria Fernanda B. Sousa – Assisted with writing the manuscript and independently screened titles and abstracts to identify eligible papers.

Raquel L. Santos and Marcela M. L. Nogueira – Independently extracted information from the selected publications and corrected the article's draft.

Marcia C. N. Dourado – Guided the conception for the review and the process of performing the literature search, and edited the manuscript.

CONFLICT OF INTEREST

None.

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