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MAJOR RESEARCH PROJECT (MRP)

INFORMANT REPORTED COGNITIVE DECLINE IN OLDER ADULTS

SECTION A

Factors Associated with Informant-Reported Cognitive Decline in Older Adults: A Literature Review

Accurate Word Count: 7977 (174)

SECTION B

Informant-Reported Cognitive Decline in Dementia Assessment: Associations with Subjective Burden

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SECTION C

Appendix of Supporting Material

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This is dedicated to my Grandma, June, who continues to inspire me personally and professionally.

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SUMMARY OF PORTFOLIO

Section A: Factors Associated with Informant-Reported Cognitive Decline in Older Adults: A Literature Review

This section provides a review of the empirical literature focussing on factors associated with informant-reported cognitive decline in older adults. Factors pertaining to both patient and informant are identified and discussed within the context of the methodological quality of published studies in the area. Limitations of the existing evidence base are examined before the potential implications of the reviews findings for both clinical practice and future research are explored.

Section B: Informant-Reported Cognitive Decline in Dementia Assessment: Associations with Subjective Burden

This section describes an empirical study investigating factors associated with informant reported cognitive decline, with a particular focus on informants' experience of burden. Univariate and multivariate analyses, as well as tests of indirect effects, are used to explore associations. Findings suggest that informant reports are directly associated with patient cognitive functioning and informant burden, whilst patient depressive symptoms interact with burden in influencing informant reports. Limitations of the study, clinical implications and directions for future research are discussed.

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MAJOR RESEARCH PROJECT

SECTION A:

LITERATURE REVIEW

Factors Associated with Informant-Reported Cognitive Decline in Older Adults: A Literature Review

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the Doctorate of Clinical Psychology at Salomon's Centre for
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Abstract

Background: Dementia diagnoses are made in part on there being evidence of a significant decline in cognitive functioning. This is increasingly established through information provided by informants. However, some studies provide evidence to suggest that informant reports of cognitive decline may be influenced by factors other than patient cognitive functioning. This review aimed to elucidate factors pertaining to patients and informants that might be associated with informant reports of cognitive decline.

Method: A search of the published literature identified 13 peer-reviewed studies that met criteria for inclusion in the review.

Results: Reviewed studies provide some evidence for associations between informant-reported cognitive decline and demographic characteristics (patient age, patient education, patient ethnicity, informant gender), clinical factors (dementia severity, diagnosis, behavioural disturbance, everyday functioning) and psychological factors (patient depressive symptoms, patient neuroticism, informant psychological distress, informant burden). However, several methodological limitations of the evidence base were identified.

Conclusion: Findings suggest that informant-reported cognitive decline may not always be reliable; in that such information is statistically predicted by patient and informant characteristics. Clinical and empirical implications are discussed.

Keywords: *Dementia, Cognitive Decline, Cognitive Assessment, Psychometrics, Informant*

Factors Associated with Informant-Reported Cognitive Decline in Older Adults: A Literature Review

Dementia is recognised as a common and serious neurodegenerative condition, with over 800,000 people formally diagnosed and an estimated annual cost of £26 billion a year in the UK alone (Prince et al., 2014). Defined as a clinical syndrome, dementia describes a set of symptoms resulting from underpinning diseases of the brain, which lead to the progressive death of brain cells (Department of Health; DoH, 2009a). As a result, dementia causes irreversible decline in global intellectual, social, physical and psychological functioning, and individuals living with dementia typically experience a progressive loss of skills, social roles, psychological wellbeing and the ability to autonomously carry out everyday activities (DoH, 2009a; Frank et al., 2006).

Consequently, individuals with dementia often require high levels of support, which is most commonly provided in their own homes by informal carers, such as spouses and adult children (Etters, Goodall & Harrison, 2007). As such, dementia has a profound impact on both those living with the condition and those caring for them. Indeed, caring for a person with dementia is associated with an increased risk of psychological and physical health problems (Van Der Lee et al., 2014). This is understood in terms of caregiver burden; “the degree to which a carer’s emotional or physical health, social life or financial status suffer as a result of caring” (Zarit et al., 1986, pp. 261). Research suggests that caregiver burden is associated not only with negative outcomes for carers (e.g. depression, reduced quality of life) but also individuals with dementia (e.g. reduced quality of life, untimely moves to residential care settings) (Etters et al., 2007).

In light of this, and estimates that the prevalence of dementia is set to rise to 1.4 million people in the next 30 years, improvements in both diagnosis and dementia care have been highlighted as a national priority (DoH, 2009a). Following reports highlighting the enormity of the challenge and the shortfall of services in place at the time to meet clinical demands (Knapp & Prince, 2007; National Audit Office, 2007), the DoH published the first ever National Dementia Strategy (DoH, 2009a), which set out recommendations for the NHS and local authorities to achieve improvements in three key areas, namely; awareness, earlier diagnosis and intervention, and better quality care. On the back of this report, the government detailed its commitment to improving quality of life in dementia through the Prime Minister’s three year challenge on dementia (DoH, 2012).

Dementia Assessment and Diagnosis

With a view to achieving these outcomes, NHS Trusts across England received extra funding and the DoH (2009b) published an implementation plan. In keeping with this, and existing clinical guidelines (National Institute for Health and Clinical Excellence; NICE, 2006), NHS Trusts set about to improve dementia service provision through the commissioning of specialist memory assessment services (MAS; DoH, 2009a). Consequently, a nationwide increase in MAS (multidisciplinary teams offering timely, accurate assessment and diagnosis) was observed (DoH, 2009a; NHS Information Centre, 2011; Royal College of Psychiatrists; RCP, 2013). The majority of these services follow the Croydon Memory Service Model, wherein individuals presenting to their GP with memory concerns are referred for further assessment, as carried out by trained clinicians, and the diagnosis and management of clients is decided upon by the team as a whole (Banerjee et al., 2007; Deloitte & Alzheimer’s Society, 2015; NICE, 2010).

Guidelines recommend that these assessments involve a comprehensive client history, standardised cognitive examination, assessment of everyday functioning and mental state examination (British Psychological Society; BPS, & RCP, 2007). Structural imaging, such as Magnetic Resonance Imaging and Computerised Tomography, are also recommended to assist with differential diagnosis and to rule out other neurological conditions (BPS & RCP, 2007). Where there are difficulties in making a differential diagnosis, as is often the case in the early stages of dementia or where there are other potentially compounding factors, guidelines advise that further neuropsychological testing should be conducted (BPS & RCP, 2007).

A diagnosis of dementia is therefore made where there is evidence of a decline in memory and other cognitive abilities (e.g. attention, visuo-spatial skills), which has been present for at least 6 months, along with a preserved awareness of the environment and a decline in emotional control, motivation or a change in social behaviour (WHO, 1992; See Appendix A for Diagnostic Criteria). Decline in cognitive functioning over time is a key feature of dementia and it is advised that its assessment should involve standardised instruments, which examine attention, concentration, orientation, memory, praxis, language and executive functioning (BPS & RCP, 2007). However, these instruments provide only a comparison of cognitive function to age-matched norms at a single time point (Quinn et al., 2014) and may be affected by education level, sensory difficulties and language ability (Mackinnon & Mulligan, 1998).

Informant-Reported Cognitive Decline

Given the potential inaccuracies of the referred individuals’ (referred to throughout as the “patient”) self-reports, and difficulties in recalling (Quinn et al., 2014), or awareness of (Lehmer et al., 2015), changes in cognitive functioning, gaining the perspective of an informant who is familiar with patient pre-morbid and current cognitive functioning has become an increasingly popular practice (Jorm & Korten, 1988; Quinn et al., 2014). Research suggests that informant-reported cognitive decline (IRCD) has the potential to be as effective as standardised cognitive assessments in screening for dementia (Jorm, 1996), is better associated with objective measures of cognitive functioning than patient self-reports (Schinka, 2010) and can be formally incorporated into assessments to increase the accuracy of detecting dementia (Mackinnon & Mulligan, 1998). Unlike standardised psychometric measures, IRCD is suggested to be unaffected by patient education level, premorbid cognitive functioning or physical ability (MacKinnon & Mulligan, 1998) and may be better able to detect the earliest symptoms of dementia (e.g. McLoughlin et al., 1996). As such, the importance of routinely incorporating informant information within cognitive assessments has been highlighted (BPS & RCP, 2007).

In clinical practice, an informant’s perspective is incorporated through informal interview or the administration of a standardised questionnaire (Mackinnon & Mulligan, 1998; Quinn et al., 2014). These questionnaires ask informants to consider the patient’s cognitive functioning in everyday life compared to functioning earlier in life. Instruments that are frequently used for this purpose include the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE; Jorm & Jacomb, 1989), the Eight-Item Informant Interview to Differentiate Aging and Dementia (AD8; Galvin et al., 2005), the Blessed Dementia Scale (BDS; Blessed, Tomlinson & Roth, 1968) and the Cambridge Mental Disorders of the Elderly Examination (CAMDEX) Informant Interview (Roth et al., 1986).

Initially comprising 26-items (later shortened to 16-items) the IQCODE has demonstrated good inter-rater reliability, internal consistency, concurrent validity and is available in over ten languages (Harrison et al., 2014; Jorm et al., 1989; Jorm, 2004). Similarly, the 8-item AD8 has demonstrated excellent internal consistency (0.84), inter-rater reliability (0.80) and concurrent validity (0.75; Galvin, Roe, Xiong & Morris, 2006), the CAMDEX Informant Interview has been shown to have good inter-rater reliability (0.91; Roth et al., 1986) and the BDS is reported to have good discriminative validity and internal consistency (Pena-Casanova et al., 2005).

Despite this, there is some concern regarding the accuracy of IRCD; Ross et al (1997) reported that informants did not report cognitive problems in 21% of patients who were subsequently diagnosed with dementia, and Kemp et al. (2002) found that 40.5% of informants gave responses inconsistent with clinician ratings in at least one of four cognitive domains examined. Further, informant reports of other aspects of patient functioning have been suggested to be influenced by various patient and informant characteristics (Neumann et al., 2000; Snow et al., 2005). As such, it is possible that non-cognitive factors, such as patient and informant characteristics, may influence IRCD, and that there is a need for research to identify informants who may be less likely to provide accurate information (Jorm, 1996; Magaziner, 1997).

Rationale and Summary

National guidelines recommend the inclusion of informant information about patient cognitive functioning as part of the memory assessment process. Although informant-reports have demonstrated resistance to factors that potentially bias self-reports and objective measures of cognitive functioning, there is growing concern that factors other than patient cognitive functioning may influence them. Given such information in part informs a diagnosis of dementia, it is vital to gain a greater understanding of this. While some studies have explored factors that may be associated with IRCD, to date there has been no comprehensive review of the existing literature pertaining to this topic.

Method

The present review evaluated peer-reviewed journal articles, from qualitative and quantitative studies, in order to identify factors that have been found to be associated with IRCD in older adults. The implications of study findings, both clinically and empirically, are discussed.

Scope of Review

In keeping with existing literature (Harrison et al., 2014), “informant” was defined as an individual with sufficient knowledge of the patient to be able to provide retrospective information on cognitive decline. The term “informant” was used (as opposed to carer or relative) so as not to assume the quality or type of relationship that the individual providing this information might have to the patient. “Cognitive decline” was defined as a change in the patient’s cognitive functioning, reported either qualitatively (via interview) or quantitatively (via a standardised assessment measure). “Older adult” was defined as an individual undergoing cognitive screening, 65 years or older.

Non-cognitive factors associated with IRCD included, but were not limited to, patient or informant demographic (e.g. age), psychological (e.g. affective state), physical (e.g. physical health) and relationship characteristics (e.g. relationship type) but excluded neurological or biological factors. Such factors were focussed on in light of previous literature, which hypothesises that non-cognitive factors may potentially bias informant information (Jorm, 1994; Jorm, 1996). Due to the paucity of literature in this area, studies that explored factors associated with the accuracy of IRCD by means of comparison with objective tests were included in the review.

Studies which primarily aimed to add to the knowledge base pertaining to specific, standardised measures of IRCD (i.e. to determine their psychometric properties, validate other versions or validate use within specific populations) were excluded. This decision was made in light of the present review’s focus on the construct of IRCD and the existing reviews focussing on the IQCODE’s psychometric properties (i.e. Harrison et al., 2014; Jorm, 2004; Quinn et al., 2014).

Literature Search Strategy

Using PsychInfo, ASSIA, PubMed and Web of Science, an electronic search of the literature was conducted. The following search terms in combination were used: [informant *or* carer *or* proxy *or* collateral] and ["cognitive decline" *or* "cognitive functioning" *or* "cognitive impairment" and (elderly *or* aged *or* "older adult"]. Search terms were applied to all literature published within each database, with searches conducted up until 1st December 2016.

Inclusion and exclusion criteria. The search results were limited to those published in the English language and peer-review journals. Abstracts were read and full articles obtained if the title or abstract stated that the paper reported an association (or lack thereof) between patient or informant factors and IRCD, in older adults. Full articles were then read and only those that met the inclusion criteria were included in this review. The reference lists of all relevant papers were hand-searched and any relevant studies included (Figure 1).

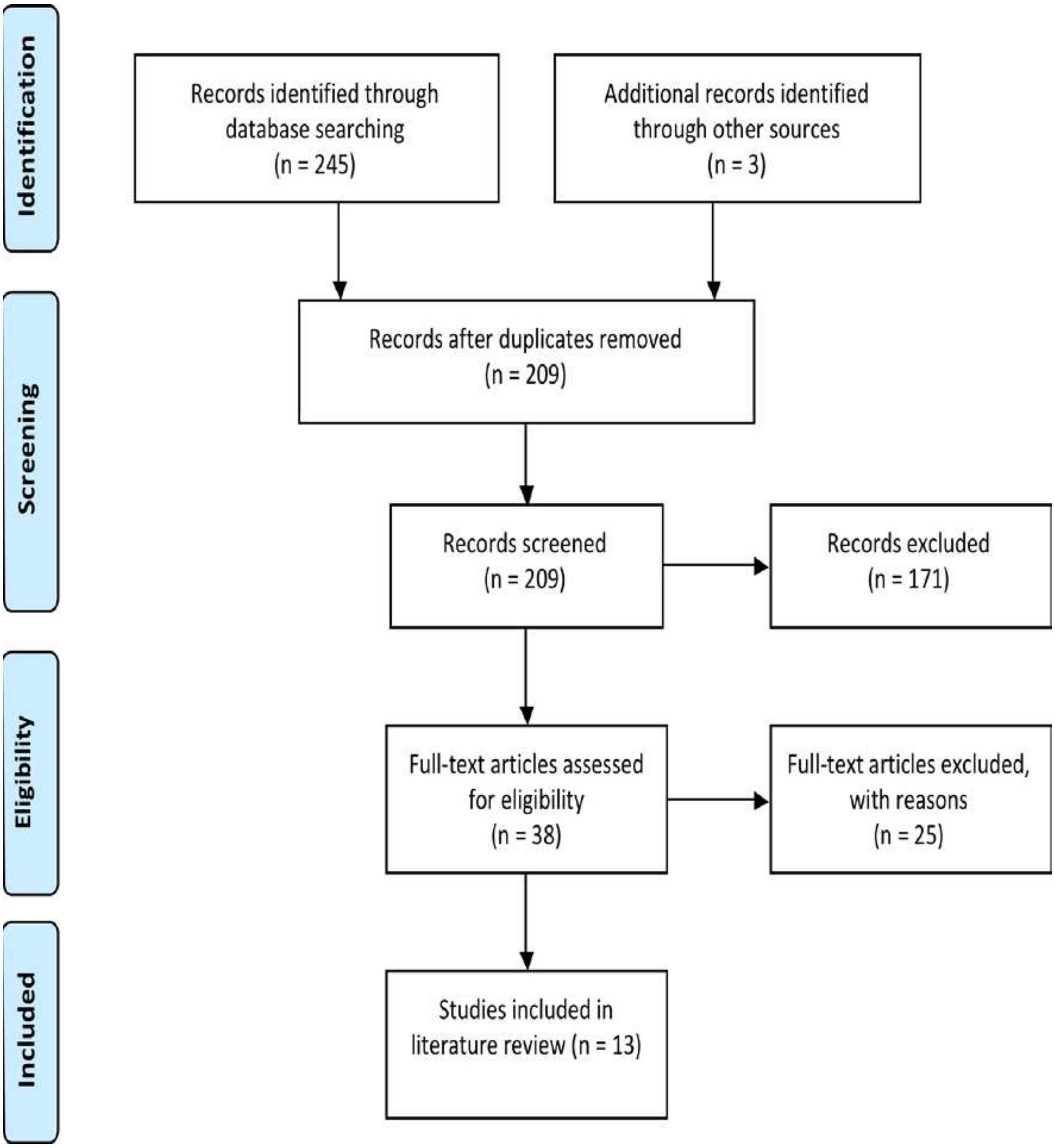

Figure 1. Flow chart depicting the literature search strategy.

Overview of Studies

In total, the literature search identified 13 studies that met the review's inclusion and exclusion criteria (Table 1). Ten of the thirteen studies identified employed a cross-sectional design, two employed a prospective cohort design with a cross-sectional analysis at a single time point (Gavett et al., 2011; Jorm et al., 1998), and one employed a purely prospective cohort design (Kemp et al., 2002).

Three of the studies were conducted in the UK (Hanson & Clarke, 2013; McLoughlin et al., 1996; O’Connor et al., 1989), with the remaining conducted in the USA (Farias et al., 2004; Gavett et al., 2011; Potter et al., 2009; Ross et al., 1997), Norway (Kirkevold & Selbaek, 2015; Nygaard, Naik & Geitung, 2009; Persson et al., 2015) and Australia (Jorm et al., 1994; 1998; Kemp et al., 2002). Two studies were written by the same research team (Jorm et al., 1994; 1998), however each presented different data and so both were included in the review.

All studies used quantitative statistical methods to examine relationships between IRCD and variables. All but one study (Jorm et al., 1994) used a standardised questionnaire to measure IRCD. Most used a version of the IQCODE (Farias et al., 2004; Gavett et al., 2011; Hanson & Clarke, 2013; Jorm et al., 1998; Kirkevold & Selbaek, 2015; Nygaard et al., 2009; Persson et al., 2015; Potter et al., 2009; Ross et al., 1997) whilst three used the CAMDEX Informant Interview (Kemp et al., 2002; McLoughlin et al., 1996; O’Connor et al., 1989) (see Appendix B for cut-off scores).

Structure of Review

The sections that follow provide an overview of the studies’ findings in the context of the review’s overarching aims. The search identified three main groups of factors examined in relation to IRCD (namely, patient, informant and patient-informant relationship factors) and so the review is structured accordingly. To assist with the evaluation of the methodological quality of the studies, Methods for the development of NICE public health guidance – third edition (NICE, 2012; Appendix C) was consulted. Using a framework derived from a previously published review (Sherer et al., 2002), based on guidelines for evaluating studies in neuropsychology

(Heaton et al., 2002), each study was given a subjective quality rating (i.e. “flawed”, “marginal”, “acceptable” and “commendable”) to aid in its interpretation (Appendix D).

Table 1. Overview of studies included in the review

STUDIES USING IQCODE TO MEASURE INFORMANT-REPORTED COGNITIVE DECLINE					
Study	**Quality^a**	**Design**	**Sample**	**Variables**	**Key Findings**
Persson et al., 2015	Acceptable	• Cross-sectional analysis of data collected for registry. • 15 Outpatient Clinics, Norway. • Consecutive sampling.	• 1832 patient/informant dyads. • Patients with MCI (n = 742) and dementia (n = 1090; mean age = 75.2; 55.7% female). • Informants were mostly spouses (mean age = 70.6) and children (mean age = 50.1).	***Patient:*** Age, gender, education level, everyday functioning (IADL), neuropsychiatric symptoms (NPI). ***Informant:*** Burden (RSS). ***Relationship:*** Type.	***Univariate analysis:*** IQCODE was associated with age, gender, education level, everyday functioning, burden, neuropsychiatric symptoms and relationship type. ***Multivariate analysis:*** IQCODE negatively correlated with MMSE but association decreased when burden and NPI were controlled for.
Nygaard et al., 2009	Acceptable	• Cross-sectional analysis of routinely collected data. • Outpatient Department, Norway. • Consecutive Sampling.	• 207 patient/informant dyads. • Patients assessed for dementia or nursing home placement (mean age = 78.8; 69.1% female). • Informants were spouses (mean age = 74.8) or non-spouses, e.g. children, partners (mean age = 79.9; 69.6% female).	***Patient:*** Age, gender. ***Informant:*** Gender, burden (RSS), risk of psychiatric morbidity (RSS cut-off). ***Relationship:*** Type.	***Univariate analysis:*** IQCODE associated with patient age, burden and relationship type. IQCODE associated with composite variable relationship type and informant gender. Spouses IQCODE score significantly lower than that of non-spouses, and significantly differed between informants at high or low risk of psychiatric morbidity. ***Multivariate analysis:*** Significant interaction between IQCODE, burden and being a female spouse.
Jorm et al., 1998	Acceptable	• Prospective cohort (with cross-sectional analysis at single time point; 3.5 years) • Australia.	• 381 participant/informant dyads. • Older adults sampled from electoral roll or residential care census (mean age = 77.2; 0% female).	***Patient:*** Age, education level, native English speaker, occupation. ***Informant:*** N/A. ***Relationship:*** N/A.	***Univariate analysis:*** IQCODE was not associated with occupation. ***Multivariate analysis:*** Occupation was not significantly associated with IQCODE when age, education and native English were controlled for.

Table 1. Overview of studies included in the review (continued)

STUDIES USING IQCODE TO MEASURE INFORMANT-REPORTED COGNITIVE DECLINE (CONTINUED)					
Study	**Quality^a**	**Design**	**Sample**	**Variables**	**Key Findings**
Potter et al., 2009	Acceptable	• Cross-sectional analysis of data from nationally representative cohort study. • USA. • Stratified sampling.	• 645 participant/informant dyads. • Community-dwelling older adults (17.2% African-American) with normal cognition, cognitive impairment or dementia (mean age = 80.5; 57.4% female). • Informants were mostly spouses or children (73%).	***Patient:*** Ethnicity, diagnosis / severity, age, gender, education. ***Informant:*** N/A. ***Relationship:*** N/A.	***Univariate analysis:*** No significant differences in IQCODE between White and African-Americans for those with normal cognition or dementia. IQCODE significantly higher for White than African-Americans with cognitive impairment. ***Multivariate analysis:*** IQCODE associated with probability of cognitive impairment and dementia in White-Americans, and of dementia in African-Americans, when controlling for age, gender and education.
Hanson & Clarke, 2013	Marginal	• Cross-sectional. • Community older adult service, UK. • Opportunity sampling.	• 46 patient/informant dyads. • Patients with MCI, AD, VD and MMSE scores > 18 (mean age = 77.0; 28.3% female). • Informants were spouses living with patients and without cognitive impairment (mean age = 74).	***Patient:*** Depression (GDS-15). ***Informant:*** Psychological distress (GHQ-12). ***Relationship:*** Expressed emotion (FMSS)	***Univariate analysis:*** No difference in IQCODE between couples with high and low expressed emotion. Overall, psychological distress associated with IQCODE, but not in dementia-only. ***Multivariate analysis:*** Expressed emotion did not significantly impact IQCODE after adjusting for depression and informant distress.
Kirkevold & Selbaek, 2015	Acceptable	• Cross-sectional. • Municipal services, Norway. • Random sampling.	• 998 patient/informant dyads. • Patients receiving social services or in-home nursing (mean age = 83.4; 68% female). • Informants were next of kin.	***Patient:*** Age, gender, medical history (GMHR), depression (CSDD), everyday functioning (IADL, PADL), neuropsychiatric symptoms (NPI). ***Informant:*** N/A. ***Relationship:*** N/A.	***Univariate analysis:*** IQCODE associated with age, everyday functioning, depression, neuropsychiatric symptoms and medical history. ***Multivariate analysis:*** Age and gender were no longer significantly associated with IQCODE, however everyday functioning, neuropsychiatric symptoms and medical history remained significantly associated.

Table 1. Overview of studies included in the review (continued)

STUDIES USING IQCODE TO MEASURE INFORMANT-REPORTED COGNITIVE DECLINE (CONTINUED)					
Study	**Quality**[a]	**Design**	**Sample**	**Variables**	**Key Findings**
Gavett et al., 2011	Acceptable	• Prospective cohort (with cross-sectional analysis at single time point; 3 years). • USA. • Opportunity Sampling.	• 384 participant/informant dyads. • Community-dwelling older adults enrolled in control group of Cognitive Change in Women study (mean age = 70.4; 100% female). • Informants were individuals who had known the patient for 10 years (age & % female unclear).	***Patient:*** Depression (GDS), everyday functioning (AAP). ***Informant:*** N/A. ***Relationship:*** N/A.	***Univariate analysis:*** IQCODE associated with GDS and AAP scores. These remained associated after adjusting for multiple comparisons. IQCODE score was associated with change in total GDS and AAP score from baseline to 3 years. No longer associated after adjusting for multiple comparisons. ***Multivariate analysis:*** N/A
Farias et al., 2004	Acceptable	• Cross-sectional. • USA. • Opportunity Sampling.	• 932 participant/informant dyads. • Older adults who were fluent speakers of English or Spanish recruited from community surveys (mean age = 71.5; 55.8% female). • Informants were not defined (mean age = 57.4; 68.7% female).	***Patient:*** Age, gender, education level, ethnicity/language. ***Informant:*** Age, gender, education level. ***Relationship:*** Type.	***Univariate analysis:*** IQCODE predicted by patient age, ethnicity/language group, patient education, informant gender, informant education but not patient gender, informant age or relationship type. ***Multivariate analysis:*** Only patient age remained a significant predictor of IQCODE when cognitive variables entered into model.
Ross et al., 1997	Acceptable	• Cross-sectional analysis of data from a larger study. • Community setting, Hawaii. • Stratified random sampling.	• 191 patient/informant dyads. • Japanese-American patients with dementia (mean age = 83; 0% female). • Informants were 'reliable' family members (mean age = 68.2; % female unclear).	***Patient:*** Age, education level, diagnosis, depression, behavioural disturbance (Behave-AD), everyday functioning (BDS). ***Informant:*** N/A. ***Relationship:*** Type.	***Univariate analysis:*** Unrecognised memory problems associated with family history of dementia, dementia severity, age, education level, Behave-AD, BDS and IQCODE, but not with diagnosis or depression. Percentage of unrecognised problems did not differ with relationship type. ***Multivariate analysis:*** Only patient education and BDS remained predictors of failure to recognise memory problems.

Table 1. Overview of studies included in the review (continued)

STUDIES USING CAMDEX TO MEASURE INFORMANT-REPORTED COGNITIVE DECLINE					
Study	**Quality^a**	**Design**	**Sample**	**Variables**	**Key Findings**
Kemp et al., 2002	Commendable	• Prospective cohort (timeframe unclear). • Primary care setting, Australia. • Consecutive Sampling.	• 242 patient/informant dyads. • Patients with memory difficulties (mean age = 79.6; 58.3% female). • Informants were spouses (40.9%), children, siblings or parents (39.3%) and friends or relatives (19.8%) (modal age range = 70-79; 75.6% female).	***Patient:*** Age, gender, education level, everyday functioning (IADL). ***Informant:*** N/A. ***Relationship:*** Type, frequency of contact.	***Univariate analysis:*** Underreporting cognitive decline by informants not associated with any non-cognitive factors, Overreporting associated with IADL score but not age, gender, education, relationship type or frequency of contact. ***Multivariate analysis:*** Underreporting associated with patient education, but overreporting was not associated with any factors.
McLoughlin et al., 1996	Marginal	• Cross sectional analysis of data from registry. • Community-setting, UK. • Opportunistic sampling.	• 170 patient/informant dyads. • Patients with dementia in contact with mental health/social services (mean age = 79.3; 60% female). • Informants were spouses (29%), 1st (16%) and 2nd (3%) degree relatives (age unclear; % female unclear).	***Patient:*** N/A. ***Informant:*** N/A. ***Relationship:*** Type, frequency of contact.	***Univariate analysis:*** The association between CAMDEX and objective measures differed according to relationship type and frequency of contact. ***Multivariate analysis:*** N/A
O'Connor et al., 1989	Marginal	• Cross-sectional. • Primary care setting, UK. • Consecutive Sampling.	• 406 patient/informant dyads. • Community dwelling patients with (n = 222) or without dementia (n = 184) (age > 75; % female unclear). • Informants were close relatives and neighbours,	***Patient:*** Dementia severity, mental and behavioural abnormalities (Psychiatrists score). ***Informant:*** Social class/occupation. ***Relationship:*** Type.	***Univariate analysis:*** CAMDEX score associated with dementia severity and number of behavioural abnormalities. CAMDEX scores did not differ according to social class/occupation or relationship type. ***Multivariate analysis:*** N/A

			friends or staff (age unclear; % female unclear).		

STUDIES USING OTHER MEANS OF MEASURING INFORMANT-REPORTED COGNITIVE DECLINE

Study	Quality[a]	Design	Sample	Variables	Key Findings
Jorm et al., 1994	Acceptable	• Cross-sectional. • Community setting, Australia. • Stratified Sampling.	• 877 patients and 744 informants. • Community-dwelling older adults sampled from electoral roll (mean age unclear; 49.1% female). • Informants were close relatives or friends (mean age unclear; 48.7% female).	***Patient:*** Age, gender, education level, anxiety, depression, neuroticism. ***Informant:*** Age, gender, anxiety, depression. ***Relationship:*** N/A.	***Univariate analysis:*** Informant reports associated with patient age, gender, anxiety, depression and neuroticism, but not with education, Informant reports associated with informant anxiety and depression but not with informant age or gender. ***Multivariate analysis:*** Only informant depression and patient MMSE score remained significantly associated with informant reports in a multiple linear regression with patient age and depression.

Table 1. Overview of studies included in the review (continued)

Note. [a]Quality rating based on framework derived from Sherer et al. (2002); MCI = Mild Cognitive Impairment; AD = Alzheimer's; VD = Vascular; IQCODE = Informant Questionnaire of Cognitive Decline in the Elderly; MMSE = Mini Mental State Examination; BDS = Blessed Dementia Scale; IADL = Instrumental Activities of Daily Living; PADL = Personal Activities of Daily Living; AAP = Adelaide Activity Profile; GMHR = Global Medical Health Rating; GHQ-12 = General Health Questionnaire; NPI = Neuropsychiatric Inventory; Behave-AD = Behavioural Pathology in Alzheimer's Disease Rating Scale; GDS = Geriatric Depression Scale; GDS-15 = Geriatric Depression Scale – 15 items; CSDD = Cornell Scale of Depression in Dementia; FMSS = Five Minute Speech Sample; RSS = Relative Stress Scale.

Results

Patient Factors

Most studies included in the review examined variables pertaining to patients when exploring IRCD (n = 12). For ease of interpretation, these variables were categorised into demographic characteristics, clinical and psychological factors.

Demographic characteristics.

Age. Of the 12 studies included in the review, seven examined the relationship between patient age and IRCD (Farias et al., 2004; Jorm et al., 1994; Kemp et al., 2002; Kirkevold & Selbaek, 2015; Nygaard et al., 2009; Persson et al., 2015; Ross et al., 1997). Five studies found a positive association between age and reported cognitive decline, with informants reporting significantly greater cognitive decline on a survey (Jorm et al., 1994) and the IQCODE (Farias et al., 2004; Kirkevold & Selbaek, 2015; Nygaard et al., 2009; Persson et al., 2015) with increasing age.

Ross et al. (1997) explored factors contributing to failure to recognise cognitive decline via the IQCODE, and concluded informants were less likely to recognise it in older patients, whilst a high quality prospective study found that patient age did not differ between those who under-reported (mean age = 80.3), over-reported (mean age = 80.3) or accurately reported cognitive decline on the CAMDEX (mean age = 79.0; Kemp et al., 2002).

Two studies used multivariate analysis to explore this association further. Farias et al. (2004) reported that age remained a significant predictor of IQCODE score after controlling for cognitive variables, whilst Kirkevold and Selbaek (2015) observed that age was no longer associated with IQCODE score when patient gender, everyday functioning, neuropsychiatric symptoms and medical health were included.

Gender. Five studies included gender as a potential correlate (Farias et al., 2004; Jorm et al., 1994; Kirkevold & Selbaek, 2015; Nygaard et al., 2009; Persson et al., 2015). Although three of these concluded that IRCD, as reported by the IQCODE, was not significantly associated with patient gender (Farias et al., 2004; Kirkevold & Selbaek, 2015; Nygaard et al., 2009), two reported a significant, albeit weak, association. Jorm et al. (1994) identified a trend for informants to report greater cognitive decline on a survey of male patients, whilst Persson et al (2015) found the opposite; in that being a female patient was associated with greater IRCD on the IQCODE. Both studies were assessed as being of good methodological quality, however differences in the samples (i.e. diagnosis, proportion of females) and measurement of IRCD, may explain the inconsistent results.

Education. Five of the reviewed studies examined the association between years of education and IRCD (Farias et al., 2004; Jorm et al., 1994; Kemp et al., 2002; Persson et al., 2015; Ross et al., 1997). Jorm et al. (1994) found that education was not significantly associated with cognitive decline as captured by an informant survey, whilst two studies utilising the IQCODE, reported an association (Farias et al., 2004; Persson et al., 2015). These described contradictory results; Persson et al. (2015) concluded IRCD increased as years of education increased, whilst Farias et al. (2004) reported fewer years of education were associated with greater cognitive decline. Kemp et al. (2002) concluded that education was statistically predictive of informant’s under-reporting (but not over-reporting) cognitive decline, whilst Ross et al. (1997) found that informants were more likely to fail to recognise cognitive decline in less educated patients. Notably, there were substantial differences between these two studies (in terms of setting, country, culture) and the impact this might have had on educational quality and attainment, must be acknowledged.

The results of multivariate analyses were equally inconclusive, with education no longer significantly associated with IRCD after controlling for cognitive variables (Farias et al., 2004), but significantly associated with informant failure to recognise cognitive decline after controlling for age, generation, stroke history, family history of dementia and hospitalisation (Ross et al., 1997).

Ethnicity and language. Three studies explored ethnicity and/or language as a potential correlate (Farias et al., 2004; Jorm et al., 1998; Potter et al., 2009). Jorm et al. (1998) found that being a native English speaker was not associated with reported decline, as captured by the IQCODE. However, the patient sample was entirely male, raising questions regarding generalisability. Farias et al. (2004) examined ethnicity and language (i.e. Hispanic-English, Hispanic-Spanish, Caucasian-English) as a combined correlate and found that ethnicity-language group significantly predicted IQCODE score. Specifically, more Caucasian-English group members scored in the lower ranges than the higher ranges of the IQCODE, whilst both Hispanic group scores were equally distributed. Within the Hispanic groups, Spanish speakers scored significantly higher than English speakers.

In a study of Caucasian-Americans and African-Americans, Potter et al. (2009) found there were no differences in mean IQCODE score between Caucasian-Americans and African-Americans in those with normal cognition or dementia, but that Caucasian-Americans had significantly higher IQCODE scores than African-Americans with cognitive impairment not fulfilling criteria for a dementia. Multivariate analysis, including age, gender and education as covariates, suggested the association between IQCODE score and subsequent dementia diagnosis differed with ethnicity. Here, IQCODE score was associated with dementia and cognitive impairment in White Americans but only associated with dementia in African-

Americans. Potter et al. (2009) speculated that this was related to the sample size being somewhat small for the models tested.

Occupation. Only two studies included occupation type as a potential correlate of IRCD (Jorm et al., 1998; O'Connor et al., 1989). Jorm et al. (1998) coded occupation according to John Holland's categories (Holland, 1959) and found that IQCODE score did not significantly differ between different occupational groups. This was also the case in a subsequent hierarchical regression analysis where age, education and native-English language were controlled for. O'Connor et al. (1989) grouped participant-informant dyads according to their combined working history or social class (i.e. non-manual or manual; Office of Population Censuses & Surveys, 1980) and found no significant differences in mean informant score, via the CAMDEX, across social class for those with mild, moderate or severe cognitive impairment.

Clinical factors.

Diagnosis and severity. Several studies evaluated the relationship of diagnosis and dementia severity with IRCD (Kemp et al., 2002; O'Connor et al., 1989; Potter et al., 2009; Ross et al., 1997). Using the Clinical Dementia Rating (CDR) scale (Hughes et al., 1982), Ross et al. (1997) observed a significant difference in the number of informants who failed to recognise cognitive decline in those with very mild dementia (52%; CDR = 0.5) and those with mild to severe dementia (13%; CDR > or = 1). The authors discuss that those in the very mild dementia group may not have had a dementia syndrome, and so symptoms may have been subtler; however O'Connor et al. (1989) found similar results, with informants' CAMDEX scores increasing with dementia severity (Roth et al., 1986). Further, Potter et al (2009) found IQCODE scores for African-American participants differed between cognitively normal patients (Mean = 2.9) and those with dementia (Mean = 3.8), but not patients with cognitive impairment without dementia. In White-American participants, IQCODE scores of cognitively normal patients (Mean = 3.0) significantly differed to patients with cognitive impairment (Mean = 3.2) and patients with dementia at time of assessment (Mean = 3.9).

Ross et al. (1997) found that there was no significant difference in the percentage of informants who failed to recognise cognitive difficulties between patients with AD (21%), vascular dementia (18%) or Parkinson's disease with dementia (10%). Using DSM-IV diagnostic criteria (American Psychiatric Association, 2000), Kemp et al. (2002) concluded that under-reporting cognitive difficulties was predicted by reporting on patients with sub-clinical dementia whilst over-reporting cognitive difficulties was predicted by reporting on those who met dementia diagnostic criteria.

Neuropsychiatric symptoms. Four studies explored neuropsychiatric or behavioural symptoms as a correlate (Kirkevold & Selbaek, 2015; O'Connor et al., 1989; Persson et al., 2015; Ross et al., 1997). Using two versions of the Neuropsychiatric Inventory (NPI), Persson et al. (2015) and Kirkevold and Selbaek (2015) found that reported cognitive decline measured using the IQCODE increased as NPI score increased. Although less methodologically robust, O'Connor et al. (1989) measured the frequency of behavioural and psychological symptoms, as rated by a psychiatrist, and similarly found a positive association with CAMDEX informant scores. Using the Behavioural Pathology in Alzheimer's Disease Rating Scale (Behave-AD; Reisberg et al., 1987) Ross et al. (1997) found that informants were more likely to recognise cognitive decline in patients with poorer Behave-AD scores.

Two studies found that this positive association remained in multivariate linear regression (Kirkevold & Selbaek, 2015; Persson et al., 2015); with Persson et al. (2015) reporting that this was the case with age, gender, education, MMSE, informant type and informant stress included in the analysis.

Everyday functioning. Five studies explored the relationship between patient everyday functioning and IRCD (Gavett et al., 2011; Kemp et al., 2002; Kirkevold & Selbaek, 2015; Persson et al., 2015; Ross et al., 1997). All studies measured everyday functioning using standardised measures. These included the instrumental activities of daily living (IADL) scale, personal activities of daily living (PADL) scale (Lawton & Brody, 1969), the Adelaide Activity Profile scale (AAP; Clark & Bond, 1995) and a modified version of the Blessed Dementia Scale, which omitted items regarding cognitive change (mod-BDS; Blessed, Tomlinson & Roth, 1968).

Two studies found that IQCODE scores were positively associated with IADL scores (Kirkevold & Selbaek, 2015; Persson et al., 2015). Kirkevold and Selbaek (2015) also found this for PADL scores. Ross et al. (1997) concluded that informants were significantly more likely to recognise problems in male patients with poorer scores on the mod-BDS. Conversely, in a prospective study, Gavett et al. (2011) found that IQCODE scores were negatively correlated with AAP scores ($r = -0.15$) which remained associated with the change in AAP scores over three years ($r = -0.12$). This is potentially surprising, though somewhat undermined, by an unrepresentative all-female sample. Kemp et al. (2002) found that IADL score was higher for informants who over-reported, but not those who under-reported, cognitive difficulties. Despite this, IADL score was not a significant predictor of under-reporting or over-reporting compared to accurate reports in subsequent binary logistic regression analysis.

In a multivariate linear regression, along with age, gender, neuropsychiatric symptoms and medical health, IADL but not PADL remained significantly associated with IQCODE scores (Kirkevold & Selbaek, 2015). A multivariate analysis including years of education, remote memory and mod-BDS (Ross et al., 1997), demonstrated that mod-BDS continued to have a significant association with informant failure to recognise cognitive problems.

Medical health. Only one study in this review included a measure of general physical health (Kirkevold & Selbaek, 2015). This study used the General Medical Health Rating (GMHR; Lyketsos et al., 1999), which considers the patient's past and current medical history, and determined that IQCODE score was negatively associated with GMHR score. Subsequent multivariate linear regression showed that this association remained, but became positive in nature, after including age, gender, IADL and neuropsychiatric symptoms. The authors did not discuss this finding; nonetheless, it is possible that the additional variables acted as moderators or mediators, or that there were issues with multicollinearity. Regardless, the study sample comprised those receiving social support or in-home nursing, limiting generalisability.

Psychological factors.

Personality. One study explored the association between patient personality and IRCD. Using the Eysenck Personality Questionnaire Revised (EPQR: Eysenck, Eysenck & Barrett, 1985), Jorm et al. (1994) found that informant reports of intellectual decline, intellectual decline interfering with life, and scores on the memory decline scale, were weakly and positively associated with patient neuroticism (r = 0.12-0.14). In contrast, only informant reports of memory decline interfering with life were weakly and negatively associated with extraversion (r = - 0.11).

Anxiety and depression. Only one study included explored patient anxiety as a potential correlate of IRCD (Jorm et al., 1994). In this study, anxiety was measured using nine questions used in a prior study (i.e. Goldberg, Bridges, Duncan-Jones & Grayson, 1988) and found that anxiety symptoms were not associated with IRCD (Jorm et al., 1994).

Conversely, four studies explored patient depression (Gavett et al., 2011; Jorm et al., 1994; Kirkevold & Selbaek, 2015; Ross et al., 1997). Three used standardised measures of depression; the Cornell Scale for Depression in Dementia (CSDD; Alexopoulos, Abrams, Young & Shamoian, 1988), the Geriatric Depression Scale (GDS; Yesavage et al., 1983) and the Hamilton Depression Rating Scale (HAM-D; Hamilton, 1960), whilst Jorm et al. (1994) again used nine questions from a previous study (i.e. Goldberg et al., 1988).

Jorm et al. (1994) found that depressive symptoms were only positively associated with informant reports of memory decline that interfered with life. Two studies (Kirkevold & Selbaek, 2015; Gavett et al., 2011) concluded that patient depressive symptoms (using the CSDD and GDS respectively) were positively associated with IQCODE score. This association was also found in a longitudinal analysis (Gavett et al., 2011). In contrast, Ross et al. (1997) found that HDRS score was not associated with informants’ ability to recognise cognitive problems. However, this study used a sample that was all of one gender (i.e. male) andculture (i.e. Japanese-American), who were recruited from a small Hawaiian island.

A fifth study explored the discrepancies in ratings of ability by patients with cognitive impairment and their informants using the IQCODE (Hanson & Clarke, 2013) and found that greater patient depression was associated with a greater patient-informant discrepancy. Although greater patient depression was associated with poorer self-reported cognitive ability, the study did not explore the association between patient depression and IRCD.

Informant Factors

Interestingly, fewer studies examined factors belonging to the informant in relation to IRCD (n = 6). Those that were investigated were categorised into those that could be considered demographic characteristics or psychological factors.

Demographic characteristics.

Two studies considered informant age as a potential correlate of IRCD (Farias et al., 2004; Jorm et al., 1994) and both concluded that there was not an association. One study included informant education level (Farias et al., 2004) and reported it was negatively associated with IRCD, such that less educated informants reported greater cognitive decline. This is inconsistent with suggestions that more educated informants may be more “sensitive to cognitive decline” (pp. 10; Ross et al., 1997). Three studies explored the association between informant gender and IRCD (Farias et al., 2004; Jorm et al., 1994; Nygaard et al., 2009). Two of these found no significant association (Jorm et al., 1994; Nygaard et al., 2009); however Farias et al (2004) reported that there was, with male informants giving disproportionately lower scores than females. When entered as a composite variable with relationship type, Nygaard et al. (2009) observed a significant association.

Psychological factors.

Carer burden. Surprisingly, only two studies explored the association between carer burden and IRCD (Nygaard et al., 2009; Persson et al., 2015). Both studies used the Relative Stress Scale (RSS; Greene, Smith, Gardiner & Timbury, 1982) and found a positive association between IRCD and carer burden. Using cut-off scores of 23 (i.e. low risk) and 30 (i.e. high risk) for the RSS, Nygaard et al. (2009)

further grouped informants into those who were at high-risk or low-risk of psychiatric morbidity, and concluded that IQCODE score significantly differed between risk-groups. Further, burden was found to interact with patient-informant relationship and informant gender, in that being a female spouse interacted with burden to statistically predict IRCD (Nygaard et al., 2009). However, many participants in this study were being assessed for a nursing home placement and so may have had care needs that potentially biased results.

Psychological distress. Only two studies explored informant psychological wellbeing as a potential correlate of IRCD (Hanson & Clarke, 2013; Jorm et al., 1994). Jorm et al. (1994) found informant reports were significantly associated with informant symptoms of anxiety and depression. Using the 12-item General Health Questionnaire (GHQ-12; Goldberg, 1992), Hanson and Clarke (2013) found that greater psychological distress was associated with a lower IQCODE score in the overall sample, but not in a dementia-only sample; a finding which authors suggest might have been related to the underpowered nature of the study.

Relationship Factors

Several studies examined factors pertaining to the patient-informant relationship (n = 8). These factors included relationship type, relationship quality and frequency of contact.

Type of relationship. Most studies considered the relationship between patient-informant relationship type and IRCD (Farias et al., 2004; Kemp et al., 2002; McLoughlin et al., 1996; Nygaad, Naik & Geitung, 2009; O'Connor et al., 1989; Persson et al., 2015; Ross et al., 1997). Two found a significant association between relationship type and IRCD as measured by the IQCODE (Nygaard et al., 2009; Persson et al., 2015). However, Persson et al. (2015) found spouses reported greater cognitive decline, whilst Nygaard et al. (2009) concluded spouses reported lower cognitive decline than non-spouses. In the latter, relationship type was found to interact with informant gender in predicting IQCODE score (Nygaard et al., 2009).

In contrast, two studies observed no association between relationship type and IRCD (via the IQCODE and CAMDEX informant interview respectively) (Farias et al., 2004; O'Connor et al., 1989). Kemp et al. (2002) found that relationship type was not predictive of informants underreporting or overreporting cognitive difficulties on the CAMDEX, while Ross et al. (1997) observed no difference in the percentage of informants who failed to recognise cognitive difficulties between spouses (19.2%) and non-spouses (25.3%), or sons (22%) and daughters (31%). In another study, informant report (as measured by the BDS) was found to correlate with objective scores for spouses and first-degree relatives but not second-degree relatives (McLoughlin et al., 1996). Here, informant reports of patient memory were found only to be accurate from first-degree and second-degree relatives, whilst reports of orientation were only accurate from first-degree relatives.

Frequency of contact. Two studies included frequency of contact as a potential correlate of informant accuracy (Kemp et al., 2002; McLoughlin et al., 1996). In the latter, informants were grouped into those that, (1) lived with the patient, (2) had contact one to seven days a week or (3) had contact less than one day a week. Frequency of contact here was associated with informant report accuracy; with only those living with the patient giving reports of cognitive decline associated with objective tests. Conversely, Kemp et al (2002) grouped informants into those who (1) lived with the patient, (2) saw the patient four to seven times a week, (3) one to three times a week and (4) every two to four weeks, and concluded that frequency of contact was not associated with informants underreporting or overreporting of cognitive difficulties. In considering the current review's quality criteria, this study was rated as "commendable", whilst the previous study was rated as "marginal". Nevertheless, both studies used objective measures as the "gold standard", which have in some cases been reported as less accurate than informant reports, and excluded potentially important confounding variables (Kemp et al., 2002; McLoughlin et al., 1996).

Quality of relationship. Hanson and Clarke (2013) explored expressed emotion (i.e. the attitudes of individuals towards a family member encountering marked cognitive difficulties) in the context of the discrepancy between self-reported and informant-reported cognitive ability. Using the Five-Minute Speech Sample (FMSS; Magana et al., 1986) as a measure of expressed emotion, and after adjusting for patient depression (i.e. GDS) and informant distress (i.e. GHQ-12), Hanson and Clarke (2013) found that expressed emotion was not associated with IRCD. However, expressed emotion was associated with the discrepancy between self-reported and informant-reported decline (as captured by the IQCODE), which the authors suggest may reflect where an informant is more critical or emotionally over-involved.

Discussion

The present review identified several studies that explored the association between non-cognitive factors and IRCD. It provides some evidence that is consistent with the possibility that various patient and informant factors, are associated with informant reports of cognitive decline in older adults.

Summary of Findings

Using predefined quality criteria (Appendix D), only one of the studies included in the review was rated as "commendable", whilst nine were rated as "acceptable" and three were rated as "marginal". The study that was subjectively rated as “commendable” (Kemp et al., 2002) was rated as such given it was an appropriately powered and consecutively sampled prospective cohort study, which used a control group, validated standardised measures and multivariate statistical analysis. However, most of the studies rated as “acceptable” lacked control groups, used cross-sectional designs, opportunistic sampling and did not compare participants who took part with those who did not. Those rated as “marginal” had an inadequate sample size, did not use multivariate analysis or adjust for other potential predictors of the outcome variable and did not provide sufficient detail about the sample or it’s selection. Overall, the studies informing this review are of suboptimal quality and so the review’s findings must be considered in this context.

Notably, more studies explored patient factors than informant factors. This is surprising in light of prior literature, which speculates that informant characteristics likely influence reports of cognitive decline (Jorm, 1996), and highlights the importance of understanding the characteristics of reliable informants (Neumann et al., 2000; Ready, Ott & Grace, 2004).

Patient factors. The review found some evidence to support an association between IRCD and patient demographic characteristics, such as age (Farias et al., 2004; Jorm et al., 1994; Kirkevold & Selbaek, 2015; Nygaard et al., 2009; Persson et al., 2015; Ross et al., 1997) and education (Farias et al., 2004; Kemp et al., 2002; Persson et al., 2015; Ross et al., 1997).

This latter association is surprising given the use of informant report as a means of minimising the influence of pre-morbid functioning (Jorm, 2004), but might be explained by pre-morbid functioning shaping patient activities so that informants are more or less able to recognise deficits.

Unexpectedly, in light of this finding, the review found little evidence for an association between IRCD and patient occupation (Jorm et al., 1998; O’Connor et al., 1989). It is worth noting however, that both these studies had substantial methodological limitations and one (O’Connor et al., 1989) was rated as “marginal” quality. No evidence was found for an association between IRCD and gender (Farias et al., 2004; Kirkevold & Selbaek, 2015; Nygaard et al., 2009), whilst some was found for a relationship with ethnicity (Potter et al., 2009) or ethnicity and language (Farias et al., 2004). Minority groups were reported to have higher informant ratings of cognitive decline, fitting with research that suggests that minority groups are at greater risk of developing dementia (Gurland et al., 1999), and the idea that caring practices and perceptions of older adults differ across cultures (Ross et al., 1997; Yaffe et al., 2002). This finding is also interesting in the context of the perception that objective measures of cognitive functioning (e.g. MMSE) are not independent of ethnicity/culture (Kirkevold & Selbaek, 2015) and suggests informant reports may not provide a means around this.

Evidence was also found for associations between IRCD and dementia severity (O’Connor et al., 1989; Ross et al., 1997), diagnosis (Kemp et al., 2002; Potter et al., 2009), behavioural disturbances (Kirkevold & Selbaek, 2015; O’Connor et al., 1989; Persson et al., 2015; Ross et al., 1997), everyday functioning (Gavett et al., 2011; Kirkevold & Selbaek, 2015; Persson et al., 2015; Ross et al., 1997) and medical health (Kirkevold & Selbaek, 2015). Such findings may not be unexpected, with symptoms and behaviours displayed by patients, potentially playing a role in an informant’s ability to recognise cognitive decline or their experiences of burden. Interestingly, informant ability to detect cognitive decline may be associated with ethnicity or culture, with Potter et al. (2009) reporting African-Americans were less likely to detect differences in decline between normal functioning and cognitive impairment.

Despite this, little evidence was found for an association between anxiety symptoms and informant ratings (Jorm et al., 1994). However, there was more support, including that from a longitudinal study, for an association between depressive symptoms and IRCD (Gavett et al., 2011; Jorm et al., 1994; Kirkevold & Selbaek, 2015). One study provided support for a relationship, although weak, between patient extraversion or neuroticism, and IRCD (Jorm et al., 1994).

Informant factors. Of the informant characteristics, education level was examined in only one study, which provided some support for an association between education and IRCD (Farias et al., 2004). Although of acceptable methodological quality, this finding contradicts literature exploring the IQCODE's psychometric properties (e.g. Jorm, 2004; Jorm et al., 1996) and suggests further research in other populations and settings is needed. No support was found for an association between informant age and IRCD (Farias et al., 2004; Jorm et al., 1994) and evidence was mixed in terms of a relationship between informant gender and IRCD (Farias et al., 2004; Jorm et al., 1994; Nygaard et al., 2009).

Psychological factors pertaining to informants have been identified as important aspects to consider in determining reliable informants. Indeed, studies provided some evidence for an association between IRCD and carer burden (Nygaard et al., 2009; Persson et al., 2015) and psychological distress (Hanson & Clarke, 2013; Jorm et al., 1994), though few studies generally considered such factors. This, alongside the potential relationship between patient factors and burden, suggests further research is warranted. Interestingly, relationship type and gender interacted with carer burden to significantly predict informant ratings of cognitive decline

(Nygaard et al., 2009). These results fit with research on carer burden in dementia, which suggests that female caregivers are more likely to experience a greater degree of burden and that providing such care is more difficult for spouses (Brodaty, 2009). Only one of the studies that explored psychological distress was given a rating of “acceptable”. This found IRCD increased as symptoms of anxiety and depression increased (Jorm et al., 1994). It is plausible, as observed by Del-Ser et al. (1997), that informants might overestimate cognitive decline “due to their own anxiety and uncertainty” with the aim of “obtaining more clinical care and social support” (p. 7).

Relationship Factors. The nature of the patient-informant relationship was the most investigated variable within the studies under review, though results were inconclusive. Two studies found an association (Nygaard et al., 2009; Persson et al., 2015), whilst four studies, one rating as being of “marginal” quality, concluded that there was no association between relationship type (i.e. spouse, child, friend, other relative) and IRCD (Farias et al., 2004; Kemp et al., 2002; O’Connor et al., 1989; Ross et al., 1997). It is plausible that this might be confounded by other factors, such as frequency of contact and relationship quality (Ablitt, Jones & Muers, 2009); however, not all studies accounted for frequency of contact (e.g. Persson et al., 2015) and none considered relationship quality in their exploration of relationship type. Two studies, providing mixed evidence, explored the association between frequency of contact and IRCD (Kemp et al., 2002; McLoughlin et al., 1996); however, the study observing an association had substantial methodological limitations (McLoughlin et al., 1996). Similarly, only one study included quality of relationship and concluded that it was not associated with informant ratings (although the authors recognised it as being underpowered) (Hanson & Clarke, 2013).

General Methodological Issues

Study design. As described previously, many of the studies included in the review employed a cross-sectional design. Although the quality of a majority of these was rated as being “acceptable”, not all conducted multivariate analyses (e.g. O’Connor et al., 1989) and some did not include other potentially important variables (e.g. Nygaard et al., 2009). Nygaard et al. (2009), for example, observed that their model explained only 18% of the variance in the IQCODE. Where studies did measure factors pertaining to the informant, it is notable that none included informant cognitive ability as a potential correlate. This is surprising given that it is reasonable to assume that spouses were likely older adults themselves, which along with the prevalence of dementia in older adults, makes it possible that some may have been experiencing similar difficulties themselves. Such cognitive impairment would likely impact the validity of informant measures; highlighted by Ross et al. (1997) who excluded patient-informant dyads on the basis of informant cognitive ability. Of those that employed a prospective or longitudinal design, only one stratified its sample so that more ‘accurate’ informants acted as a control group (Kemp et al., 2002). This together limits the ability to infer causal associations within the results (Mann, 2003).

Sample. Generally, methods through which researchers determined required sample sizes were not made explicit in the studies under review. Few studies detailed a power calculation. One recognised that analyses may have been underpowered, reducing the likelihood of detecting a significant association between IRCD and potential correlates, were such an association to exist (Hanson & Clarke, 2013). Further, validity may have been compromised where sampling was not randomised. Few studies provided sufficiently detailed information on those who did not participate in the research, making it difficult to comment further on this. Only one study conducted a comparative analysis (Gavett et al., 2011), where the authors observed that those who did not participate were significantly less educated and had a lower baseline cognitive function, calling into question the external validity of findings.

It should be noted that studies used narrow inclusion and exclusion criteria, and that individuals from lower socioeconomic status and poorer educational backgrounds were potentially under-represented. In some cases, studies included only male patients (e.g. Jorm et al., 1998), spouses as informants (e.g. Hanson & Clarke, 2013) and excluded patients residing in residential care (e.g. Kemp et al., 2002), with co-morbid psychiatric diagnoses (e.g. Persson et al., 2015) and with sensory difficulties (e.g. McLoughlin et al., 1996). Although this lack of diversity may have improved internal validity, it may be unrepresentative of the older adult population accessing clinical or memory assessment services, which is largely heterogeneous with multiple morbidities (Barnett et al., 2012). In light of these factors, findings must be generalised with caution.

Outcome measures. Encouragingly, most studies used standardised measures that had been validated in older adult and cognitively impaired populations. However, the range of different measures used makes it difficult to draw comparisons. Many of the studies included in this review used the IQCODE to capture IRCD. Although frequently used in clinical practice, with a plethora of support for its use in research (Harrison et al., 2014; Jorm, 2004; Quinn et al., 2014), as a self-report tool the IQCODE is likely to be vulnerable to various biases. Further, several of the measures of other factors (i.e. ADL) were also completed by the informant, calling into question whether any associations found between these factors were impacted by them not being independently measured (Kirkevold & Selbaek, 2015).

Where the discrepancy between IRCD and the change in an objective measure of cognitive functioning was reported, it is possible that the length of the study (i.e. 3.5 years) may have impacted any associations observed with the IQCODE, which considers current functioning, across several discrete areas, as compared to that of 10 years ago (Gavett et al., 2011).

Clinical Implications

The studies included in this review provide evidence that non-cognitive factors, pertaining to both patients and informants, are associated with IRCD. These findings are consistent with the possibility that factors other than patient cognitive functioning may influence informants' perceptions of patient decline. National guidelines recommend the inclusion of informant reports of cognitive decline within the memory assessment process (BPS & RCP, 2007). As such, informant information plays a pivotal role in the assessment and diagnosis of dementia, and as such, the findings of this review hold potentially important clinical implications.

Evidence that IRCD may be shaped by factors other than those relating to patient cognitive functioning may suggest that informant ratings are not a valid or reliable means of obtaining such information. This could be of particular interest, since the use of informant information in the assessment of dementia has been suggested as a means of overcoming limitations of objective measures of cognitive functioning, particularly with regard to being potentially biased by patient educational level and physical ability (MacKinnon & Mulligan, 1998). Indeed, informant information has been suggested to be useful where the validity of objective cognitive assessments normative sample and cut-off scores are called into question, such as where patients pre-morbid functioning is well above or below average. Although this review provides evidence only for associations between IRCD and non-cognitive factors, it does lend support to concerns about the use of informant reports in clinical and memory assessment services, where such information, if unreliable, could lead to patients receiving inaccurate diagnoses, inappropriate referrals (i.e. further testing, support services) and further cost to services.

Potential relationships between patient and informant psychological wellbeing and informant information, highlight the importance of the assessing clinician taking such factors into consideration. As highlighted by WHO (2016), mental health difficulties in older adults often go unrecognised by clinicians, and older adults themselves, related perhaps to the stigma surrounding mental health difficulties and them coinciding with other problems. This may be particularly poignant where informants have difficulties in distinguishing organic cognitive difficulties from depression, and highlights that there may be some room for improvement in terms of the awareness and identification of psychological distress in older adults. Similarly, the potential association between informant psychological wellbeing and their reports of cognitive decline highlights the potential for the commissioning of greater support for informants or carers both during and after memory assessment processes.

Research Implications

Although this review recognised that the existing literature has investigated a multitude of factors in relation to IRCD, further research is warranted. In particular, research utilising multivariate analyses is warranted, to explore the relative contributions of non-cognitive factors in explaining the variance in IRCD.

Future research might also aim to unpick the relative associations of relationship factors (type of relationship, quality and frequency of contact) on informants’ perception and recognition of patient cognitive decline. Further, studies should include more potentially important informant-related variables, such as age and cognitive ability. Specifically, further investigation of of the association between informant burden on perceptions of cognitive decline is warranted, which may also further understanding of the relationship between patient functioning and psychological wellbeing, and informant reports.

Additionally, the review highlighted the lack of studies using a prospective or longitudinal design. Longitudinal studies that aim to investigate relationships between identified variables and IRCD would be helpful in making conclusions regarding causality. Further, the lack of studies with a sufficiently large and representative population sampled randomly or consecutively, is something that future research could address.

It is worth noting that most studies were conducted in the USA, New Zealand or Norway, potentially limiting the generalisability of results to the UK. Further research may be needed to ascertain patient and informant correlates of IRCD in the memory assessment process in the UK wherein informant reports are routinely used. None of the studies described service user involvement in the research process, which in line with national guidance (National Institute for Health Research, 2012), should be addressed.

Conclusions

The present review identified 13 peer-reviewed journal articles, which explored the associations between non-cognitive patient and informant factors with IRCD in older adults. Despite the paucity of research in this area, and the methodological limitations inherent within the studies reviewed, the review provided some evidence for associations between informant-reported cognitive decline and demographic characteristics (patient age, education and ethnicity, informant gender), clinical factors (dementia severity, diagnosis, behavioural disturbance, everyday functioning) and psychological factors (patient depressive symptoms, patient neuroticism, informant psychological distress, informant burden). Evidence for an association with factors pertaining to the patient-informant relationship was inconclusive. Given the use of informant reports in cognitive assessment, and the importance of such reports being reliable, these findings have potentially important clinical implications. Further research is required however before definitive conclusions about what makes a reliable informant can be drawn.

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MAJOR RESEARCH PROJECT

SECTION B:

EMPIRICAL REPORT

Informant-Reported Cognitive Decline in Dementia Assessment: Associations with Subjective Burden

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Abstract

Objectives: Gaining an informant's perspective on cognitive decline has become an increasingly popular and recommended practice in the assessment of dementia. However, concern regarding the accuracy of such reports has been documented. The current study aimed to explore factors that are associated with such reports, with a particular focus on informant burden.

Design: Using a cross-sectional, single-group design, routinely collected data from 82 patient-informant dyads within a memory assessment service were analysed. Univariate and multivariate analyses explored associations between informant-reported cognitive decline, demographic characteristics and clinical variables (including burden).

Results: None of the demographic characteristics explored were associated with informant-reported cognitive decline. Informant reports were associated with patient cognitive functioning, as assessed by a standardised psychometric measure, and the final outcome of the assessment. Patient affective state and informant-reported burden interacted in influencing informant-reported cognitive decline. Informant-reported burden did not mediate the relationship between informant-reported cognitive decline and patient performance on a standardised psychometric measure.

Conclusions: Findings suggest that informant subjective burden predicts informant-reported cognitive decline, and that patient affective state interacts with subjective burden in doing so. Clinical and empirical implications are discussed.

Key terms: *Dementia, Cognitive Impairment, Cognitive Assessment, Informant, Burden*

Informant-Reported Cognitive Decline in Dementia Assessment: Associations with Subjective Burden

With over 800,000 people formally diagnosed, and an estimated annual cost of £26 billion a year in the UK, dementia is a common and serious condition (Prince et al., 2014). Defined as a clinical syndrome, dementia describes a set of symptoms resulting from underpinning diseases of the brain, which cause irreversible decline in intellectual, social, physical and psychological functioning. As a result, people living with dementia often require high levels of support (Department of Health; DoH, 2009; Frank et al., 2006), which is commonly provided by informal carers, such as spouses and adult children (Etters, Goodall & Harrison, 2007). As such, dementia has been recognised as having a profound impact on individuals and their wider systems (Van Der Lee, Bakkerb, Duivenvoordenc & Dröesd, 2014).

Assessment and Diagnosis

In light of estimates that the prevalence of dementia is set to rise to 1.4 million people in the next 30 years, improvements in dementia diagnosis and care have been highlighted as a national priority (DoH, 2012). Subsequently, an increase in specialist memory assessment services has been observed; these comprising multi-disciplinary teams commissioned to offer timely, accurate assessment and diagnosis (DoH, 2009; NHS Information Centre, 2011; Royal College of Psychiatrists; RCP, 2013). Assessments carried-out within such services typically comprise standardised psychometric measures, assessments of everyday functioning and mental state, neuro-imaging and a comprehensive client history (BPS & RCP, 2007). A dementia diagnosis is subsequently made where there is evidence of a decline in memory and other cognitive abilities that has been present for at least 6 months, a preserved awareness of the environment, and a change in emotional control, motivation or social behaviours (WHO, 1992). As such, decline in cognitive functioning over time is a key feature of the dementias, however the potential bias within self-report information has led to informant reports being increasingly utilised, with their use recommended in national guidelines (Jorm & Korten, 1988; Quinn et al., 2014).

Informant-Reported Cognitive Decline

In practice, informant-reported cognitive decline is gathered through either informal interviews or standardised self-report questionnaires. Frequently used to this end, and with good psychometric properties (Harrison et al., 2014), the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE; Jorm & Jacomb, 1989) invites informants to consider the identified patients’ cognitive functioning in everyday life compared to their functioning 10 years ago. Research has suggested that such reports are largely unaffected by patient education, pre-morbid functioning and physical ability, and may be able to detect earlier symptoms of dementia than objective tests (Jorm, 2004; McLoughlin et al., 1996). However, informant reports of other aspects of patient functioning have been suggested to be influenced by various demographic and clinical characteristics (Neumann et al., 2000; Snow et al., 2005). Further, studies have observed that informants do not identify cognitive problems in 21% of patients subsequently diagnosed with dementia (Ross et al., 1997) or in line with reports given by clinicians (Kemp, Brodaty, Pond & Luscombe, 2002). As such, it has long been speculated that non-cognitive factors, such as patient and informant characteristics, may bias informant-reported cognitive decline (Jorm, 2004).

Factors Associated with Informant-Reported Cognitive Decline

Despite the importance of understanding factors that may influence informant-reported cognitive decline, which in part can inform a diagnosis of dementia, relatively few studies have investigated this. Studies to date have provided some evidence for an association between informant-reported cognitive decline and demographic characteristics (i.e. informant education, gender, patient age, education, ethnicity), factors pertaining to the informant-patient relationship (i.e. nature of the relationship, frequency of contact) and clinical factors (i.e. dementia severity, diagnosis, behavioural disturbance, everyday functioning) (Farias, Mungas, Reed, Haan & Jagust, 2004; Gavett, Dunn, Stoddard, Harty & Weintraub, 2011; Hanson & Clarke, 2013; Kemp et al., 2002; Kirkevold & Selbaek, 2015; Persson et al., 2015; Potter et al., 2009). Fewer studies have explored psychological factors, however those that have provide some evidence for an association between informant-reported cognitive decline and patient depressive symptomatology (Gavett et al., 2011; Kirkevold & Selbaek, 2015) and informant psychological distress (Hanson & Clarke, 2013). Further support has come from studies focussing on the psychometric properties of the IQCODE (see Jorm, 2004 for review).

Informant subjective burden. As described by Zarit et al. (1986), burden is "the degree to which a carer's emotional or physical health, social life or financial status suffer as a result of caring" (pp. 261). Defined heterogeneously, burden can be understood as the factual requirements and repercussions of care on the carer's life (objective burden), or the subjective perception of and emotional reaction to the impact of caring (subjective burden; Carretero, Garces, Rodenas & Sanjose, 2009). Providing care within the context of dementia is understood to be associated with psychological problems, such as depression, anxiety, stress, and physical health issues for carers (van der lee et al., 2014). The relationship between caring for an individual with dementia, burden and physical and mental health, can be understood in terms of stress through the Pearlin Stress Process Model, which positions burden as a result of the context (e.g. demographics), external "stressors" (e.g. experience of caring) and the carer’s internal states (e.g. self-efficacy) (Pearlin, Mullan, Skemple & Skaff, 1990; Pearlin, Turner & Semple, 1989). Research supports this, with informant characteristics (age, gender, socioeconomic status) and informant-patient relationship characteristics (the nature of the relationship, frequency of contact) found to be associated with burden (International Psychogeriatric Association, 2002; Navaie-Waliser, Spriggs & Feldman, 2002). Further, burden in the context of caring is associated with abuse and untimely moves to residential or nursing care settings for individuals with dementia (Carretero et al., 2009). In a single case study, Burke and McNeilly (2002) highlight the potential role of burden on informant reports of patient cognitive functioning; specifically, the negative consequences that this may have for patients, carers and services.

Indeed, burden has been proposed in the literature as likely to influence informant reports (Jorm, 1996; Kemp et al., 2002). This is plausible when considering the relationship between burden and psychological distress, and the underpinnings of psychological distress according to cognitive theory. Here, different affective states (e.g. depression, anxiety) are associated with cognitive biases, which distort information processing and perception (Beck, 1964; Williams et al., 1997). By means of biases in attention, interpretation and in the retrieval of memories, it is possible that informant burden may be associated with informant-reported cognitive decline in that it biases the informant’s perception of patient cognitive functioning.

However, to date, few studies have explored this association. Two such studies, both conducted in Norwegian outpatient departments and both using the Relative Stress Scale (RSS) to assess informant burden (Nygaard, Naik & Geitung, 2009; Persson et al., 2015), found a significantly positive association with informant-reported cognitive decline (as measured by the IQCODE). A third study, exploring the utility of specific measures in an Australian memory clinic, found that informant-reported cognitive decline was positively associated with burden (as measured by the 29-item Zarit Burden Interview) (Stratford et al., 2003). Most recently, Persson et al. (2015) found that the negative association between IQCODE and the MMSE decreased when carer burden was controlled for. However, the nature of this interaction was not explored further and none of the studies explored the role of patient affective state in these associations. It is plausible that patient psychological symptoms act as additional external stressors, and increase feelings of burden, in accordance with the Pearlin Stress Process Model. This is supported by research that shows the frequency of anxiety, depression, delusions and irritability symptoms are positively associated with burden (Huang et al., 2012) and that depression, hallucinations and irritability symptoms are significant predictors of burden (Torrisi et al., 2016).

Aims of the Current Study

In endeavouring to address gaps within the existing empirical evidence base, the current study aimed to (1) explore associations between informant-reported cognitive decline, a standardised psychometric measure and the diagnostic outcome of the memory assessment process, and (2) explore the associations between demographic and clinical factors with informant-reported cognitive decline. Further understanding of associations (or lack thereof) may have implications for clinical practice in terms of the use of informant-reported cognitive decline within the context of dementia assessments. Specifically, it was hypothesised that:

1. In line with previous research (e.g. Persson et al., 2015), informant-reported cognitive decline would be significantly associated with a) scores

on a standardised psychometric measure completed by the identified patient, and associated with (b) the outcome of the assessment process;

2. Informant subjective burden would be significantly associated with informant-reported cognitive decline, consistent with the evidence base (e.g. Nygaard et al., 2009);
3. Patient affective state (symptoms of anxiety and depression) would be significantly associated with informant-reported cognitive decline, as suggested by past studies (e.g. Kirkevold & Selbaek, 2015);
4. It was speculated that informant subjective burden and patient affective state would interact with one another to influence informant-reported cognitive decline;
5. Informant subjective burden would significantly mediate any association between patient cognitive functioning (as measured by a standardised psychometric measure) and informant-reported cognitive decline, in keeping with theory relating to psychological distress and cognitive bias.

Methods

Design

The study employed a single-group, cross-sectional design, within which data from patient-informant dyads (as routinely collected within a memory assessment service) was collated and retrospectively analysed using quantitative methods.

Setting

The present study took place within a specialist memory assessment service, wherein the term “patients” was used to describe individuals presenting with suspected cognitive difficulties (thought to potentially be in keeping with MCI or dementia) referred for assessment, and the term “informants” used to describe individuals providing formal or informal care to the identified patient. Consecutive sampling was used to collate data from patient-informant dyads that had engaged in routine assessment processes over a two-month period. Data sets were omitted from the study where (1) an informant was not available or elected not to provide information (i.e. no informant measures were completed) or (2), the patient had not completed all aspects of the assessment process (i.e. was unable to complete the objective measure of cognitive functioning, due to hearing or visual impairment). Drop out was therefore not an issue as only data sets from those who had elected to take part were included.

Procedure

Subsequent to a referral from their GP, patients engaged in a routine assessment during which they completed a standardised psychometric cognitive screening measure and a self-report measure of affective state, verbally administered by a Community Mental Health Nurse. Concurrently, informants completed a proxy measure of cognitive decline and a self-report measure of subjective burden. Prior to the aforementioned assessment, the nurse assessed the patients’ mental capacity and sought informed consent to store their data (this to be made available to the direct care team) on the NHS Trusts electronic record system. Anonymised data was subsequently made available to the researcher for analysis.

Ethical Considerations

Permission to undertake the current study was obtained from a local NHS research ethics committee (Appendix E) and the trust’s research and development department (Appendix F). At the point of referral into the service, patients engaged in a comprehensive clinical interview with a nurse, with an emphasis on pre-diagnostic counselling. Both capacity and consent were carefully considered. During the assessment itself, consent was sought from patients and informants for their data to be used in research initiatives. Where individuals gave consent, data were extracted by a member of the direct care team and anonymised by assigning a randomly generated code to ensure confidentiality. Data collected were stored in accordance with Caldicott Principles (The Caldicott Committee, 1997) and the British Psychological Society's Code of Ethics and Conduct (BPS, 2009).

Measures and Variables

Informant-reported cognitive decline. Informant information regarding patients' cognitive decline was obtained by means of a short-form version of the Informant Questionnaire of Cognitive Decline in the Elderly (IQCODE; Jorm, 1994) (Appendix G). Comprising 16-items, the IQCODE requires an informant to consider current cognitive functioning as compared to 10 years prior. Items are answered on a 5-point scale, from 1 “much improved” to 5 “much worse”, and an overall score of 1-5 (with higher scores indicating greater impairment) arrived at by averaging scores (Jorm, 2004). Cut-off scores used in community samples have ranged from 3.3-3.6, however most clinicians accept scores above 3.44, as a compromise of sensitivity (100%) and specificity (86%; Harwood et al., 1997; Jorm, 2004).

The unabbreviated (26-item) version of the IQCODE has been recognised as providing high internal consistency ($\alpha = 0.95$) in the general population and has been shown to have a good test-retest reliability (0.75) over one year in a dementia population (Jorm & Jacomb, 1989). The short-form version has been shown to correlate highly with the unabbreviated version (0.98; Jorm, 1994; Jorm, 2004) and is suggested to have comparable validity to the full version when compared to clinical diagnosis (Jorm et al., 1994; Jorm, 2004). In the present study, internal consistency of the IQCODE was found to be good (Cronbach's $\alpha = 0.93$).

Subjective burden. Defined as the response to the multiple and varied stressors of caring for another, informant subjective burden was assessed through a revised version of the Zarit Burden Interview (ZBI; Zarit, Orr & Zarit, 1985) (Appendix G). Derived from an original 29-item version (Zarit, Reever & Bach-Peterson, 1980), the revised scale is frequently used in research pertaining to dementia carers (Bedard, Pedlar, Martin, Malott & Stones, 2000). Completed by the informant, the revised ZBI comprises 22 items that are answered on a 5-point scale, from 0 “Never” to 4 “Nearly Always”. Item scores are summed to give a total score ranging from 0 to 88. Higher scores indicate greater subjective burden.

Scores of less than 21 have been suggested to indicate ‘little or no burden’ and scores of 21-40 ‘mild to moderate burden’ (Hebert, Bravo & Preville, 2000; Zarit et al., 1985). Scores over 40 have been suggested to indicate ‘high burden’ (Stagg & Larner, 2015), with scores of 41-60 indicating ‘moderate to severe burden’ and scores of 61-88 indicating ‘severe burden’ (Bedard et al., 2001; Hebert et al., 2000). The revised ZBI has demonstrated high internal consistency ($\alpha = 0.89$; Zarit, Anthony & Boutselis, 1987), which has been replicated in carers of community-dwelling older adults with dementia (Herbert et al., 2000).

Cognitive functioning. Patient cognitive functioning was formally assessed using Addenbrooke’s Cognitive Examination – 3rd Edition (ACE-III; Hodges, 2012). This standardised psychometric measure assesses five cognitive domains (attention and orientation, memory, verbal fluency, language and visuospatial and constructional skills). Like it’s predecessor (i.e. the ACE-R), the ACE-III has a maximum score of 100 and two recommended age and education dependent cut-off scores for dementia diagnosis. A cut-off score of 82 has been proven to have high sensitivity (84%) and excellent specificity (100%) in detecting dementia, whereas a cut-off score of 88, has been found to offer better sensitivity (94%) but lower specificity; increasing the risk of false positives (Hseih, Schubert, Hoon, Mioshi & Hodges, 2013).

The ACE-R has demonstrated good psychometric properties; high internal consistency, good construct validity and good sensitivity (Mathuranath, Nestor, Berrios, Rakowicz & Hodges, 2000). Overall, total ACE-III scores have been shown to highly correlate with the ACE-R and show similar sensitivity and specificity (Hseih et al., 2013). The ACE-III cognitive domains have been found to correlate with standardised neuropsychological tests and shown to have good internal consistency ($\alpha = 0.88$; Hseih et al., 2013).

Affective state. Patient affective state was assessed via the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). This self-report measure comprises 14-items; with 7 items pertaining to anxiety (HADS anxiety subscale) and 7 items pertaining to depression (HADS depression subscale). Each item is answered on a scale of 0-3 and summed to give a total subscale score ranging from 0 to 21. Higher scores indicate greater symptoms of anxiety or depression. In a literature review of 747 studies, Bjelland and collagues (2002) reported most studies found an optimal balance between sensitivity and specificity when using a cut-off of 8. Accordingly, the HADS anxiety subscale (HADS-A) demonstrated a sensitivity of 0.9 and specificity of 0.78, whilst the HADS depression subscale (HADS-D) had 0.83 and 0.79, respectively.

The HADS has been suggested to perform well in identifying anxiety and depressive symptoms in the general population, mental health, physical health and primary care patients (Bjelland, Dahl, Haug & Neckelmann, 2002). Although validity and reliability estimates have not been established in a dementia population, the HADS has demonstrated adequate sensitivity and specificity amongst older adult populations (Bjelland et al., 2002), high internal consistency in individuals with Parkinson’s disease (α = 0.81-0.83; Rodriguez-Blazquez 2009), and validity in individuals with a traumatic brain injury (Dahm, Wong & Ponsford, 2013).

Other information. Relevant demographic data were extracted from electronic records (patient age, gender, ethnicity, occupation at retirement, age at leaving formal education, nature of relationship with informant). Additional information pertaining to the assessment process was also collated (type of neuroimaging, referral for further psychometric testing, outcome of assessment).

Sample Size

Prior to data extraction, power calculations were carried out to determine the number of patient records that would need to be accessed in order to detect statistically significant findings were they to exist. It was determined that a two-tailed Pearson product-moment correlation, with a significance level of $p < 0.05$, would require a sample of 82 to achieve a power of 0.80 and a large effect size (0.3; Cohen, 1992), whilst a regression equation with three predictors and a significance level of $p < 0.05$, would require a sample size of 77 to achieve a power of 0.80 and a medium effect size (0.15; Cohen, 1992). Statistical literature indicated that between 10-15 participants per predictor would achieve sufficient power in testing a regression model (Field, 2009). As such, data from patient-informant dyads was consecutively sampled until a total of 82 was achieved (i.e. a two-month period).

Sample Characteristics

The patient sample (n = 82) had a mean age of 78.8 years (SD = 8.67; Range = 53-9) and just over half were male (n = 42; 51.2%). A majority identified as white British (n = 79) and on average patients left education at 15.63 years (SD = 2.19; Range = 11-25). Most patients were working as a professional (n = 16) or craft and trades worker (n = 11) at retirement, as categorised according to the International Standard Classification of Occupations (International Labour Organization, 2012; Appendix H). Most patients underwent neuroimaging (n = 70) during the assessment process; however few were referred for further psychometric testing (n = 16). After all investigations had been completed, most patients were given a diagnosis of dementia (n = 63) or mild cognitive impairment (n = 6). One patient opted out prior to diagnosis and one was recognised as experiencing marked cognitive difficulties subsequent to depression. The remaining 11 patients’ reported cognitive changes were assessed as being in keeping with age-related processes, as there was no objective evidence for a neurodegenerative condition (Table 2).

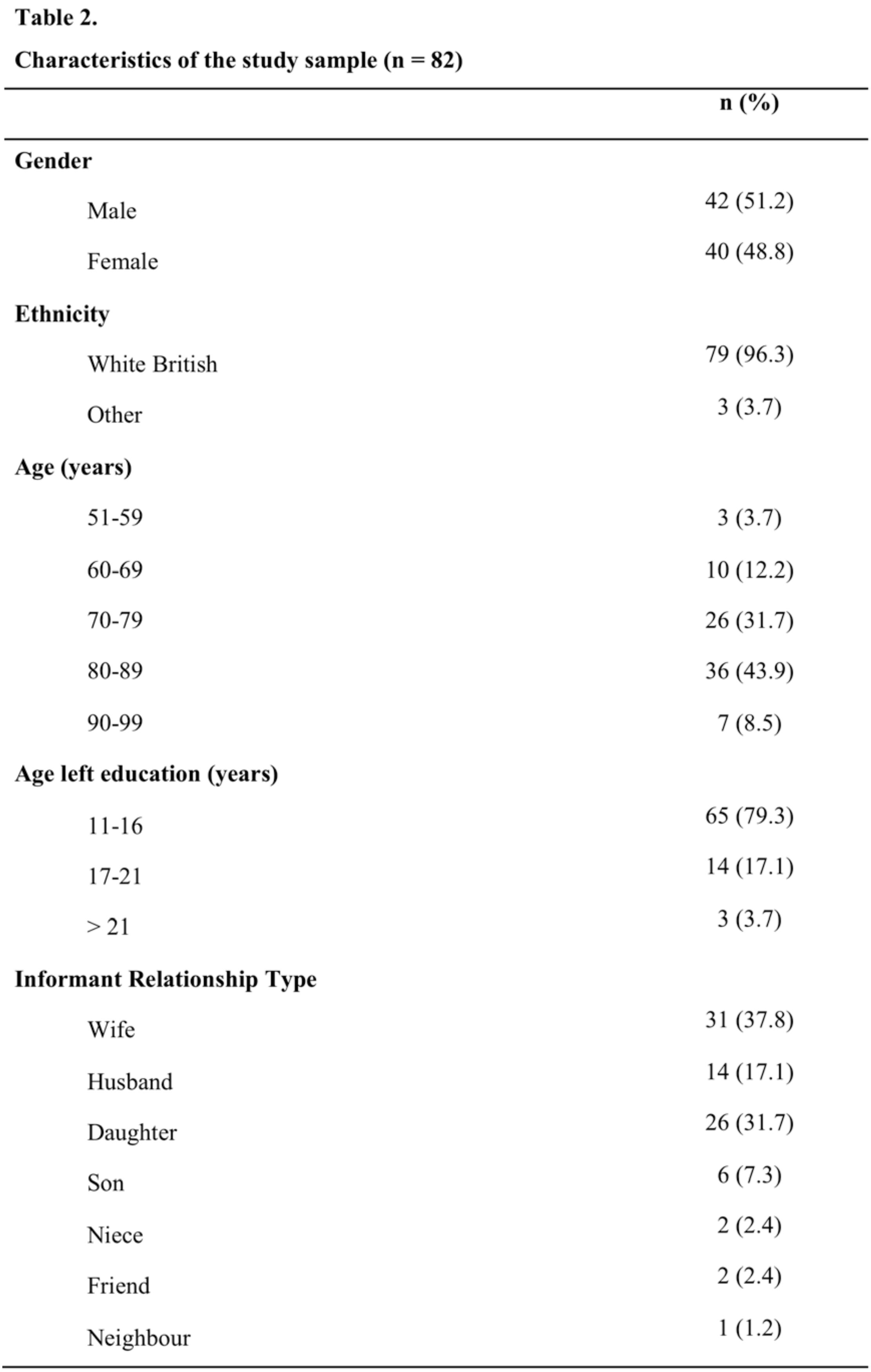


Table 2.

Characteristics of the study sample (n = 82)

	n (%)
Gender	
Male	42 (51.2)
Female	40 (48.8)
Ethnicity	
White British	79 (96.3)
Other	3 (3.7)
Age (years)	
51-59	3 (3.7)
60-69	10 (12.2)
70-79	26 (31.7)
80-89	36 (43.9)
90-99	7 (8.5)
Age left education (years)	
11-16	65 (79.3)
17-21	14 (17.1)
> 21	3 (3.7)
Informant Relationship Type	
Wife	31 (37.8)
Husband	14 (17.1)
Daughter	26 (31.7)
Son	6 (7.3)
Niece	2 (2.4)
Friend	2 (2.4)
Neighbour	1 (1.2)

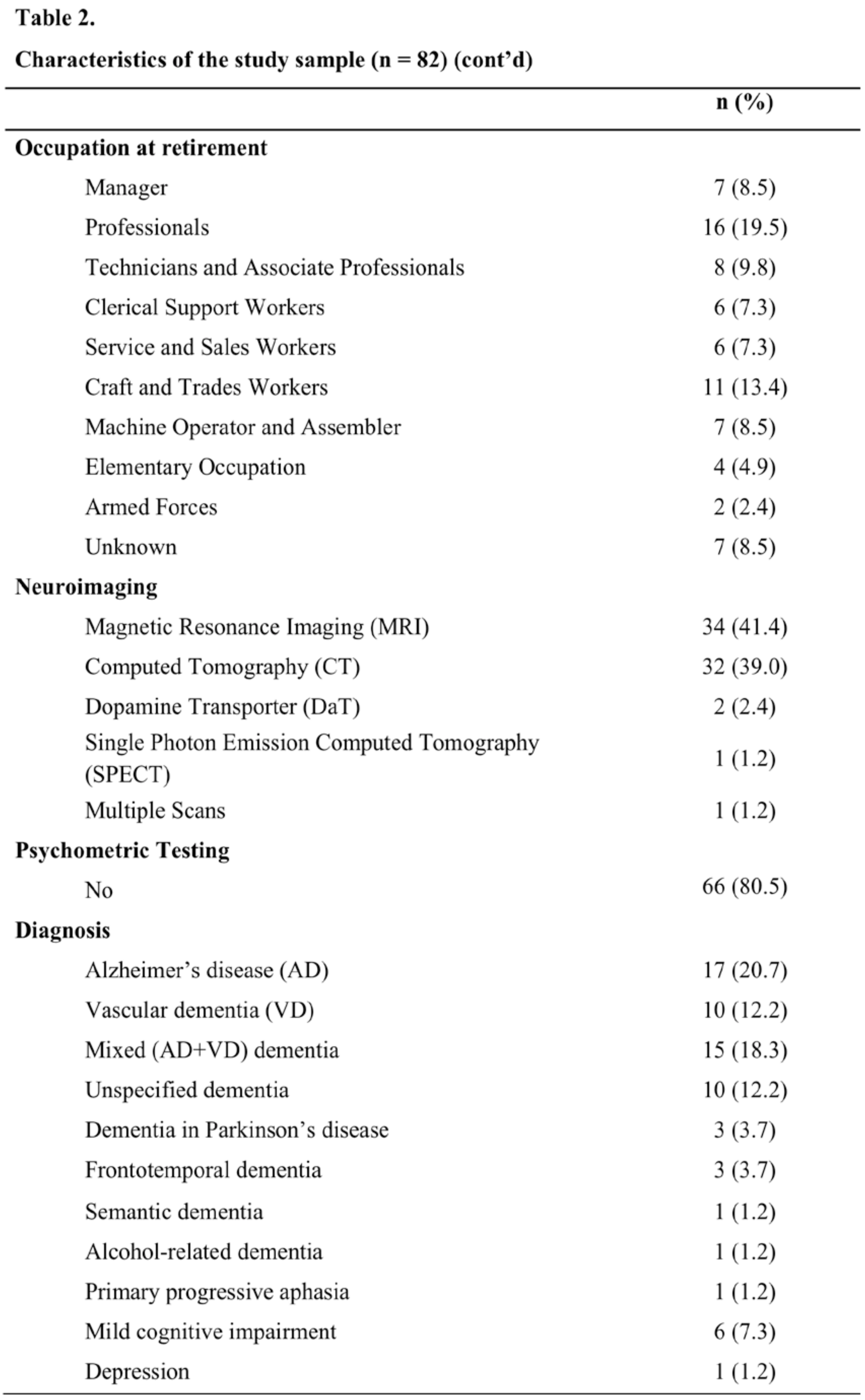


Table 2.

Characteristics of the study sample (n = 82) (cont'd)

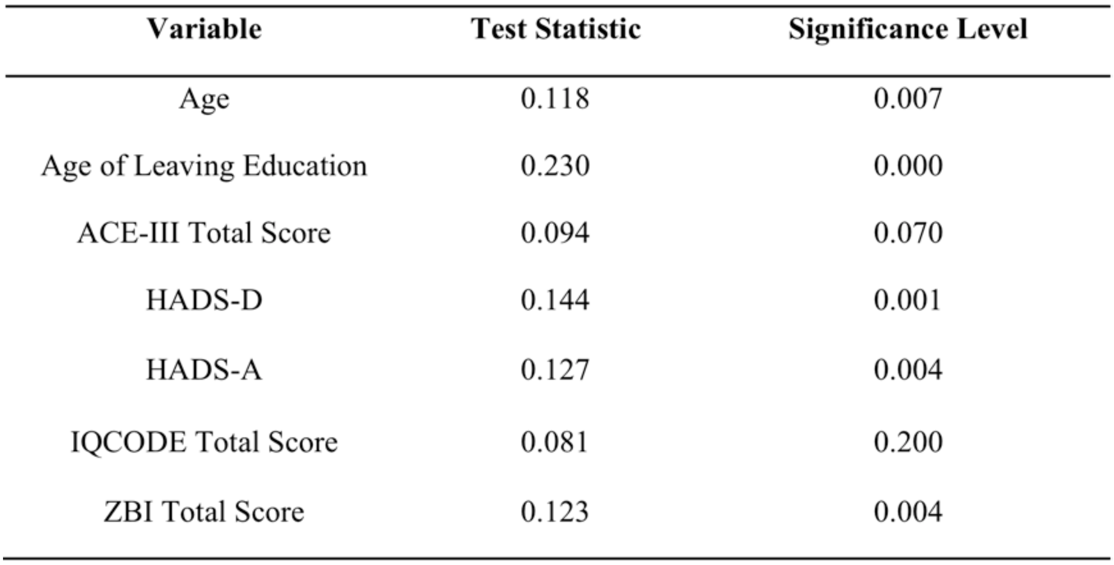
	n (%)
Occupation at retirement	
Manager	7 (8.5)
Professionals	16 (19.5)
Technicians and Associate Professionals	8 (9.8)
Clerical Support Workers	6 (7.3)
Service and Sales Workers	6 (7.3)
Craft and Trades Workers	11 (13.4)
Machine Operator and Assembler	7 (8.5)
Elementary Occupation	4 (4.9)
Armed Forces	2 (2.4)
Unknown	7 (8.5)
Neuroimaging	
Magnetic Resonance Imaging (MRI)	34 (41.4)
Computed Tomography (CT)	32 (39.0)
Dopamine Transporter (DaT)	2 (2.4)
Single Photon Emission Computed Tomography (SPECT)	1 (1.2)
Multiple Scans	1 (1.2)
Psychometric Testing	
No	66 (80.5)
Diagnosis	
Alzheimer's disease (AD)	17 (20.7)
Vascular dementia (VD)	10 (12.2)
Mixed (AD+VD) dementia	15 (18.3)
Unspecified dementia	10 (12.2)
Dementia in Parkinson's disease	3 (3.7)
Frontotemporal dementia	3 (3.7)
Semantic dementia	1 (1.2)
Alcohol-related dementia	1 (1.2)
Primary progressive aphasia	1 (1.2)
Mild cognitive impairment	6 (7.3)
Depression	1 (1.2)

Statistical Analysis

Data were analysed using SPSS Statistics Version 23.0.0.3 for Mac (SPSS Inc, 2016). Descriptive statistics were used to detail the characteristics of the study sample. Prior to detailed data analysis, Kolmogorov-Smirnov tests revealed that data pertaining to patient age, age of leaving education, HADS (A and D) and ZBI scores did not follow the normal distribution (Table 3). Z-Scores (Table 4 & 5; Appendix I) and Histograms (Figure 2; Appendix J) supported these findings. Consequently, a square-root transformation was applied to continuous data (Field, 2009), resulting in a normal distribution of data for HADS, HADS-D and ZBI scores. Data pertaining to patient age, ACE-III total, HADS-A and age of leaving education remained significantly skewed (Table 6). Accordingly, non-parametric tests were used where appropriate.

Table 3

K-S Test Results for Continuous Variables



Variable	Test Statistic	Significance Level
Age	0.118	0.007
Age of Leaving Education	0.230	0.000
ACE-III Total Score	0.094	0.070
HADS-D	0.144	0.001
HADS-A	0.127	0.004
IQCODE Total Score	0.081	0.200
ZBI Total Score	0.123	0.004

A significance of $p \leq 0.05$ indicates that data is not normally distributed

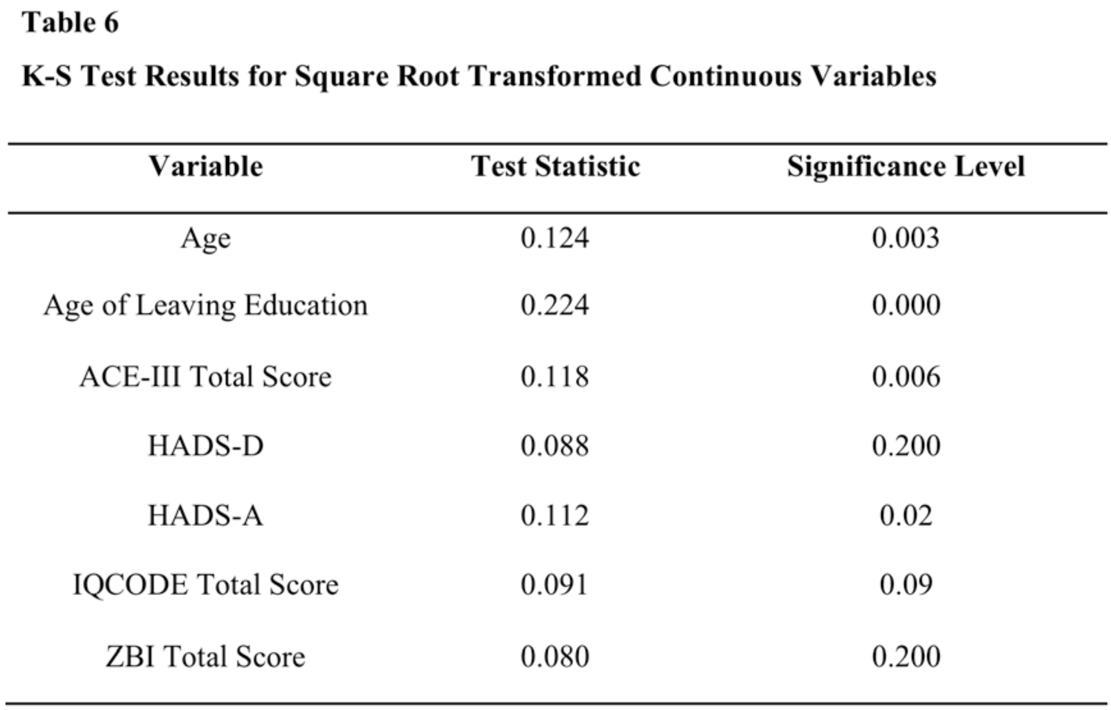


Table 6

K-S Test Results for Square Root Transformed Continuous Variables

Variable	Test Statistic	Significance Level
Age	0.124	0.003
Age of Leaving Education	0.224	0.000
ACE-III Total Score	0.118	0.006
HADS-D	0.088	0.200
HADS-A	0.112	0.02
IQCODE Total Score	0.091	0.09
ZBI Total Score	0.080	0.200

A significance of $p \leq 0.05$ indicates that data is not normally distributed

Two-tailed Pearson’s and Spearman’s Rho correlational analyses (for continuous variables), and point-biserial correlational analyses and one-way ANOVA (for categorical variables), were used to determine which, if any, variables correlated significantly with informant-reported cognitive decline. Given the lack of research in this area, two-tailed analyses were conducted, as a direction of association could not be confidently assumed.

Variables were then entered into a hierarchical regression analysis, to explore their independent, and interaction, effects as predictors. Bootstrapping techniques (Hayes, 2009) subsequently explored mediation effects. The significance level for all analyses was $p < 0.05$ and where appropriate analyses were conducted pairwise to maximise the use of available data.

Results

Descriptive Statistics

Patients had a mean ACE-III score of 71.04 (SD = 15.50; SE = 1.71; Range = 30-98). Recommended cut-off scores for ACE-III indicate that a score of less than 82 or 88 can be suggestive of the presence of a dementia. A large proportion of patients obtained a score of below 88 (84.1%) and just over three-quarters obtained a score below 82 (75.6%).

Informants rated patients as having a mean IQCODE score of 3.81 (SD = 0.59; SE = 0.06; Range = 1.20-4.87). Jorm (2004) suggests a score of 3.44 or above as being suggestive of changes consistent with dementia. Accordingly, just over two thirds of patients (67.1%) scored above this cut off.

Patients had a mean score of 4.60 (SD = 4.15; SE = 0.48; Range = 0-20) on the HADS-D and 6.23 (SD = 4.00; SE = 0.46; Range = 0-15) on the HADS-A. In line with Bjellend et al. (2002), scores above 8 were considered to suggest the presence of clinically significant symptoms of depression or anxiety. Only 18.5% of patients scored above the cut-off on the HADS-D however 34.6% of patients scored above the cut-off on the HADS-A.

The mean ZBI score was 22.88 (SD = 14.45; SE = 1.62; Range = 0-64). Using cut-off scores described by Zarit et al. (1985), just under half of informants experienced “little to no burden” (< 21), 32 experienced “mild to moderate burden” (21-40), eight experienced “moderate to severe burden” (41-60) and two experienced “severe burden” (61-88). According to the criteria set out by Stagg and Larner (2015), 87.5% of informants’ scores (n = 70) were consistent with their experiencing ‘low burden’ (≤ 40) and 12.5% ‘high burden’ (> 40; n = 10).

Factors Associated with IQCODE

For the purposes of statistical analysis, adjustments were made to relationship type groups, so that friend, niece and neighbour were collapsed into one group (n = 5) and entered into a one-way ANOVA with the following; son (n = 6), daughter (n = 26), wife (n = 31) and husband (n = 14). Diagnosis groups were also collapsed for a one-way ANOVA according to their pathological and anatomical similarities, so that PPA, semantic and FTD formed one group (n = 5), Lewy Body and Parkinsons dementia (n = 5), depression, opted out and none given (n = 13), and unspecified and alcohol-related (n = 11). Ethnicity was initially dichotomised into white British (n = 79) and other (n = 3) groups, however the low number of participants in the other group was deemed to make statistical analysis not possible.

Demographic and clinical factors. Correlational analysis indicated that gender, age and age of leaving education were not associated with IQCODE score. A one-way ANOVA indicated that neither occupation at retirement or relationship type had a significant main effect on IQCODE score. As described by Hypothesis 1, IQCODE score was found to be associated with ACE-III score, through a large negative correlation ($r = -0.62$, $p < 0.001$), and the outcome of the assessment process (diagnosis given) ($F(7, 74) = 3.23$, $p < 0.01$). Post-hoc tests indicated that IQCODE score for those not given a dementia diagnosis was significantly lower ($M = 3.28$) than the score for those who received a diagnosis of Alzheimer’s type ($M = 3.95$; $p < 0.05$), mixed ($M = 3.99$; $p < 0.05$) or unspecified dementia ($M = 4.15$; $p < 0.01$).

Informant subjective burden. Two-tailed correlational analysis supported Hypothesis 2, with informant subjective burden positively (and moderately) correlated with IQCODE score ($r = 0.50$, $p < 0.001$). Further support was found when the sample was dichotomised into those with low burden (< 40) or high burden scores

(> 40) (Stagg & Larner, 2015). Here, informants in the low burden group reported significantly lower IQCODE scores (M = 3.74, SE = 0.07) than those in the high burden group (M = 4.26, SE = 0.18, $t(78) = -2.76$, $p < 0.01$).

Patient affective state. Conversely, correlational analyses did not provide evidence for Hypothesis 3, which demonstrated that neither HADS-D nor HADS-A subscale score, were associated with IQCODE score.

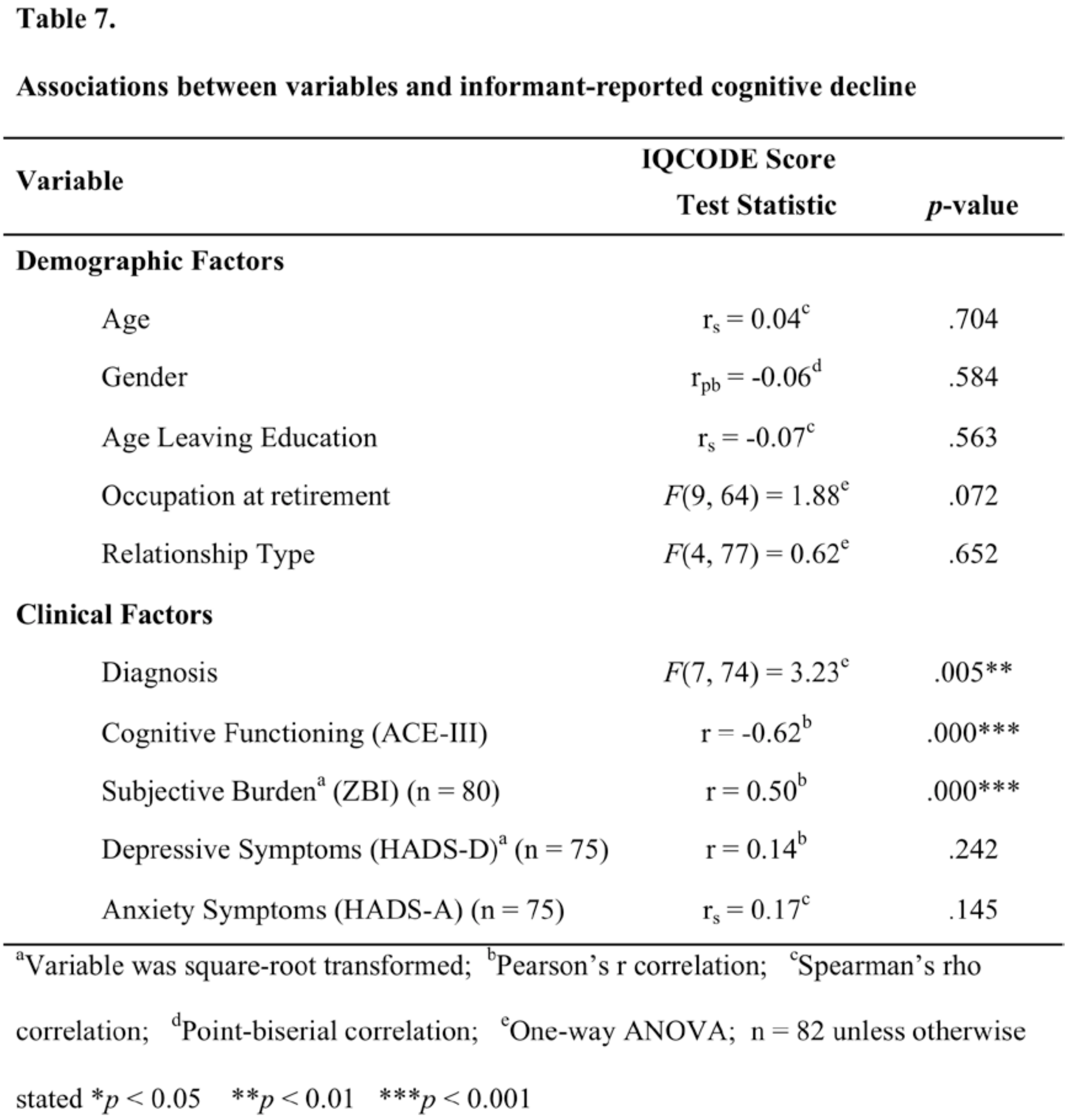


Table 7.

Associations between variables and informant-reported cognitive decline

Variable	**IQCODE Score** **Test Statistic**	***p*-value**
Demographic Factors		
Age	$r_s = 0.04$[c]	.704
Gender	$r_{pb} = -0.06$[d]	.584
Age Leaving Education	$r_s = -0.07$[c]	.563
Occupation at retirement	$F(9, 64) = 1.88$[e]	.072
Relationship Type	$F(4, 77) = 0.62$[e]	.652
Clinical Factors		
Diagnosis	$F(7, 74) = 3.23$[e]	.005**
Cognitive Functioning (ACE-III)	$r = -0.62$[b]	.000***
Subjective Burden[a] (ZBI) (n = 80)	$r = 0.50$[b]	.000***
Depressive Symptoms (HADS-D)[a] (n = 75)	$r = 0.14$[b]	.242
Anxiety Symptoms (HADS-A) (n = 75)	$r_s = 0.17$[c]	.145

[a]Variable was square-root transformed; [b]Pearson's r correlation; [c]Spearman's rho correlation; [d]Point-biserial correlation; [e]One-way ANOVA; n = 82 unless otherwise stated *$p < 0.05$ **$p < 0.01$ ***$p < 0.001$

Predictors of IQCODE

Patient cognitive functioning (ACE-III score) and informant-reported burden (ZBI score), were entered into a hierarchical multiple regression analysis with informant-reported cognitive decline (IQCODE score) as the dependent variable (Table 8). Patient anxiety and depressive symptoms were not associated with IQCODE score in correlational analysis and so not entered into this analysis.

At Step 1, cognitive functioning was included in the model and alone accounted for 38.8% of the variance in IQCODE score. This model was significant (*F*(1, 78) = 49.42, *p* < 0.001). At Step 2, informant subjective burden was included in the model. This model was significant (*F*(2, 77) = 40.74, *p* < 0.001) and explained 51.4% of the variance in IQCODE score. Informant subjective burden was a significant predictor of IQCODE score when cognitive functioning was taken into account (p < 0.001).

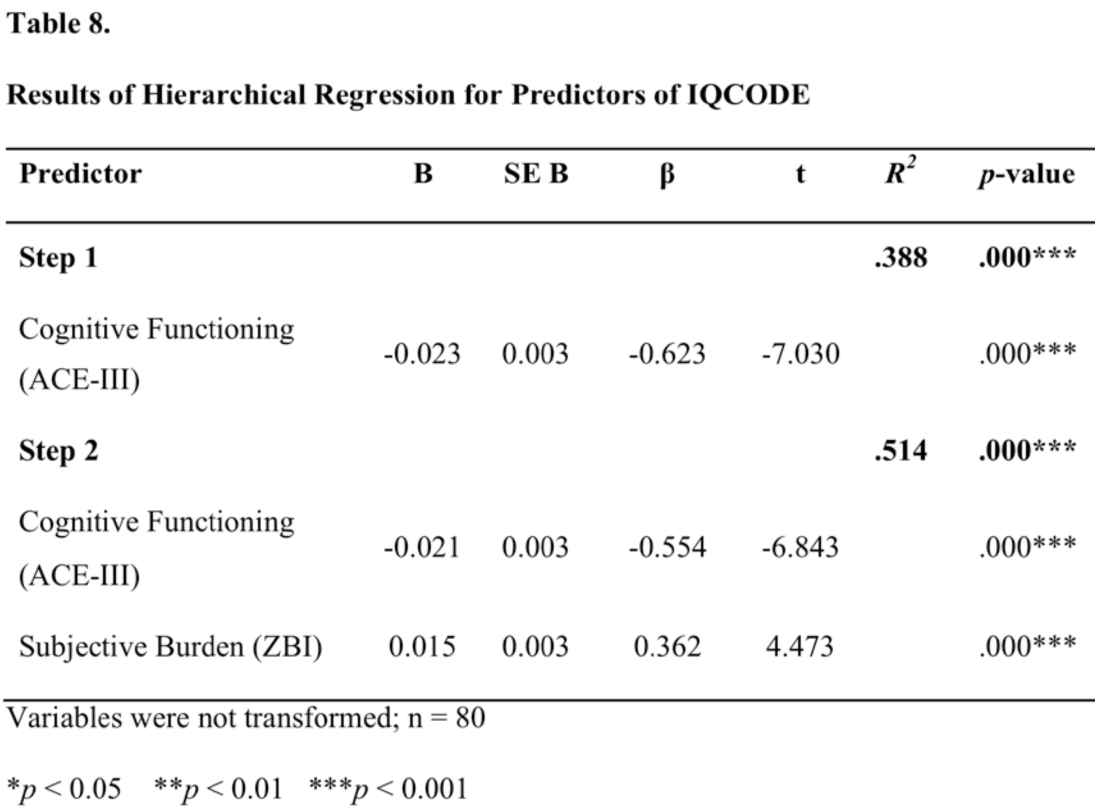


Table 8.

Results of Hierarchical Regression for Predictors of IQCODE

Predictor	**B**	**SE B**	**β**	**t**	**R^2**	***p*-value**
Step 1					**.388**	**.000*** **
Cognitive Functioning (ACE-III)	-0.023	0.003	-0.623	-7.030		.000***
Step 2					**.514**	**.000*** **
Cognitive Functioning (ACE-III)	-0.021	0.003	-0.554	-6.843		.000***
Subjective Burden (ZBI)	0.015	0.003	0.362	4.473		.000***

Variables were not transformed; n = 80

*$p < 0.05$ **$p < 0.01$ ***$p < 0.001$

Adjusted R^2 values were similar to R^2 values suggesting good generalisability of the model (Field, 2009). The Durbin-Watson statistic was close to 2 indicating that the assumption of independent errors had been met (Statistic = 2.01), whilst all variables had tolerance values above 0.2 and Variance Inflation Factor (VIF) values below 2, indicating multicollinearity did not significantly impact the model (Field, 2009).

A linear regression analysis with only informant burden entered as a predictor variable and IQCODE score as the dependent variable indicated that informant burden alone accounted for 24.5% of the variance in IQCODE score. This model was significant ($F(1,78) = 25.26$, $p < 0.001$).

Interaction Effect: Affective State and Burden

To explore whether patient affective state (HADS scores) and informant subjective burden (ZBI scores) interacted with one another in influencing informant-reported cognitive decline (IQCODE score; Hypothesis 4), two interaction terms were entered into a hierarchical multiple regression analysis with patient depressive symptoms, patient anxiety symptoms and informant subjective burden (Table 9).

At Step 1, patient anxiety symptoms, depressive symptoms and informant subjective burden were entered into the model. This model was significant ($F(3, 69) = 5.90$, $p < 0.01$) and explained 20.4% of the variance in IQCODE score. Only subjective burden contributed significantly to the model.

At Step 2, the interaction term for subjective burden and depressive symptoms was entered into the model. This model was significant ($F(4, 68) = 5.63$, $p < 0.01$) and explained 24.9% of the variance in IQCODE score. The interaction term significantly contributed to the model, however subjective burden no longer contributed significantly to the model when the interaction between depressive symptoms and burden (i.e. Burden*Depression) was taken into account.

At Step 3, the interaction term for subjective burden and anxiety symptoms was entered into the model. This model was significant ($F(5, 67) = 4.66$, $p < 0.01$) and explained 25.8% of the variance in IQCODE score. The interaction between anxiety symptoms and burden (i.e. Burden*Anxiety) did not significantly contribute to the model. The interaction between depressive symptoms and burden (i.e. Burden*Depression) no longer significantly contributed to the model when the interaction between subjective burden and anxiety symptoms (i.e. Burden*Anxiety) was taken into account.

Results suggested that patient depressive symptoms, but not anxiety symptoms, moderated the relationship between informant burden and IQCODE score. To explore this interaction effect further, data was categorised into three groups based on patient depressive symptom score (low, moderate and high) and plotted in a graph (Figure 3). This illustrated that as patient depressive symptoms increased, the strength of the positive association between informant subjective burden and informant-reported cognitive decline increased.

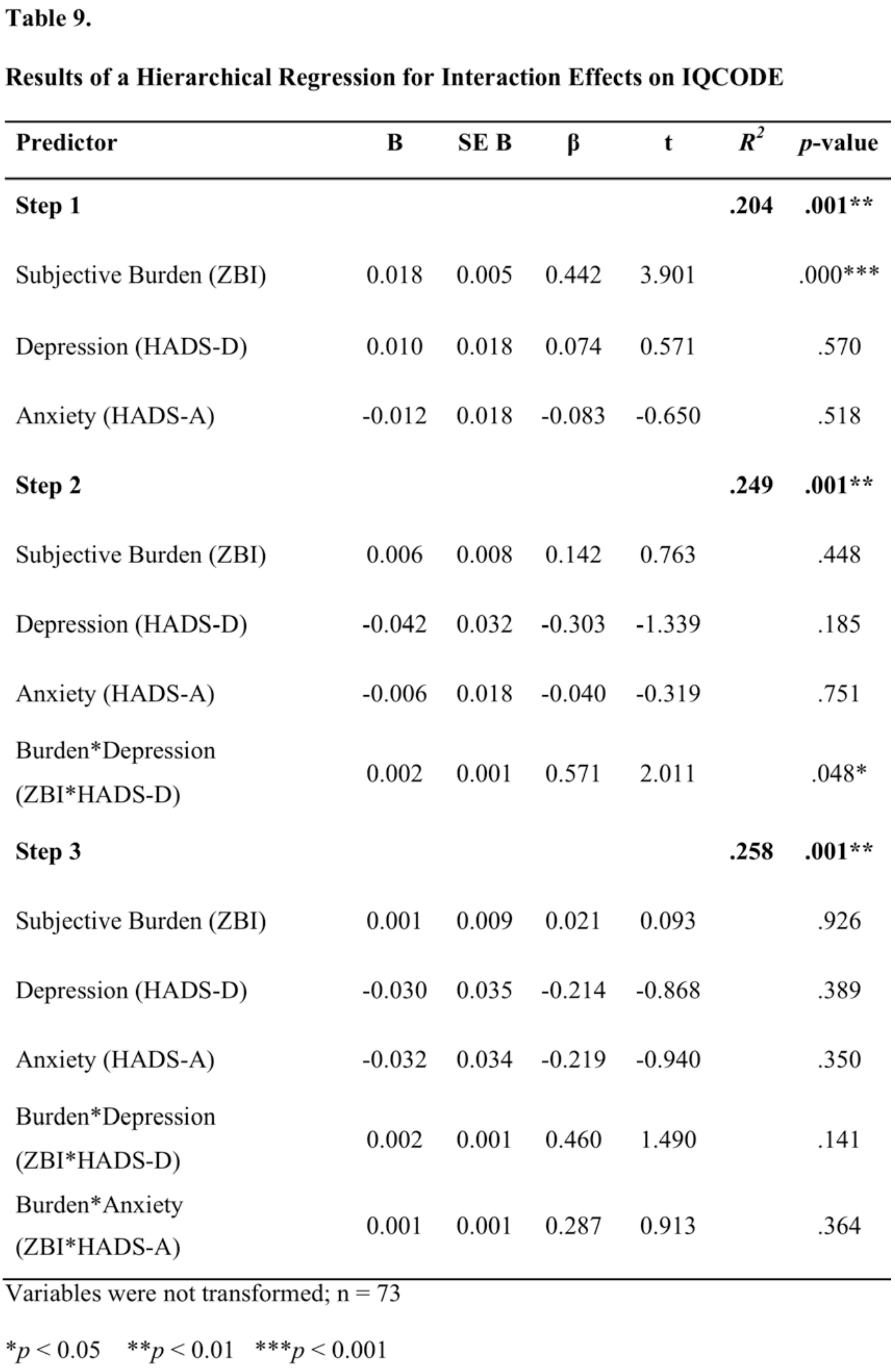


Table 9.

Results of a Hierarchical Regression for Interaction Effects on IQCODE

Predictor	B	SE B	β	t	R^2	*p*-value
Step 1					**.204**	**.001****
Subjective Burden (ZBI)	0.018	0.005	0.442	3.901		.000***
Depression (HADS-D)	0.010	0.018	0.074	0.571		.570
Anxiety (HADS-A)	-0.012	0.018	-0.083	-0.650		.518
Step 2					**.249**	**.001****
Subjective Burden (ZBI)	0.006	0.008	0.142	0.763		.448
Depression (HADS-D)	-0.042	0.032	-0.303	-1.339		.185
Anxiety (HADS-A)	-0.006	0.018	-0.040	-0.319		.751
Burden*Depression (ZBI*HADS-D)	0.002	0.001	0.571	2.011		.048*
Step 3					**.258**	**.001****
Subjective Burden (ZBI)	0.001	0.009	0.021	0.093		.926
Depression (HADS-D)	-0.030	0.035	-0.214	-0.868		.389
Anxiety (HADS-A)	-0.032	0.034	-0.219	-0.940		.350
Burden*Depression (ZBI*HADS-D)	0.002	0.001	0.460	1.490		.141
Burden*Anxiety (ZBI*HADS-A)	0.001	0.001	0.287	0.913		.364

Variables were not transformed; n = 73

*$p < 0.05$ **$p < 0.01$ ***$p < 0.001$

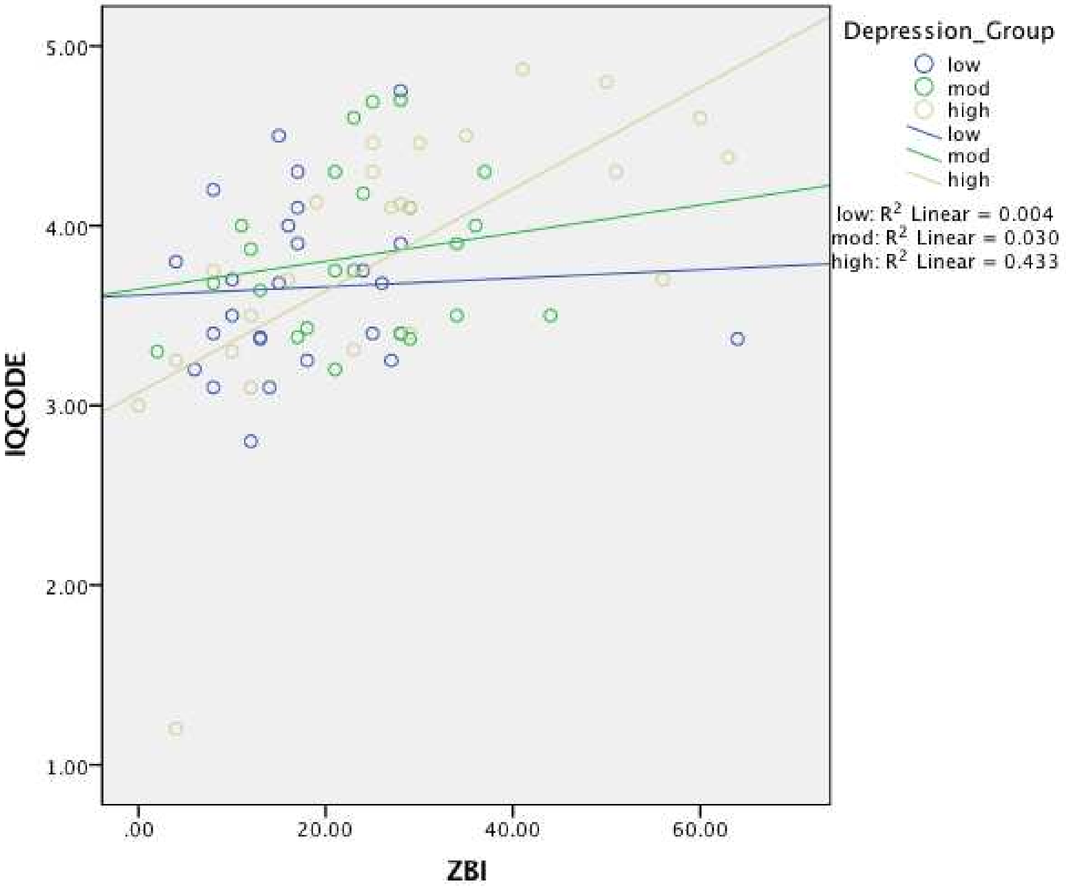


Figure 3. Patient depressive symptoms (HADS-D) as a moderator of the relationship between informant subjective burden (ZBI) and informant-reported cognitive decline (IQCODE).

Mediation Analysis

Mediation analysis was carried out to explore informant-reported burden as a potential mediator of informant-reported cognitive decline and patient cognitive functioning (Hypothesis 5). Using an SPSS macro (Preacher & Hayes, 2004), a mediational model was derived in which the indirect effect of cognitive functioning (predictor variable, X) on informant-reported cognitive decline (dependent variable, Y) through informant subjective burden (M) was tested.

In this analysis, mediation is significant if the bias corrected and accelerated confidence intervals for the indirect effect do not include zero (Preacher & Hayes, 2004). Results based on 1000 bootstrapped samples indicated that there was not a significant indirect effect of cognitive functioning on IQCODE score (*ab* = -0.003, SE = 0.002, 95% BCaCI [-0.007, 0.001]); demonstrating that informant subjective burden did not significantly mediate the relationship between cognitive functioning and informant-reported cognitive decline (Figure 4).

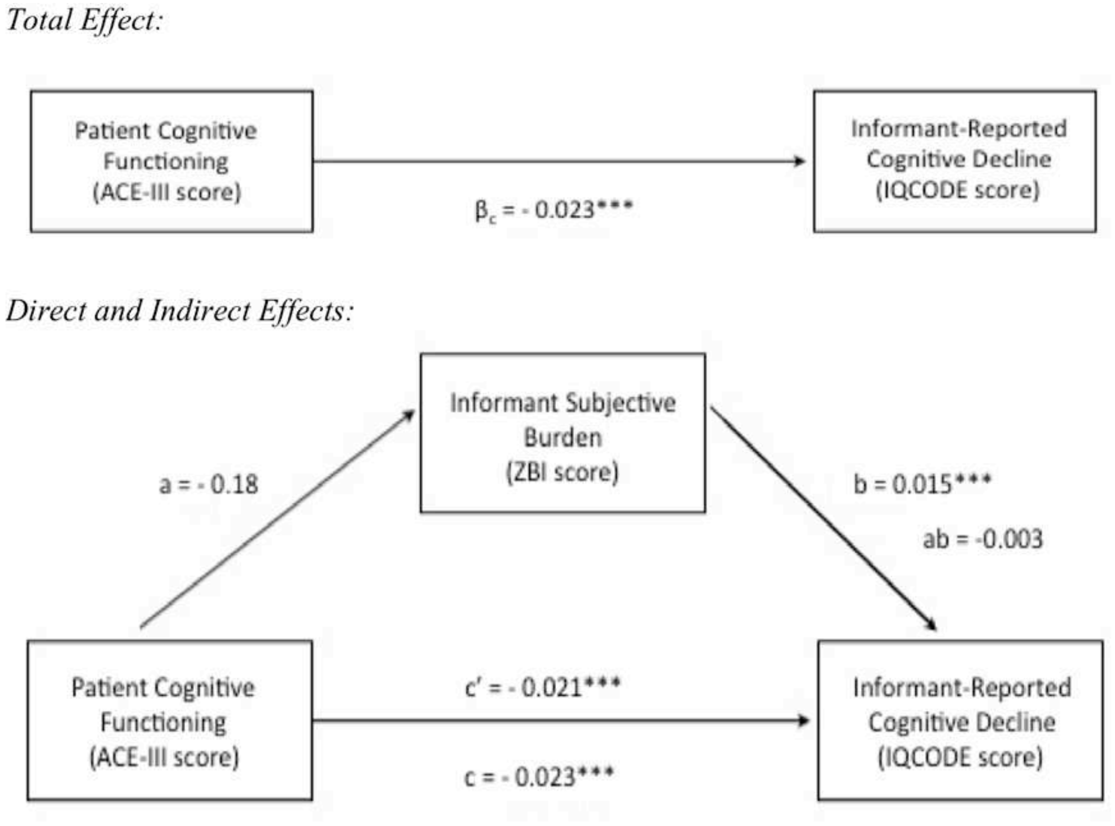


Figure 4. Subjective burden (ZBI) as a mediator of the relationship between cognitive functioning (ACE-III) and informant-reported cognitive decline (IQCODE). a = direct effect of ACE-III on ZBI; b = direct effect of ZBI on IQCODE; c = total effect of ACE-III on IQCODE; c’ = direct effect of ACE-III on IQCODE; ab = indirect effect of ACE-III on IQCODE; *$p < 0.05$ **$p < 0.01$ ***$p < 0.001$

Discussion

The current study explored associations between various clinical variables, demographic characteristics and informant-reported cognitive decline in patient-informant dyads engaged in a memory assessment for suspected dementia. The study further investigated the differential relationships between clinical variables, specifically informant subjective burden, patient cognitive functioning and patient affective state, and informant-reported cognitive decline. On conclusion of the study, a summary was made available to the ethics panel, R&D department and the site within which the sample was recruited (Appendix K).

Summary of Findings

As hypothesised, the study observed a significant association between informant-reported cognitive decline and the diagnostic outcome of the assessment process. This finding is consistent with the possibility that informant report plays an important role in the assessment of dementia and highlights the importance of understanding factors that may potentially influence the accuracy of these reports.

Support was also found for the hypothesis that informant-reported cognitive decline would be associated with patient performance on an objective measure of cognitive functioning and informant subjective burden. In contrast, none of the demographic characteristics included in the study, nor patient affective state, were found to be associated with informant-reported cognitive decline. Patient depressive, but not anxiety symptoms, were however found to moderate the relationship between informant subjective burden and informant-reported cognitive decline. Unexpectedly, informant subjective burden did not mediate the relationship between patient cognitive functioning and informant-reported cognitive decline.

Patient cognitive functioning. According to informant reports, 67.1% of patients (n = 55) were experiencing cognitive decline suggestive of dementia. This was slightly below (75.6%; n = 62) those who met the criteria for dementia according to the cut-off on the objective measured (ACE-III). A negative association was observed between informant reports and patient cognitive functioning, indicating that informants reported greater decline as patients performed more poorly on an objective measure of cognitive functioning. This finding has been replicated in previous research (Jorm, 2004; Kirkevold & Selbaek, 2015; Nygaard et al., 2009; Persson et al., 2015), though the present study is the first to explore this association using the ACE-III. These results provide some evidence to suggest that informant reports might corroborate objective psychometric measures, and supports their use in the memory assessment process. However the results of hierarchical regression (where cognitive functioning accounted for just 38.8% of the variance in informant report), suggests that other factors may contribute to an informants' perspective of cognitive decline.

Demographic characteristics. The present study found no significant associations between informant-reported cognitive decline and any of the demographic characteristics included. This was in keeping with the existing literature for patient gender (Farias et al., 2004; Nygaard et al., 2009), patient occupation (Jorm et al., 1998; O'Connor et al., 1989) and patient-informant relationship type (Farias et al., 2004; Kemp et al., 2002). However, the latter of these findings has not been consistently observed and it is important to recognise potential confounds within this variable such as frequency of contact and quality of relationship (McLoughlin et al., 1996; Nygaard et al., 2009; Persson et al., 2015).

Unlike previous research (Nygaard et al., 2009; Persson et al., 2015), including those that have explored the IQCODE psychometric properties (Jorm, 2004), no association was observed between informant-reported cognitive decline and patient age. Similarly, the lack of an association between informant-reported cognitive decline and patient education, although supportive of the use of informant reports as a means of minimising the potential influence of pre-morbid ability, was inconsistent with the evidence base (Farias et al., 2004; Jorm, 2004; Kemp et al., 2002; Persson et al., 2015). This may relate to the present study using a different indicator of educational attainment (i.e. age of leaving education) to that of these previous studies (i.e. years of education). Indeed, age of leaving education does not necessarily reflect the number of years spent in education, with it potentially confounded by differences in the educational system at the time, the educational pathway taken by the individual and the nature of study (i.e. full or part-time).

Informant subjective burden. On average, the informant sample reported experiencing mild to moderate levels of burden (Mean = 22.88). Few informants reported experiencing moderate to severe or severe levels of burden (12.5%). These statistics are difficult to put into context given the different measures of burden used in other studies, yet are somewhat unexpected given the association between burden and informant reports, and the large proportion of the sample with IQCODE scores above the cut-off score. One explanation for this related to burden measures being particularly susceptible to social desirability biases (Graessel, Berth, Lichte & Grau, 2014) and so it may have been the case that informants’ responses reflected a desire to appear to be coping. Further, where the purpose of the assessment is known, informants’ may be reticent to provide information that might support a diagnosis of dementia (Jorm, 2004). This may relate to the stigma surrounding dementia, which has been reported as a persistent barrier to early diagnosis (Bunn et al., 2012).

Regardless, a positive association was found between informant-reported cognitive decline and subjective burden, suggesting that informants report greater cognitive decline as they perceive themselves to be experiencing greater burden. Hierarchical regression supported this, indicating that informant subjective burden, when accounting for patient cognitive functioning, was a significant predictor of IQCODE score and explained 11.4% of the variance in informant-reported cognitive decline.

According to Jorm (2004), this association may arise where informants are asked to report on symptoms that are closely related to burden and is supported by the nature of the IQCODE, which measures the consequences of cognitive decline (Nygaard et al., 2009). However, the association in this study fits with the findings of a study that used the 29-item version of the ZBI in an Australian memory clinic (Stratford et al., 2003) and two studies that used the RSS in Norwegian geriatric outpatient clinics (Nygaard et al., 2009; Persson et al., 2015).

Taken together, findings provide growing support for a relationship between the two constructs, and are consistent with the possibility that an informants' perception of patient cognitive decline is influenced by the informants' own emotional and psychological wellbeing. Further support for such an association arises from qualitative reports (Del-Ser, Morales, Barquero, Canton & Bermejo, 1997; Lim, Lim, Anthony, Yeo & Sahadeyan, 2003) and studies that have found significant associations between informant perceptions of patient functioning and caregiver characteristics, such as anxiety and depression (Jorm, 2004). In one such study, Schulz et al. (2008) found that patient "suffering", as perceived by a caregiver, was predictive of their own distress.

It was hypothesised that informant subjective burden would mediate the relationship between cognitive functioning and informant-reported cognitive decline, however mediational analysis illustrated that this was not the case. Further, the mediational model elucidated that informant subjective burden was not associated with patient cognitive functioning. Although unexpected, this replicated the findings of Nygaard et al. (2009) who observed no correlation between RSS and MMSE score. One explanation for these findings is that informant subjective burden is more dependent on the impact that a decline in functioning has on the patient (i.e. their distress or suffering), than it is on the decline in cognitive functioning itself. Indeed, Lyketsos et al. (2003) observed that reducing patient distress (without any improvements in patient functioning) was associated with reduced caregiver burden. Given the national drive toward early diagnosis in dementia (DoH, 2009), it is possible that the study sample had accessed services before the patients' cognitive decline had begun to impact patient wellbeing.

Patient affective state. The prevalence of clinically significant symptoms of depression in the patient sample was just 18.5%, whilst for anxiety it was considerably higher (34.6%), suggesting that the HADS-A may have captured a degree of anxiety about the assessment situation itself. Neither patient depressive nor anxiety symptoms were associated with informant-reported cognitive decline. Previous literature has relatively consistently provided support for a positive association with patient depressive symptoms (see Jorm, 2004 for review) (Gavett et al., 2011; Jorm et al., 1994; Kirkevold & Selbaek, 2015); however, less evidence exists for a relationship with anxiety symptoms. The lack of an association here may relate to such effects not being detected due to the sample size being below the minimum required for appropriate statistical power.

Although affective state did not appear to directly correlate or predict informant-reported cognitive decline, the results of a hierarchical regression indicated that patient depressive symptoms (but not anxiety symptoms) significantly moderated the relationship between informant subjective burden and informant-reported cognitive decline. As such, the strength of the positive association between burden and informant-reported cognitive decline increased as patient depressive symptoms increased. Together, the interaction between depressive symptoms and burden, alongside informant subjective burden, patient depressive and anxiety symptoms, explained 25.2% of the variance in informant-reported cognitive decline. Whilst burden explained 19.8% of the variance in informant-reported cognitive decline at step one, when the interaction term was entered at step 2, burden no longer significantly contributed to the model.

Previous studies have not explored the indirect effects of patient affective state on informant-reported cognitive decline. However, support for an interaction between patient depression and informant burden arises when considering the theoretical models of burden. According to the Pearlin Stress Process Model (Pearlin et al., 1989; 1990), caregiver burden is an outcome that arises from a combination of stress factors associated with caring, and contextual factors (e.g. demographic characteristics), which shape a caregiver’s adaptation to the stress process of providing care. Primary stressors are those that arise from the source of burden (i.e. the cognitive, behavioural and psychological symptoms of dementia) as well as the caregiver’s own negative emotional reactions to them (Carretero et al., 2009). These stressors can result in secondary stressors, which encompass the negative impact caring has on other aspects of the caregiver’s life unrelated to the caregiving role (i.e. “secondary role strains”) and the caregiver’s self-concept and internal states (i.e. “secondary intrapsychic strains") (Carretero et al., 2009). In line with this, patient depressive symptoms may act as additional stressors in the stress process. The interaction of patient depressive symptoms and informant subjective burden may therefore be explained by depressive symptoms acting as an additional source of burden, and informants' perceiving greater cognitive decline in this context.

Study Limitations

The aforementioned findings should be considered in the context of study limitations. Although the exploratory nature and timescale of the present study indicated that a cross-sectional design was most appropriate, the inability to infer causations between variables must be acknowledged. Where values were missing, the modest sample size may have resulted in some of the analyses being underpowered, and explained the lack of associations observed in previous studies (e.g. patient affective state, age) in this study. Despite this, significance was achieved; suggestive of strong and significant relationships between informant-reported cognitive decline, cognitive functioning and informant subjective burden. Although caution was taken in collapsing categories to provide more powerful and robust tests, the loss of detail and potential impact on the meaning of the findings must be acknowledged.

Further, the study sample was recruited from a single site. Although the sample reflected the population of the setting in which data were collected, it is likely that it does not reflect the demographics of the UK and lacks ethnic diversity. This was unfortunate, in that a more accurate representation of BME groups would have enabled an investigation of associations between ethnicity or culture with informant-reported cognitive decline, which is potentially important given previous research has found some evidence for such associations (Farias et al., 2004; Potter et al., 2009).

The majority of the study sample had mean scores on the informant report and objective measure of cognitive functioning that were suggestive of cognitive changes in keeping with dementia. Indeed, 76.8% of the patient sample received a dementia diagnosis. In 2016, the national average diagnosis rate for dementia was 59% (DoH, 2016). The high diagnostic rates seen in the present study likely relate to the population from which the sample was taken; in that diagnosis rates are often higher in specialist memory services (de Silva, 2015). Further, referrals to such services are made in the context of increasingly more significant memory complaints, with GPs more aware, and encouraged to screen (i.e. Mini-Cog, 6-item Cognitive Impairment Test) and manage memory complaints before referring to specialist services (NHS England, 2015). As such, the findings of the present study should be generalised beyond similar clinical settings with caution.

Results of hierarchical regression analyses indicated that the variables included in the present study did not explain all of the variance in the informant reports of cognitive decline. It is likely that there are other potentially important variables that were not included in the present study. Little information was gathered in terms of informant characteristics, such as age, cognitive functioning (e.g. Ross et al., 1997) and affective state (e.g. Hanson & Clarke, 2013), which previous studies indicate may potentially influence informant-reported cognitive decline.

In terms of the measures used in the study, it may have been the case that they did not sufficiently measure the constructs under investigation. Although this was less important in terms of informant-reported cognitive decline, given the aims of the study to explore factors that were associated with this, the high prevalence of clinically significant anxiety symptoms in the patient sample may suggest that the HADS was confounded by anxiety related to the assessment process.

Directions for Future Research

Whilst the variables included in this study explained a substantial proportion of the variance in informant-reported cognitive decline, further research may be justified to help explain the remaining variance. In particular, several potentially important variables pertaining to the informant (e.g. age, cognitive status, affective state, quality of life) and patient (e.g. activities of daily living) were not addressed. Although the relationship type of the patient/informant dyad was included in this study, and no significant association was observed, given the mixed findings in the evidence base, future studies should include potentially confounding factors, such as frequency of contact and quality of relationship, to help elucidate the nature of any association.

Given the relationship between informant burden and informant reports of cognitive decline, gaining further information with regard to objective components of burden, and sources of burden outside of the informant/patient relationship, may be a potentially useful direction for future research. Indeed, it seems plausible that informants’ with other caring responsibilities (e.g. children, individuals with physical disabilities) may have different experiences of burden than those without, that informants sharing the caring role with another individual may have different experiences of burden to those who are not, and that informants’ experiences of burden may differ dependent on the onset of the dementia (specifically, early onset dementia, in those under age 65). Further, informants’ with greater experiences of factors (e.g. social support, coping strategies) that mitigate the impact of the stress of caring, and informants’ who have been caring for different lengths of time, may demonstrate differences in how their caring role impacts their experience of burden.

Consequently, it is possible that informants' perception of patient cognitive decline may differ with such differences.

Additionally, longitudinal or prospective cohort studies that aim to investigate the relationship between patient and informant characteristics (including subjective burden) and informant-reported cognitive decline would be helpful in providing further evidence for causal associations. Future multi-site studies might also helpfully aim to garner a more ethnically representative sample, and in doing so, increase the generalisability of findings. Longitudinal research would also enable a more accurate comparison of informant-reported cognitive and objective measures of cognitive functioning (by obtaining a change in cognitive functioning score, as opposed to capturing a patients' functioning at a single time point).

Lastly, it is recognised that the present study's focus is somewhat negative in examining associations between demographic and clinical factors and informant-reported cognitive decline. Future studies might helpfully explore how factors are associated with positive outcomes. For example, a large proportion of the informant sample reported experiencing mild subjective burden; further understanding of coping strategies and protective factors (e.g. sense of self-efficacy) could be explored.

Clinical Implications

Providing care within the context of dementia can be associated with negative consequences for both patient and caregiver (i.e. subjective burden). A variety of factors, including informant subjective burden, have previously been suggested to influence informants' perceptions of patient functioning. Informant reports of cognitive decline play a pivotal role in the assessment and diagnosis of dementia, and as such, the findings of this study hold potentially important clinical implications.

The finding that informant-reported cognitive decline, as measured by the IQCODE, was not associated with patient or informant demographic characteristics, is consistent with the possibility that the IQCODE is a reliable and valid measure within the context of dementia assessments. This is encouraging given its current use in some memory assessment services. Further, findings potentially demonstrate the utility of gaining an informants' perspective in the memory assessment process, where the validity of an objective cognitive assessments normative sample and cut-off scores, are called into question, such as where individuals pre-morbid intellectual abilities are significantly above or below average. In such instances, informant reports of cognitive decline can provide helpful information in terms of the patients' baseline functioning.

Secondly, the present study demonstrated associations between factors unrelated to the patients' cognitive functioning (i.e. informant subjective burden) and informant-reported cognitive decline; providing support to the possibility that non-cognitive factors may influence informant-reported cognitive decline. This has potentially important implications in terms of the increased potential for (inappropriate) further investigations (e.g. further psychometric testing, neuroimaging), and ultimately an increased risk of misdiagnosis at outcome.

Caregiver burden is generally associated with premature moves to residential or nursing care for patients with dementia. This, along with the finding that informant burden is associated with informant report, which plays a part in the assessment and diagnosis of dementia, indicates the importance of pre-diagnostic counselling and the consideration of the informants' circumstances and emotional wellbeing during (as well as after) the assessment process. Memory assessment services offer a unique opportunity to consider the impact of the caring role on informants at a potentially early stage of dementia, and as such an opportunity to consider this when planning future care. In line with the Pearlin Stress Process Model, care plans could include interventions to maximise mitigating factors, such as social support, coping strategies and sense of self-efficacy.

Conclusion

The present study provides evidence that patient and informant characteristics, such as informant subjective burden, are associated with informant-reported cognitive decline, and consequently is in keeping with the possibility that such factors may bias informant perceptions of patient cognitive decline. The associations found are consistent with existing empirical evidence. Although patient affective state was not directly associated with informant reports, patient depressive symptoms were observed to interact with informant subjective burden in influencing informant-reported cognitive decline. This finding fits with theoretical models of burden. In contrast to previous research, the present study did not find support for associations between demographic characteristics and informant-reported cognitive decline. Findings provide some support for informant reports of cognitive decline being potentially shaped by non-cognitive (patient and informant) factors, and highlight the importance of considering them, specifically informant burden, during the assessment process and in planning subsequent care. In light of the methodological limitations of the study, further research that aims to replicate and expand on current findings is warranted.

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MAJOR RESEARCH PROJECT

SECTION C:

APPENDIX OF SUPPORTING MATERIAL

Lucy Kate Morrell

Thesis submitted in partial fulfilment for the requirements of
the Doctorate of Clinical Psychology at Salomon's Centre for
Applied Psychology, Canterbury Christ Church University

April 2017

APPENDIX A

Summary of ICD-10 Diagnostic Criteria for Dementia (WHO, 1992)

G1. Evidence of each of the following:

1. A decline in memory, particularly in learning new information, which applies to both verbal and non-verbal material. This should be verified by an informant, and supplemented if possible with cognitive assessment.
2. A decline in other cognitive abilities, such as judgement and thinking and the processing of information. If possible, evidence for this should be obtained from informant interview or cognitive assessment. Decline from a higher level of ability should be established.

G2. Preserved awareness of the environment during a period long enough to demonstrate G1.

G3. A decline in emotional control or motivation, or a change in social behaviours, that manifests as at least one of the following:

1. Emotional lability
2. Irritability
3. Apathy
4. Coarsening of social behaviour

G4. The presence of G1 for at least 6 months.

Note. Judgement about activities of daily living should take into consideration the individual’s culture and context.

APPENDIX B

Scoring of Measures of Informant Reported Cognitive Decline

Informant Questionnaire of Cognitive Decline in the Elderly (IQCODE)

The IQCODE is a measure of cognitive decline originally comprising 26-items, though a 16-item version with similar validity is commonly used. Items ask informants to consider change in the patients' cognitive functioning over the past 10 years and are rated on a 5-point from 1 ("much improved") to 5 ("much worse"). Scores are averaged to give an overall score of between 1 and 5; with 3 representing no change on any item. The higher the score, the greater the cognitive decline.

Cut-off scores used in community samples have ranged from 3.3-3.6, however clinicians frequently use a cut-off score of 3.44, as a compromise of sensitivity (100%) and specificity (86%; Harwood et al., 1997).

Cambridge Mental Disorders of the Elderly Examination (CAMDEX)

The CAMDEX consists of three main sections; a structured clinical interview with the patient, a range of objective cognitive tests, and a structured interview with an informant. Items of informant interview ask informants to consider change in patient personality, memory, orientation, everyday functioning, mood and general cognitive functioning. Items are rated on 2-point scale from 0 ("no difficulty noted") to 2 ("great difficulty") and summed to give a total informant score with a maximum of 63 (Roth et al., 1986). The higher the score, the greater the cognitive decline. Cut-off scores for the informant interview section of the CAMDEX alone are unavailable.

APPENDIX C

Methods for the development of NICE public health guidance (NICE, 2012)

Population

Is the source population or source area well described?

Is the eligible population or area representative of the source population or area?

Do the selected participants or areas represent the eligible population or area?

Method of selection

How was selection bias minimised?

Was the selection of explanatory variables based on a sound theoretical basis?

Is the setting applicable to the UK?

Outcomes

Were outcome measures and procedures reliable?

Were all outcome measurements complete?

Were all the important outcomes assessed?

Was follow-up time meaningful?

Analyses

Was the study sufficiently powered to detect an effect?

Were multiple explanatory variables considered in the analyses?

Were the analytical methods appropriate?

Was the precision of intervention effects given or calculable? Were they meaningful?

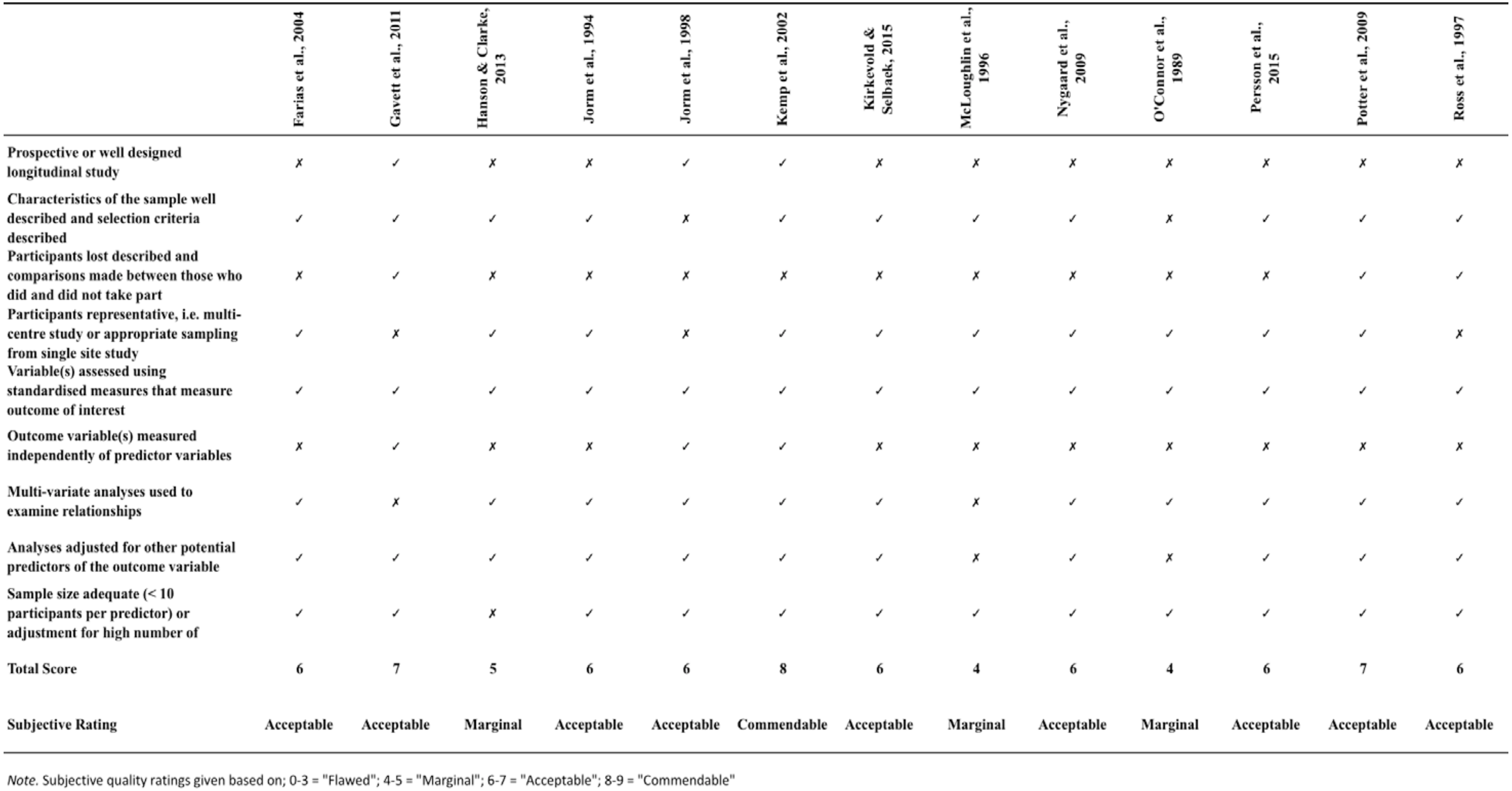
Summary:

Are the study results internally valid (i.e. unbiased)?

Are the findings generalizable to the source population (i.e. externally valid)?

APPENDIX D

Subjective quality rating of studies included in review (Sherer et al., 2002)



	Farias et al., 2004	**Gavett et al., 2011**	**Hanson & Clarke, 2013**	**Jorm et al., 1994**	**Jorm et al., 1998**	**Kemp et al., 2002**	**Kirkevold & Selbaek, 2015**	**McLoughlin et al., 1996**	**Nygaard et al., 2009**	**O'Connor et al., 1989**	**Persson et al., 2015**	**Potter et al., 2009**	**Ross et al., 1997**
Prospective or well designed longitudinal study	✗	✓	✗	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗
Characteristics of the sample well described and selection criteria described	✓	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓
Participants lost described and comparisons made between those who did and did not take part	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓
Participants representative, i.e. multi-centre study or appropriate sampling from single site study	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗
Variable(s) assessed using standardised measures that measure outcome of interest	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Outcome variable(s) measured independently of predictor variables	✗	✓	✗	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗
Multi-variate analyses used to examine relationships	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
Analyses adjusted for other potential predictors of the outcome variable	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓
Sample size adequate (< 10 participants per predictor) or adjustment for high number of	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total Score	**6**	**7**	**5**	**6**	**6**	**8**	**6**	**4**	**6**	**4**	**6**	**7**	**6**
Subjective Rating	**Acceptable**	**Acceptable**	**Marginal**	**Acceptable**	**Acceptable**	**Commendable**	**Acceptable**	**Marginal**	**Acceptable**	**Marginal**	**Acceptable**	**Acceptable**	**Acceptable**

Note. Subjective quality ratings given based on; 0-3 = "Flawed"; 4-5 = "Marginal"; 6-7 = "Acceptable"; 8-9 = "Commendable"

APPENDIX E

Approval letter from NHS Research Ethics Committee

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APPENDIX F

Approval from NHS Research & Development Department

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APPENDIX G

Measures Used in the Study

Informant Questionnaire of Cognitive Decline in the Elderly (IQCODE)

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Zarit Burden Interview (ZBI)

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Addenbrooke’s Cognitive Examination – Third Edition (ACE-III)

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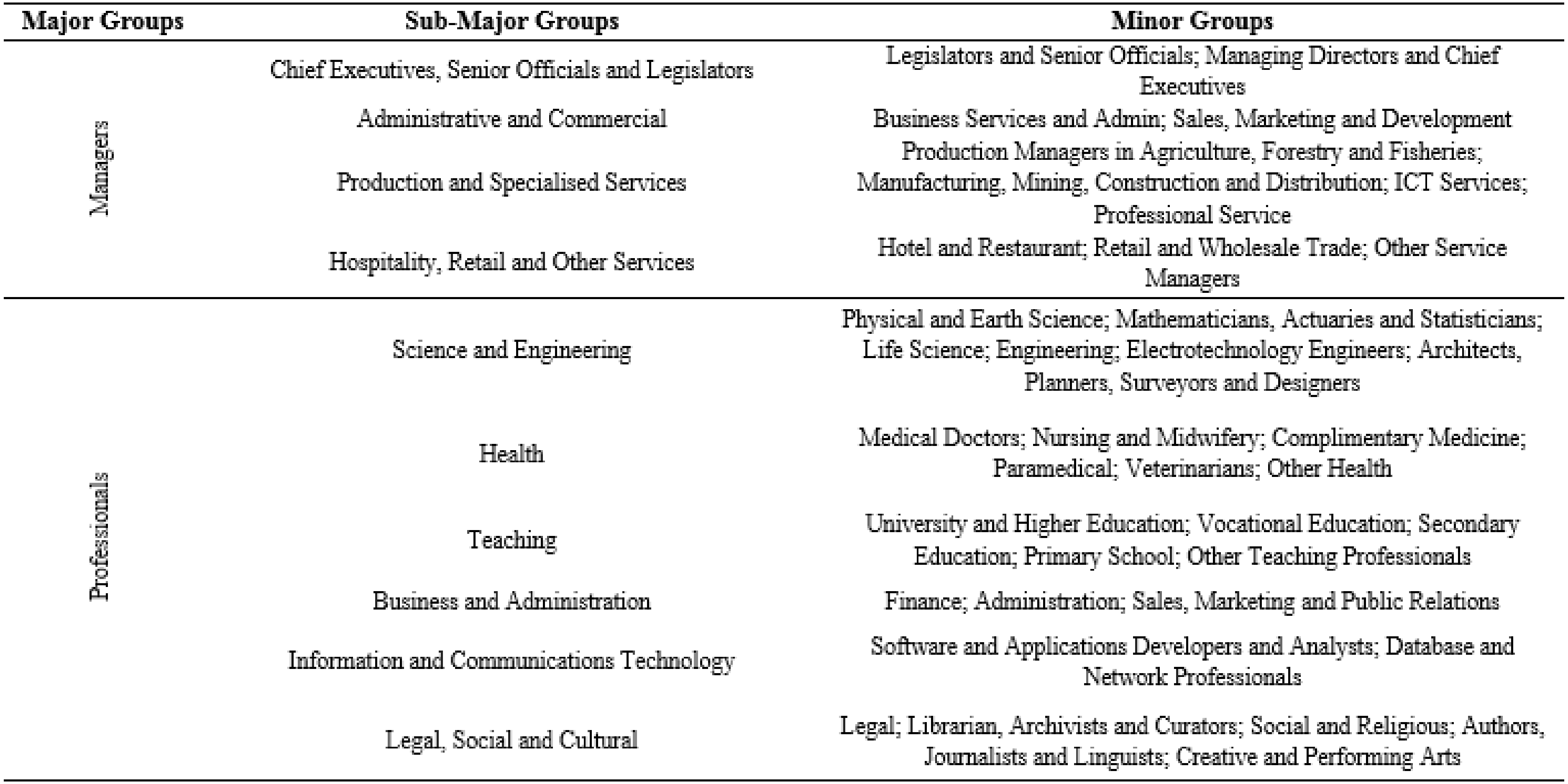
APPENDIX H

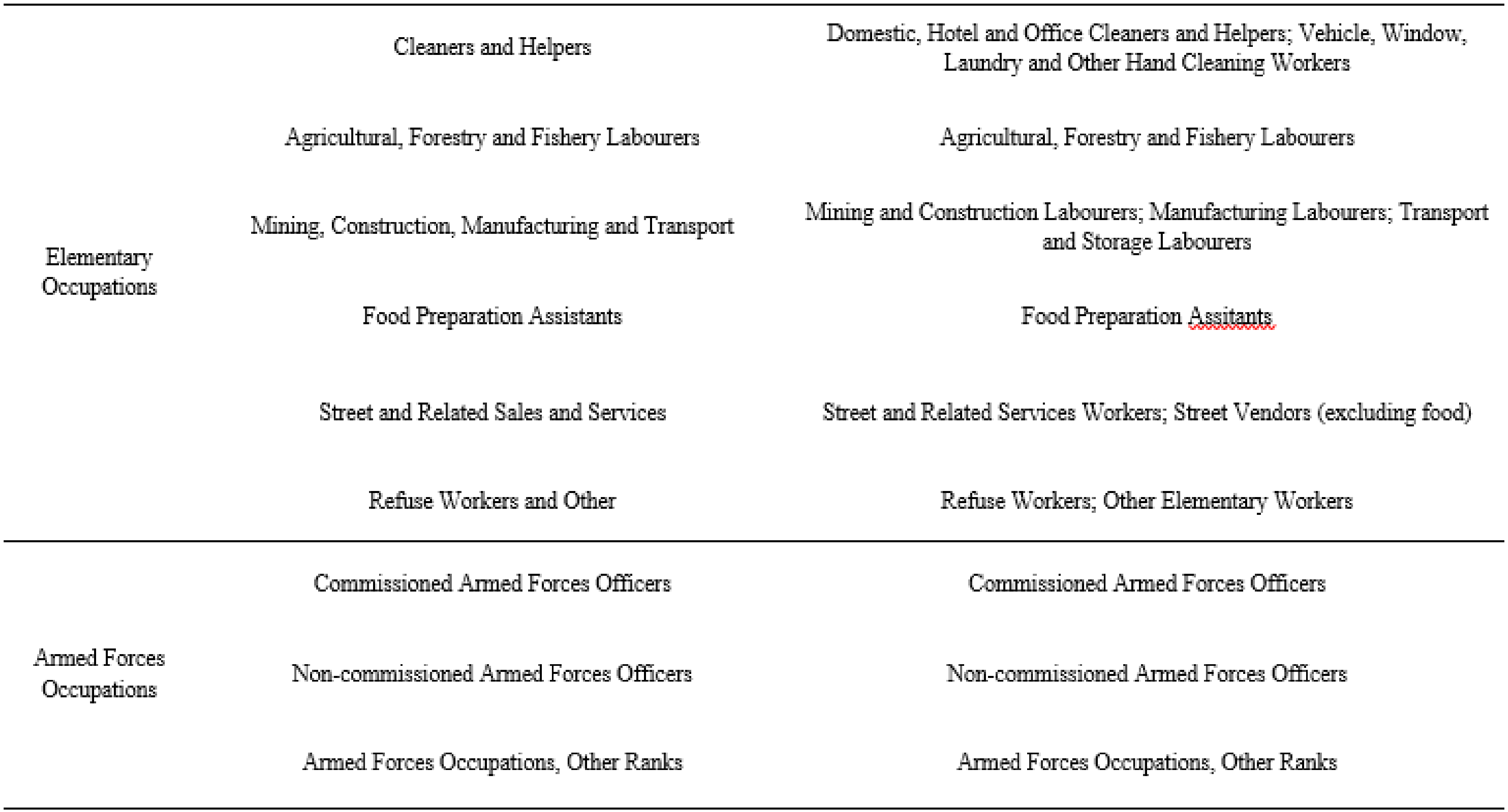
International Standard Classification of Occupations (International Labour Organisation, 2012)



Major Groups	Sub-Major Groups	Minor Groups
Managers	Chief Executives, Senior Officials and Legislators	Legislators and Senior Officials; Managing Directors and Chief Executives
	Administrative and Commercial	Business Services and Admin; Sales, Marketing and Development
	Production and Specialised Services	Production Managers in Agriculture, Forestry and Fisheries; Manufacturing, Mining, Construction and Distribution; ICT Services; Professional Service
	Hospitality, Retail and Other Services	Hotel and Restaurant; Retail and Wholesale Trade; Other Service Managers
Professionals	Science and Engineering	Physical and Earth Science; Mathematicians, Actuaries and Statisticians; Life Science; Engineering; Electrotechnology Engineers; Architects, Planners, Surveyors and Designers
	Health	Medical Doctors; Nursing and Midwifery; Complimentary Medicine; Paramedical; Veterinarians; Other Health
	Teaching	University and Higher Education; Vocational Education; Secondary Education; Primary School; Other Teaching Professionals
	Business and Administration	Finance; Administration; Sales, Marketing and Public Relations
	Information and Communications Technology	Software and Applications Developers and Analysts; Database and Network Professionals
	Legal, Social and Cultural	Legal; Librarian, Archivists and Curators; Social and Religious; Authors, Journalists and Linguists; Creative and Performing Arts

Technicians and Associate Professionals	Science and Engineering Professionals	Physical and Engineering Science Technicians; Mining, Manufacturing and Construction Supervisors; Process Control Technicians; Life Science Technicians and Related Associates; Ship and Aircraft Controllers and Technicians
	Health Associate Professionals	Medical and Pharmaceutical Technicians; Nursing and Midwifery Associates; Complimentary Medicine Associates; Veterinary Associates; Other Health Associates
	Business and Admin Associate Professionals	Financial and Mathematical Associates; Sales and Purchasing Agents and Brokers; Business Services Agents; Admin and Specialised Secretaries; Government regulatory associates
	Legal, Social, Cultural and Related Associate Professionals	Legal, Social and Religious Associates; Sports and Fitness Workers; Artistic, Cultural and Culinary Associates
	Information and Communications Technicians	ICT Operations and User Support Technicians; Telecommunications and Broadcasting Technicians
Clerical Support Workers	General and Keyboard	General Office Clerks; Secretaries; Keyboard Operators
	Customer Service	Tellers, Money Collectors and Related; Client Information Workers
	Numerical and Material Recording	Numerical Clerks; Material recording and Transport Clerks
	Other Clerical Support	Other Clerical Support Workers
Services and Sales Workers	Personal Services	Travel Attendants, Conductors and Guides; Cooks; Waiters and Bartenders; Hairdressers, Beauticians and Related Workers; Building and Housekeeping Supervisors; Other Personal Services Workers
	Sales Workers	Street and Market Salespersons; Shop Salespersons; Cashiers and Ticket Clerks; Other Sale Workers
	Personal Care Workers	Child Care and Teachers' Aides; Personal Care in Health Services
	Protective Services	Protective Services Workers

Skilled Agricultural, Forestry and Fishery Workers	Market-oriented Skilled Agricultural	Market Gardeners and Crop Growers; Animal Producers; Mixed Crop and Animal Producers
	Market-oriented Skilled Forestry, Fishery and Hunting	Forestry and Related Workers; Fishery Workers, Hunters and Trappers
	Subsistence Farmers, Fishers, Hunters and Gatherers	Crop Farmers; Livestock Farmers; Mixed Crop and Livestock Farmers; Fishers, Hunters, Trappers and Gatherers
Craft and Related Trades Workers	Building and Related Trades	Building Frame and Related; Building Finishers and Related; Painters, Building Structure Cleaners and Related
	Metal, Machinery and Related	Sheet and Structural Metal Workers, Moulders and Welders; Blacksmiths and Toolmakers; Machinery Mechanics and Repairers
	Handicraft and Printing	Handicraft Workers; Printing Trades Workers
	Electrical and Electronic	Electrical Equipment Installers and Repairers; Electronics and Telecommunications Installers and Repairers
	Food Processing, Woodworking, Garment and Other Craft	Food Processing; Wood Treaters and Cabinet Makers; Garment and Related Trades; Other Craft and Related
Plant and Machine Operators and Assemblers	Stationary Plant and Machine Operators	Mining and Mineral Processing; Metal Processing and Finishing; Chemical and Photographic Products; Rubber, Plastic and Paper Products; Textile, Fur and Leather Products; Food and Related; Wood Processing and Papermaking; Other Stationary
	Assemblers	Assemblers
	Drivers and Mobile Plant Operators	Locomotive Engine Drivers; Car, Van and Motorcycle Drivers; Heavy Truck and Bus Drivers; Mobile Plant Operators; Ships' Deck Crews



Elementary Occupations	Cleaners and Helpers	Domestic, Hotel and Office Cleaners and Helpers; Vehicle, Window, Laundry and Other Hand Cleaning Workers
	Agricultural, Forestry and Fishery Labourers	Agricultural, Forestry and Fishery Labourers
	Mining, Construction, Manufacturing and Transport	Mining and Construction Labourers; Manufacturing Labourers; Transport and Storage Labourers
	Food Preparation Assistants	Food Preparation Assitants
	Street and Related Sales and Services	Street and Related Services Workers; Street Vendors (excluding food)
	Refuse Workers and Other	Refuse Workers; Other Elementary Workers
Armed Forces Occupations	Commissioned Armed Forces Officers	Commissioned Armed Forces Officers
	Non-commissioned Armed Forces Officers	Non-commissioned Armed Forces Officers
	Armed Forces Occupations, Other Ranks	Armed Forces Occupations, Other Ranks

APPENDIX I

Z-Scores for Untransformed Continuous Data

Table 4.

Z-Scores for Skewness of Continuous Variables

Variable	Skewness	Standard Error	Z-Score
Age	-0.690	0.266	-2.59**
Age Left Education	1.792	0.267	6.71***
ACE-III Total Score	-0.391	0.266	-1.47
HADS-D	1.488	0.277	5.37***
HADS-A	0.569	0.277	2.05*
IQCODE Total Score	-0.864	0.266	-3.25**
BADL Total Score	0.456	0.271	1.68
ZBI Total Score	0.941	0.269	3.50***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 5.

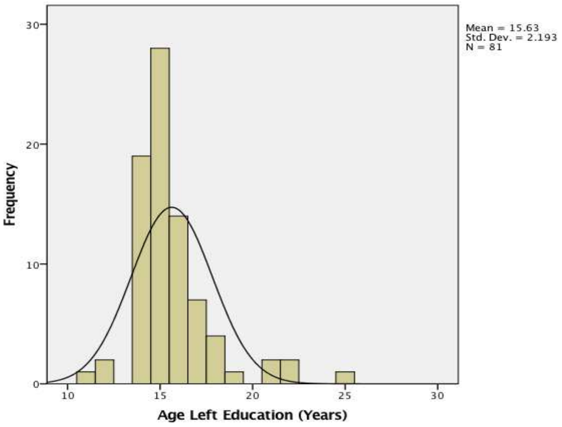
Z-Scores for Kurtosis of Continuous Variables

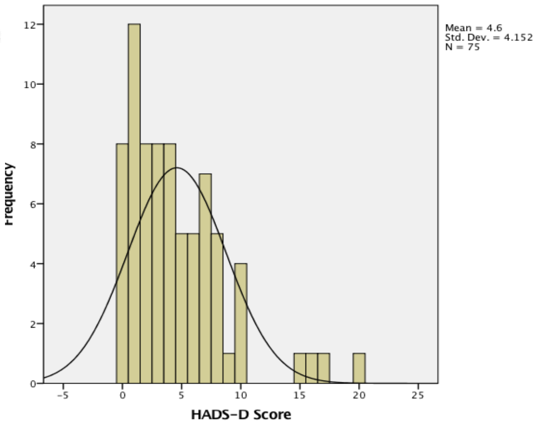
Variable	Kurtosis	Standard Error	Z-Score
Age	0.187	0.526	0.36
Age Left Education	4.971	0.529	9.40***
ACE-III Total Score	-0.210	0.526	-0.40
HADS-D	2.749	0.548	5.02***
HADS-A	-0.411	0.548	-0.75
IQCODE Total Score	3.398	0.526	6.46***
BADL Total Score	-0.624	0.535	-1.17
ZBI Total Score	0.764	0.532	1.44

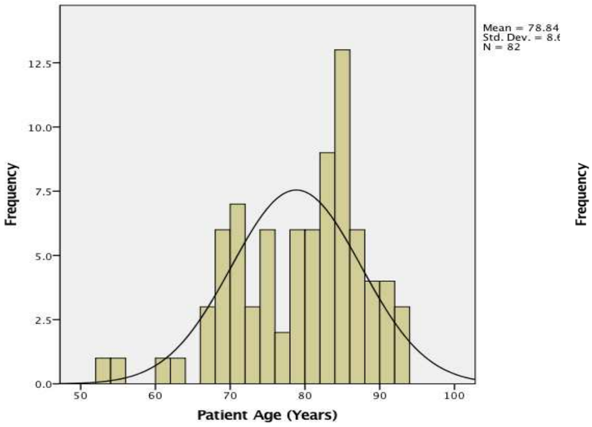
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

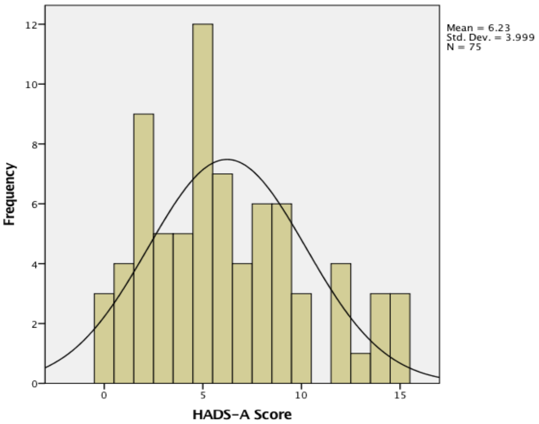
APPENDIX J

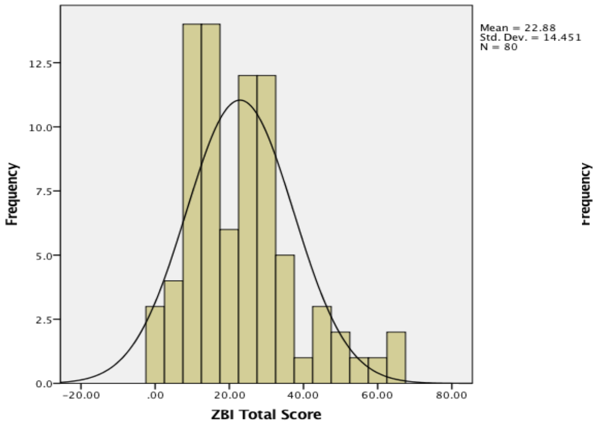
Histograms of Untransformed Continuous Data

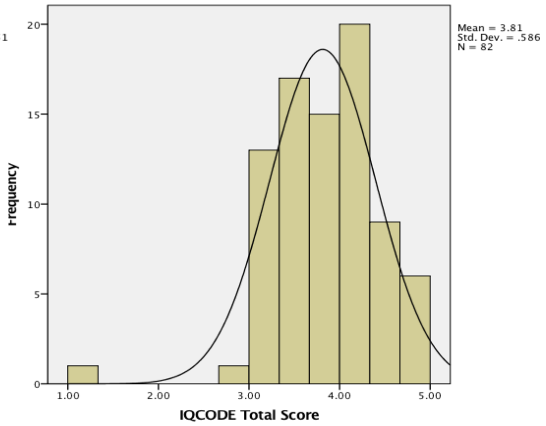












APPENDIX K

End of Study Report to Ethics Committee

Informant-Reported Cognitive Decline in Dementia Assessment: Associations with Subjective Burden

Objectives

Gaining an informant's perspective on cognitive decline is a recommended in the assessment of dementia. However, concern regarding the accuracy of such reports is documented. The current study aimed to explore patient and informant non-cognitive factors that may be associated with such reports, with a particular focus on informant burden.

In considering the evidence base, it was hypothesised that; (1) informant-reported cognitive decline would be associated with patient cognitive functioning, the assessment outcome, informant burden, and patient affective state, (2) that informant burden and affective state would interact in influencing informant reports, and (3) informant burden would mediate the relationship between informant-reported cognitive decline and patient cognitive functioning.

Design and Setting

Using a cross-sectional design, routinely collected data from a memory assessment service was consecutively sampled over a two-month period. Univariate and multivariate analyses were conducted to analyse associations between variables.

Procedure

Subsequent to a referral, patients engaged in a routine assessment during which they completed a measure of cognitive functioning (Addenbrooke's Cognitive Examination – 3rd Edition; ACE-III; Hodges, 2012) and a self-report measure of affective state (Hospital Anxiety and Depression Scale; HADS; Zigmond & Snaith, 1983), administered by a clinician. Concurrently, informants completed a proxy measure of cognitive decline (Informant Questionnaire of Cognitive Decline in the Elderly; IQCODE; Jorm, 1994) and self-report measure of subjective burden (Zarit Burden Interview; ZBI; Zarit, Orr & Zarit, 1985). Patients were assessed for mental capacity, and their consent sought for data to be made available to the direct care team. Anonymised data, including demographic and assessment information (e.g. outcome of assessment), was made available for analysis.

Results

Findings indicated IQCODE score was associated with cognitive functioning ($r = -0.62$, $p < 0.001$), diagnosis ($F(7, 74) = 3.23$, $p < 0.01$) and burden ($r = 0.50$, $p < 0.001$), but not demographic characteristics or affective state.

Hierarchical regression with IQCODE score as the dependent variable indicated cognitive functioning accounted for 38.8%, whilst informant burden accounted for a further 12.6%, of the variance in IQCODE score.

Hierarchical regression with IQCODE as the dependent variable, and interaction terms, indicated patient depressive, but not anxiety symptoms, interacted with subjective burden in influencing IQCODE score.

Using an SPSS Macro (Preacher & Hayes, 2004), a mediational model was derived in which the indirect effect of patient cognitive functioning on IQCODE score, through informant subjective burden, was tested. Results indicated informant burden did not act as a mediator.

Conclusions

Consistent with existing empirical evidence, the present study suggests that subjective burden, but not affective state, directly influences informant-reported cognitive decline. Patient depressive symptoms interact with subjective burden in influencing informant-reported cognitive decline. Unlike previous research, demographic characteristics were not associated with informant report. Findings highlight the importance of considering non-cognitive factors, particularly burden, in dementia assessment and care. Further research that aims to replicate and expand on current findings is warranted.

APPENDIX L

Journal Submission Guidelines: Psychology and Ageing

Submission

Submit manuscripts electronically through the Manuscript Submission Portal. *Psychology and Aging*® is now using a software system to screen submitted content for similarity with other published content. The system compares the initial version of each submitted manuscript against a database of 40+ million scholarly documents, as well as content appearing on the open web. This allows APA to check submissions for potential overlap with material previously published in scholarly journals (e.g., lifted or republished material).

Length

Manuscripts should not exceed 8,000 words (approximately 27 double-spaced pages in 12-point Times New Roman font). Shorter manuscripts are equally welcomed. The word count does not include references, tables, and figures. Please include the word count for the main text below the keywords.

Manuscript Preparation

Prepare manuscripts according to the Publication Manual of the American Psychological Association (6th edition). Manuscripts may be copyedited for bias-free language (see Chapter 3 of the Publication Manual). Review APA's Checklist for Manuscript Submission before submitting your article. Double-space all copy. Other formatting instructions, as well as instructions on preparing tables, figures, references, metrics, and abstracts, appear in the Manual. Additional guidance on APA Style is available on the APA Style website.

Abstract and Keywords

All manuscripts must include an abstract containing a maximum of 250 words typed on a separate page. After the abstract, please supply up to five keywords or brief phrases.

References

List references in alphabetical order. Each listed reference should be cited in text, and each text citation should be listed in the References section. Examples of basic reference formats:

Journal Article.

“Hughes, G., Desantis, A., & Waszak, F. (2013). Mechanisms of intentional binding and sensory attenuation: The role of temporal prediction, temporal control, identity prediction, and motor prediction. Psychological Bulletin, 139, 133–151. http://dx.doi.org/10.1037/a0028566”

Authored Book.

“Rogers, T. T., & McClelland, J. L. (2004). Semantic cognition: A parallel distributed processing approach. Cambridge, MA: MIT Press.”

Chapter in an Edited Book.

“Gill, M. J., & Sypher, B. D. (2009). Workplace incivility and organizational trust. In P. Lutgen-Sandvik & B. D. Sypher (Eds.), Destructive organizational communication: Processes, consequences, and constructive ways of organizing (pp. 53–73). New York, NY: Taylor & Francis.”

Figures

Graphics files are welcome if supplied as Tiff or EPS files. Multipanel figures (i.e. figures with parts labeled a, b, c, d, etc.) should be assembled into one file.

The minimum line weight for line art is 0.5 point for optimal printing.

For more information about acceptable resolutions, fonts, sizing, and other figure issues, please see the general guidelines.

When possible, please place symbol legends below the figure instead of to the side.

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