SOCIAL COGNITION AND ALCOHOL RELATED BRAIN DAMAGE

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ABSTRACT

Introduction: Alcohol Related Brain Damage (ARBD) is caused by chronic alcohol misuse and can result in profound neuropsychological impairments. Despite the increasing incidences of ARBD in the UK, it remains underdiagnosed and often managed inappropriately. Literature on social cognition in alcohol use disorders is emerging, yet study of this domain specifically in ARBD populations is still in its very early stages. The aim of this study was to explore whether there are social cognition problems in the ARBD population and, if so, whether this would be a useful addition to the routine neuropsychological assessment of ARBD.

Method: Sixteen individuals (mean age = 56.44 years) were recruited from a specialist ARBD step-down unit. Participants completed a battery of neuropsychological tests including three measures of social cognition (tests of mentalisation, affect recognition, and a self-report empathy questionnaire). Scores were analysed against normative data and a case series analysis was utilised for descriptive analysis.

Results: Individual and group level analyses suggested that individuals with ARBD present with impairments of higher-level mental inferences and social competence, but did not show impairments in low-level, perceptual tasks – specifically in affect recognition.

Conclusions: These findings should be utilised as a platform for further research to help improve understanding and treatment of ARBD. Future research should focus on assessing more subtle deficits of mentalisation and social competence to explore the impairments identified in the present study. While understanding of the relationship between social cognition and ARBD continues to develop, these findings indicate further investigation could lead to significant improvements to treatment provided, and ultimately to the quality of life of people affected by ARBD.

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ABBREVIATIONS

ACE-III	Addenbrooke's Cognitive Examination (Third Edition)
AD	Alcohol Dependence
ARBD	Alcohol Related Brain Damage
ARBI	Alcohol Related Brain Injury
ARCI	Alcohol Related Cognitive Impairment
ARD	Alcohol Related Dementia
ARLD	Alcohol Related Liver Disease
ASC	Autism Spectrum Condition
AUD	Alcohol Use Disorder
BADS	Behavioural Assessment of the Dysexecutive Syndrome
COPD	Chronic Obstructive Pulmonary Disease
CORE-10	Clinical Outcomes in Routine Evaluation - 10
DASS	Depression Anxiety and Stress Scale
FAB	Frontal Assessment Battery
GABA	Gamma-Aminobutyric Acid
HADS	Hospital Anxiety and Depression Scale
HIV	Human Immuno-deficiency Virus
IQ	Intelligence Quotient
KS	Korsakoff's Syndrome
mPFC	Medial PreFrontal Cortex
MRI	Magnetic Resonance Imaging
NHS	National Health Service
NICE	National Institute for health and Care Excellence
PAF	Paroxysmal Atrial Fibrillation
QCAE	Questionnaire of Cognitive and Affective Empathy
RBANS	Repeatable Battery for the Assessment of Neuropsychological Status
RCT	Randomised Controlled Trial
RMET	Reading the Mind in the Eyes Test
SPSS	Statistical Package for the Social Sciences
SS	Strange Stories

SST	Strange Stories Task
ToM	Theory of Mind
TOPF	Test Of Premorbid Functioning
UK	United Kingdom
WE	Wernicke's Encephalopathy
WHO	World Health Organisation
WKS	Wernicke-Korsakoff Syndrome

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1. INTRODUCTION

This chapter offers an overview of the construct of Alcohol Related Brain Damage (ARBD), with discussion of epidemiology, aetiology, assessment and treatment options. The chapter introduces the concept of social cognition, its main facets, links with neuropathology and its use in clinical settings. Critiques will also be raised including a discussion of the problems associated with the use of the concept. From here, links are made with the literature surrounding ARBD and social cognition, and existing literature on this topic is outlined. A rationale is thereby provided for examining the relationship between these two areas, and the objectives of the present study are outlined.

1.1. Literature Search

Section 1.5.2 contains the results of the literature search, conducted using PubMed, Science Direct and Psychinfo databases to identify relevant published literature, which included journal articles and book chapters. The following key words and terms were used: ("ARBD" or “ARCI” or "Korsakoff" or "alcohol related dementia" or "alcoholic dementia" or "alcohol amnesic disorder") AND ("social" or "affect recognition" or "emotion recognition" or "theory of mind" or "mentalisation" or "mentalization" or "strange stories"). However, due to the paucity of research relating specifically to the subject under study, the author extended the search to include non-traditional academic work and unpublished material such as newspaper articles, government documents and doctoral theses. The author then used a snowball search methodology – scanning reference lists for previously unidentified papers. Generic terms such as “alcoholism” or “alcohol dependence” were not used due to the research questions (section 1.7) relating specifically to individuals with a diagnosis of ARBD. While people with AUDs may display some cognitive impairment, this is separated from ARBD within the literature.

Additional parameters filtered out non-human participants, participants under 19 years of age and studies which were not published in English. Initial database searches yielded 286 items. Titles and abstracts of the initial results were then screened against exclusion and inclusion criteria (see Appendix A), which yielded 6 relevant pieces. After screening the papers' methodology and results for applicability and robustness, this left 3 articles which were deemed suitable, and 1 article was gleaned from reference lists. Due to the small number of papers retrieved, a narrative literature review will introduce the topics more generally and the specific papers found during systematic review will be discussed following this.

1.2. Alcohol

Alcohol use is commonplace in the UK (Office for National Statistics, 2018), and yet it is often deemed the most harmful drug to both individuals and society when considering psychological, social and physical impact (Nutt, King & Phillips, 2010). Due to its small molecular size, alcohol can cross membranal barriers into different parts of the body easily, and the devastating impact that this can have on numerous areas of the body has been well documented (Mukherjee, 2014). Along with many other physical, social and psychological comorbidities, people who drink alcohol to harmful levels experience changes in the structure and functioning of the brain. This can occur both in the acute phase of intoxication and also occur chronically when people develop Alcohol Use Disorders (AUDs) and consume large amounts of alcohol over time. Some 50-80% of people (without diagnosed ARBD) presenting to alcohol services in the UK show significant cognitive decline (Bates, Bowden & Barry, 2002). For the most severe cases, this can develop into clinical ARBD which causes lasting and devastating effects on the health of the individual.

1.3. Alcohol Related Brain Damage

1.3.1. Definitions

ARBD is a term used to describe a range of neuropsychiatric problems caused by the effects of long-term, excessive alcohol use. ARBD (often termed Alcohol Related Brain Injury in Australian studies) comes under many guises: for example, Wernicke-Korsakoff Syndrome; alcohol related dementia; or alcohol amnesic syndrome (Wilson et al., 2012) and varies in severity across typically affected domains. As such there remains debate around classification, aetiology, assessment and treatment of ARBD, reflecting the heterogeneity of the population. Common criteria for diagnosis include Oslin or DSM-V criteria (Oslin & Carey, 2003). Oslin and Carey (2003) state symptoms should meet the following criteria: probable history of heavy, long standing alcohol drinking (35 units or more a week for at least five years); confusion, memory problems, doubt about capacity and concerns about risk on discharge, after withdrawal/physical stabilisation; three or more admissions into hospital and/or A&E in one year with probable associated either directly or indirectly with alcohol use; or one or more delayed discharges from general hospital wards in the last 12 months (due to social and/or mental health difficulties).

The main condition described under ARBD is known as Wernicke-Korsakoff Syndrome (WKS). In the 1880's Carl Wernicke and Sergei Korsakoff separately described the respective aspects of WKS as 'Wernicke's Encephalopathy' (WE) (Wernicke, 1881) and 'Korsakoff's Syndrome' (KS) (Korsakoff, 1889) – now understood as two distinct aspects of the same syndrome (Victor, Adams & Collins, 1989). WE is understood to represent the acute phase, a medical emergency characterised by rapid onset of confusion, disorder of gait and coordination, jerky eye movements, coma and risk of fatality (Lana-Peixoto, Santos & Pittella, 1992). When WE is left untreated, this can develop into KS – the chronic phase of WKS, characterised by neuropsychological deficits, including profound impairments in learning and memory, and executive functions. An estimated 85% of people who survive WE will go on to develop KS (Day et al., 2013).

A second condition recognised under the umbrella of ARBD is Alcohol Related Dementia (ARD). ARD has been understood either as “chronic WKS”, or more recently as representing the accumulation of historical comorbid factors, including traumatic head injury and other medical complications (Svanberg & Evans, 2015). As discussed, diagnosis of ARD and WKS is contested, broad and often problematic due to the heterogeneous nature of these conditions. This has led to the introduction of umbrella terms, such as ARBD and Alcohol Related Cognitive Impairment (ARCI).

Within the past decade the term ARBD has been adopted in research, policy and clinical practice in the UK to describe WKS and ARD. The term ARBD will be used throughout this study as a catch-all term for both disorders, especially as this fits with contemporary trends in policy and diagnosis.

1.3.2. Epidemiology

The prevalence of ARBD itself is hard to define as most people go undiagnosed: a post-mortem study found only 16% of people identified as having ARBD at autopsy had been clinically diagnosed during their lifetime (Harper, Krill & Sheedy, 1998). It is estimated that 1.5% of the general UK population have some form of ARBD (Cook, Hallwood & Thomson, 1998), and studies show that incidence of ARBD has been recorded as rising, especially in Scotland (Ramayya & Jauhar, 1997). Suggested reasons for this increase include wider recognition of the condition, increased consumption of alcohol, decreased use of preventative medications, and poorer diet (Smith & Hillman, 1999). Rates of ARBD are likely to be unevenly distributed throughout the UK, with higher rates in areas of socio-economic deprivation (MacRae & Cox, 2003; Cox, Anderson & McCabe, 2004).

1.3.3 ARBD Pathology

1.3.3.1 Thiamine. Deficiency of thiamine, or vitamin B1, was discovered to be a central component to WKS, and thiamine deficiency is thought to be the main cause of WE onset. Despite this having been established by de Wardener and Lennox (1947), WKS is still “the most important preventable and treatable

vitamin deficiency syndrome still frequently seen worldwide" (Scalzo, Bowden & Hillbom, p. 5, 2015). Although much remains to be understood about the role of thiamine in the body, its main purpose is in regards to metabolism and production of energy within the body. For people experiencing malnutrition it can take less than three weeks to develop thiamine deficiency (much shorter compared to other vitamins) and can have devastating effects. Although thiamine deficiency and the resulting WKS can be associated with a number of other clinical situations in developed countries (for example anorexia, HIV or gastrointestinal surgery), WKS is most attributable to alcohol use disorders (Rolland & Truswell, 1998), as a person's thiamine resources are depleted through using alcohol to replace meals; reduced need for the body to retain thiamine due to alcohol providing an energy source or reducing the amount of thiamine stored in the body (Heap et al., 2002; Price, 1985; Rees & Gowing, 2013; Sechi & Serra, 2007). It should be noted that thiamine deficiency does not always lead to WKS. One hypothesis for this is a genetic propensity to vulnerability (Nixon, 1988), whereby the GABA gene unit cluster has been found to have links with incidence of KS and AUDs. Although some research found support for this (Loh, Smith, Murray, McLaughlin, McNulty & Ball, 1999), subsequent studies show less convincing results (Guerrini, Thomson & Gurling, 2008; Matsushita, Kato, Muramatsu & Higuchi, 2000).

1.3.3.2 Brain changes. The neurotoxic effects of long term alcohol use has been shown to have a devastating effect on the brain; including atrophy of white matter and demyelination (Harper, 2009), leading to reduction in overall brain weight (de la Monte., 1988). ARBD neuropathological studies using MRI scans reveal that a reduction in volume of both grey and white matter is also noted in the cerebellum (Zahr et al., 2010), the frontal lobes (Pitel et al., 2012), thalamus (Chanraud et al., 2007), mammillary bodies, hippocampus (Sullivan and Pfefferbaum, 2008), amygdala, insula (Cardenas et al., 2011) and brainstem (Sullivan, 2003). Acute WE can cause brain damage in and of itself. MRI scans reveal lesions, and destruction of mammillary bodies, periaqueductal grey matter, hypothalamus and inferior colliculi (Lough, 2012). The relationship between the shrinkage of these regions and the resulting effects on neurocognitive domains are explored below.

1.3.4. Neuropsychological Profile of ARBD

The neuropsychological profile of ARBD can vary greatly between individuals, therefore identifying patterns in impairment can present challenges. However, literature suggests key domains tend to be more affected than others: impairment is most frequently detected in areas of memory, attention and executive functioning (outlined further below). Here though, it is pertinent to mention that tests designed to assess the following domains are often underpinned by other domains (e.g. tests of executive function require attention); therefore, it can be difficult to make assertions about single domains.

1.3.4.1. Learning and memory. When KS was first conceptualised in 1887, it was thought to be localised to memory disturbances and was classified as an 'amnesic syndrome' (World Health Organization, 1992). ARBD has been observed to cause deficits in both retrograde amnesia (memories for events that occurred before onset of WKS) and anterograde amnesia (memories for events occurring after onset). Similar to forms of dementia, ARBD displays in a temporal amnesic gradient (Kopelman, Thomson, Guerrini & Marshall, 2009); that is memories for events in the distant past tend to be well preserved compared to memories of more recent events. There is, however, an ongoing debate over the processes which cause retrograde memory impairment (Squire, 2006; Moscovitch, Nadel, Winocur, Gilboa, & Rosenbaum, 2006; Cermak, 1984), although it is beyond the scope of this review to explore further.

Some studies suggest deficits of working memory and attention (Schmidt, Gallo, Ferri, Govannetti, Sestito, Libon & Schmidt, 2005), causing difficulty in encoding of information; however, others suggest that the more significant impairment is shown in tests that involve the storage or consolidation of new information (Moscovitch, 1982). The consolidation process is commonly considered to involve the 'transfer' of information to short term stores. To illustrate this, Baddeley and Warrington (1970) identified that digit span subtest scores and other measures of working memory were typically intact in their population of people with WKS. Others have suggested specific deficits in the storage of contextual information. Postma, Van Asselen, Keuper, Wester and Kessels

(2006) identified disproportionate deficits in recall of spatial or temporal aspects of presented information.

Further findings report participants with ARBD having difficulty linking complex associations or relationships between items (Cohen et al., 1997); and it has therefore been argued that there may be dissociations between free recall memory and recognition memory (Mayes & Downes, 1997). The above deficits can lead to general difficulties in activities of daily living and the anterograde amnesic aspect is linked with confabulation – where gaps in memory are filled with likely, but inaccurate, information.

1.3.4.2. Executive function. Historically, literature focused on the amnesic aspects of ARBD. However, contemporary studies have adopted the 'frontal lobe hypothesis' suggesting that the deficits may be attributed, at least in part, to damage to the frontal lobe – an area intimately associated with executive functioning (Harper, 2009).

Executive function is a term used to describe a variety of higher level cognitive functions; including regulation of reasoning, judgement, inhibition, planning and mental flexibility (Burgess, 2004), all of which are implicated in frontal lobe impairment. Multiple studies have found the frontal lobe to be the cortical region most vulnerable to the effects alcohol dependence (Dirksen, Howard, Cronin-Golomb & Oscar-Berman, 2006, Ratti, Bo, Giardini, Soragna, 2002). One study identified neuron density in the frontal cortex of people with alcohol dependence to have decreased by 15-23% (Harper & Matsumoto, 2005); which is specifically associated with difficulties in the areas of inhibition, flexibility, categorisation, organisation, planning and deduction of rules (Ihara, Berrios & London, 2000; Pitel et al., 2007). There is also evidence to suggest this is similar in people identified with ARBD. One study by Van Oort & Kessells (2009) found executive function deficits in 80% of people completing the Behavioural Assessment of the Dysexecutive Syndrome (BADS) compared to a normative control group – notable areas included tasks of divided attention and verbal fluency. Studies such as this one are challenging the notion of ARBD as a solely amnesic concept; however, the area is still largely under-researched.

1.3.4.3. Motor skills. Deficits in motor skills have been observed in an ARBD population (Saxton, Munro, Butters, Schramke & McNeil, 2000); although there has been scant discussion on this as the deficits do not appear as consistent as those found in memory and executive functioning. It is hypothesised that motor deficits observed are linked to verbal encoding deficits rather than being exclusive impairments of motor skills (Cermak, Lewis, Butters & Goodglass, 1973).

1.3.4.4. Visuospatial ability. Visuospatial ability refers to a set of skills used to process and manipulate visual information. When assessed, people with ARBD scored comparatively lower on tasks of visuospatial ability than age-matched norms on clock drawing task and figure copying (Oslin, Atkinson, Smith & Hendrie, 1998). Although evidence suggests impairment in this domain quickly improves with abstinence (Sullivan, Rosenbloom, Lim & Pfefferbaum, 2000).

1.3.4.5. Language. Research suggests that language comprehension and production remain largely intact in ARBD (Oslin, Atkinson, Smith & Hendrie, 1998). While general language functioning appears to be preserved, there is strong evidence for difficulty in verbal fluency which is considered to reflect deficits in executive functioning rather than language itself. Language deficits also feature as exclusion criteria for ARBD in some sources (as language difficulties tend to be more indicative of other disorders such as Dementia of the Alzheimer's Type).

1.3.5. Assessment and Diagnosis of ARBD

The "classic triad" at the acute phase is the main method of diagnosis of onset of ARBD. This includes oculomotor abnormalities, cerebellar dysfunction (especially in disorder of gait) and altered mental state (ranging from mild cognitive difficulties to profound cognitive impairment, global confusional state or even coma); occurring alongside, or following, a period of chronic and enduring alcohol dependence. Identified by Wernicke himself (1881), these are still relied upon by clinicians as key diagnostic signs of WE (Galvin, Bråthen, Ivashynka, Hillbom, Tanasescu & Leone, 2010). However, the triad is viewed by

some as outdated and poses problems for diagnostic sensitivity. Post-mortem studies reveal that most instances of WE are missed, and indeed one study found only 8% of people diagnosed with ARBD at autopsy met the criteria for the triad of impairment (Galvin, Bråthen, Ivashynka, Hillbom, Tanasescu & Leone, 2010). This suggests the diagnostic criteria are not sensitive enough to detect WE in the vast majority of cases, meaning many people may be left unable to gain the support they require during their life. That being said, ARBD is very rarely identified during the acute stages and is more often diagnosed during the chronic KS phase. Owing much to the more stable state of the individual during the chronic phase, general diagnostic processes often include:

- Brief cognitive screening – such as the Addenbrooke's Cognitive Examination (ACE-III; Hsieh, Schubert, Hoon, Mioshi & Hodges, 2013).
- Clinical interview – including documenting a full drinking history (if available); drinking history needs to meet a certain threshold for an extended period; onset must have occurred within three years of chronic alcohol use.
- Diagnosis is often supported by the presence of alcohol related comorbidities; such as liver, gastrointestinal or cardiac disease, ataxia and peripheral neuropathy or neuroimaging evidence of atrophy of the cerebellar region. Neuroimaging is also often used to rule out other aetiologies such as stroke, tumour or neurodegenerative disorders.
- Multidisciplinary assessment of functioning; including occupational therapy, social care and medical assessment.

Following an ARBD diagnosis, a more thorough neuropsychological assessment is warranted. This namely includes a full battery of tests to gain a better picture of an individual's profile of cognitive strengths and impairments. These scores also act as a baseline against which to measure improvement or decline, which can then be used to inform management of the person's care.

1.3.6. ARBD Comorbidities

Comorbidities among people who present to services with ARBD tend to be the rule rather than the exception, with an estimated 87% of people experiencing comorbidities (Sumransub, 2012). It could be hypothesised that the high rates of comorbidities in ARBD are associated with the general lack of research and

subsequent tangible findings. Comorbidities are commonly attempted to be controlled for in many studies to increase validity, however in doing so leads to significantly fewer participants and limit the generalisability of findings. Studies excluding comorbidities have little pertinence to the vast majority of people affected by ARBD (Valderas, Mercer & Fortin, 2011).

1.3.6.1. Physical health. Almost every system in the human body can be affected by alcohol use (Demirkol, Haber & Congrave, 2011), and risk to physical health is heightened with the continued, dependent drinking required to develop ARBD. While each individual is affected differently, problems are wide ranging and common. Public knowledge of alcohol related liver problems, including cirrhosis, liver disease and liver cancer, are quite well established. While these are common, other recorded sequelae are wide and varied, and include breast and gastrointestinal cancers, cardiac problems, muscular myopathy and endocrine conditions amongst many others (Bofetta & Hashibe, 2006; Kranzler, 1998). Comorbidities should also be considered within the context of individuals' social circumstances and common features within the population.

1.3.6.2. Behavioural comorbidities. Many of the physical comorbidities mentioned above may occur due to problematic behaviours associated with chronic alcohol use. One instance of this includes poly-drug use; which increases a person's chances of blood-borne viruses, as well as risky and disinhibited behaviour linked to chronic and acute effects of alcohol use which can often lead to increased incidences of violence, falls, vulnerability to assault and self-neglect including malnutrition, dehydration and alcohol poisoning (Kessler, Nelson, McGonagle, Edlund, Frank & Leaf, 1996; Jamal, Saadi & Morgan, 2005).

1.3.6.3. Social comorbidities. AUDs and ARBD have also been linked to higher rates of social isolation, relationship difficulties, domestic violence, financial problems, unemployment and child abuse or neglect (Dube, Anda, Felitti, Edwards & Croft, 2002). AUDs which include ARBD are also among the most stigmatised conditions in UK society (Crisp, Gelder, Rix & Meltzer, 2000). ARBD

and AUDs are linked with therapeutic nihilism, with many people in society seeing alcohol related difficulties as ‘self-inflicted’, health professionals and services can view people with ARBD as ‘beyond help’ which means people may go without support, leading to difficulties and other health conditions worsening (Svanberg, Withall, Draper & Bowden, 2015), as in the case of Mr H, outlined by the Mental Welfare Commission for Scotland (2006).

Rates of AUDs within countries can vary greatly and studies have reported a socio-economic gradient in relation to alcohol related mortality and morbidity (Melchior, Choquet, Le Strat, Hassler & Gorwood, 2011). While socio-economic status is a wide, and varied, term generally links between lower levels of education, employment, and resources (including access to nutrition, housing and healthcare) are associated with higher levels of AUDs, including ARBD (Chiang, 2002, Huckle, You & Casswell, 2010). Rates of social inequalities are also associated with adverse childhood experiences, which increases rates of psychological distress, and which is further associated with increased use of alcohol and AUDs (Dube et al., 2002).

Housing problems are also common, with one study reporting that 21% of homeless people residing in hostels displayed signs of ARBD (Gilchrist & Morrison, 2005). Johnco & Draper (2015) hypothesise that this may be linked with increased rates of long-term disruption of family ties, unemployment and poverty.

1.3.6.4. Mental health. Experiencing four or more adverse childhood experiences was found to increase the likelihood of developing AUD, drug use, depression and suicide attempts in later life by over 500% (Felitti et al., 1998). AUDs frequently occur alongside mental health difficulties, including depression, anxiety and suicide ideation (Farrell et al., 2001, Haber et al., 2009). The relationship between substance use and mental health difficulties is a complex one – with alcohol commonly used as a coping strategy for intense emotions, and the depressant effects alcohol use can have on an individual, both directly and indirectly. Davidson (1995) found that depression is common in “chronic alcoholics” (67%), but not in “detoxified alcoholics”.

These findings would suggest a history of mental health difficulties may be common within the ARBD population, but that these may subside while the individual is in treatment and therefore abstinent from alcohol. Studies have found that those diagnosed with ARBD have HADS and DASS scores (measures of anxiety, depression and stress) within the normal range, although individual results varied, with some individuals showing signs of severe depression (Horton, Duffy & Martin, 2015). Despite this, data collected by Wilson et al., (2012) from patients receiving rehabilitation in the community, revealed that 17 of 41 presented with comorbid depression, 8 with aggression, 1 with post-traumatic stress disorder and 1 with bipolar disorder, however these may have been historic diagnoses prior to treatment.

Of note is the reciprocal relationship between AUDs, ARBD and co-occurring difficulties whereby alcohol use disorders make it more likely that someone will experience other problems (outlined above), but also that other issues occurring primarily make it more likely that someone will use alcohol to cope with such difficulties and go on to develop AUDs, and later ARBD.

1.3.7. Epidemiology

Despite the high prevalence of AUDs in the UK and many other parts of the world, epidemiological data on rates of ARBD around the world is lacking. WHO published data highlighting that South American, Southern African and Eastern European countries have higher rates of episodic drinking, with the potential for more acute alcohol-related injury (2011). This suggests rates of ARBD may be higher in these regions. While alcohol consumption in Western European countries is high, rates of alcohol related mortality are comparatively low.

1.3.7.1. Sex. Generally, AUDs are more common among males, although studies suggest this gender gap is lessening, with more women using alcohol to harmful levels (Peltzer et al., 2011; Plant & Haw, 2000). There are many theories as to why AUDs disproportionately affect men as there appear to be many social factors at play; especially in terms of drinking culture in the UK and

issues surrounding masculinity, avoidance and social acceptability or social pressure (Brotchie, Hanes Wendon & Waller, 2007; de Visser & Smith, 2007).

As may be expected, studies also generally report higher incidence of ARBD in men; with ratios of men and women affected at 1.5:1 in a Scottish sample (Ramayya & Jauhar, 1997), and Chiang (2002) reported that only one in six people known to UK ARBD services are female. Although ratios generally vary, these findings are at odds with the literature which states rates of AUDs are higher in men than women (Wilsnack, Wilsnack, Kristjanson, Vogeltanz-Holm & Gmel, 2009). Studies have explored this, revealing that, in a sample of 65 people, brain shrinkage was similar in males and females, despite reported use of alcohol being less for women (Mann, Batra, Gunthner & Schroth, 1992). Similar results were found in a study by Cutting (1978) revealed that the women they assessed had a significantly shorter drinking history before onset of ARBD than men. Adding to the gender gap, a study on recovery from ARBD suggests better outcomes occur more frequently for men than women (Fujiwara, Brand, Borsutzky, Steingass & Markowitsch, 2008). Reasons behind these observations are unclear; although some have suggested the impact of reduced tolerance of alcohol due to body composition, and the differences in production of enzymes used to break down alcohol in the body (Baraona et al., 2006). Research in this area still needs to be developed.

1.3.7.2. Age. Age tends to have a positive correlation with cognitive impairment in the general population (Kumar et al., 2005). While studies into the effects of alcohol in later life are mixed (with some studies controversially stating that moderate alcohol use may have a neuroprotective effect (Collins et al., 2009)), Pfefferbaum, Sullivan, Mathalon and Lim (1997) found that older people with significant drinking history (average age = 52.7) showed increased rates of frontal lobe volume loss than younger people (average age = 37.5) with similar drinking history.

Specifically, prevalence of ARBD itself does not necessarily increase with age. Typically affected age range varies across the literature, although ARBD appears to be more common in mid-life than later life (MacRae & Cox (2003).

Australian sources (Arbias, 2011) state that over half of their patients come from 35-54 age range; however, particular attention has been paid to early detection and intervention for WKS in this recruiting site. This may account for the difference between their findings and UK samples, where average patient age is 50-60 years (Cox, Anderson & McCabe, 2004). Some studies have also shown that early onset of ARBD has been associated with poorer prognosis and recovery outcomes in both men and women (Arbias, 2011), although literature in this area remains sparse.

1.3.8. Treatment of ARBD

Seminal research by Smith and Hillman (1999) identified that 25% of people with WKS make a full recovery, 25% a significant recovery, 25% a slight recovery, and 25% show no recovery in recent memory functioning. Encouraging abstinence is regarded as the primary, acute treatment in order to prevent deterioration. In addition, there are a number of other interventions used in the UK to treat ARBD, described below.

1.3.8.1. Pharmacological treatment. A number of pharmacological treatments are routinely used to treat ARBD, most commonly is the use of thiamine, B vitamin complex and various medications for treating deficiency in the acute phase (Horton, Duffy & Martin, 2014). Although the role of thiamine deficiency is well documented in the development of ARBD, literature on the use in treatment of ARBD yields fairly inconclusive results, owing to small sample sizes and inconsistencies across the literature. Arbias (2011) recommends that, due to its involvement in the development of WKS, thiamine supplements should be used to prevent further damage. This should be administered in conjunction with vitamin B6 and B12 (to promote absorption of thiamine), along with a balanced diet. Due to the lack of rigorous studies in the area, the value of pharmacological treatment in the KS phase remains unclear, however, NICE guidelines recommend people with AUDs at high risk of developing WE are administered a high dose of intravenous thiamine daily (National Institute for Health and Clinical Excellence, 2011).

1.3.8.2. Neuropsychological rehabilitation. Some neurorehabilitation techniques have been found to improve functioning over time and can help people develop strategies for deficits. The strongest evidence has been shown in utilisation of visual imagery (Cermak, 1980), errorless learning using verbal tasks (Komatsu, Mimura, Kato, Wakamatsu & Kashima, 2000) and using verbal labels and semantic cues (Davies & Binks, 1983). In addition, studies have shown that using memory aids, physically enacting instructions, and allowing more processing time has also improved outcomes for people with ARBD (Monteiro, Bolognani, Rivero & Bueno, 2011).

1.3.8.3. Psychosocial interventions. Research points to the importance of specialist ARBD, alcohol-free supported accommodation over generic nursing care (Blansjaar et al., 1992; Irvine & Mawhinney, 2008). In units, interventions involving provision of a structured, regular routine with training and support in order to execute and practice daily living tasks and timetabled activities have been found to be helpful (Montiero Bolognani, Rivero, & Bueno, 2011). To support people with social isolation (MacRae & Cox, 2003) practitioners are recommended to involve families as much as possible and help individuals to build up community links (Wilson et al., 2012).

Findings regarding psychotherapeutic interventions for ARBD are limited. Morrison and Pestell (2010) highlighted the potential value of cognitive behaviour therapy in promoting recovery in their single case review. They found that when using a behavioural, motivational approach the individual showed lower scores on a standardised measure of mood. They noted that cognitive technique was too difficult/inaccessible for individuals with ARBD, due to memory problems and problems with abstract thought and meta-cognition. Despite this, behavioural interventions, such as behavioural activation, may be of benefit to neuropsychological rehabilitation (Williams & Martinez, 2008).

Horton, Duffy & Martin (2014) highlight the importance of further research into the rehabilitation of individuals with ARBD. They recommend that rather than RCTs (which may lack ecological validity), future studies should focus on single

case experimental studies, which offer the best chance of providing a rich sense of what works for people affected by ARBD.

1.4. Social Cognition

Social cognition relates to a range of cognitive processes which underlie an individual's ability to understand and interact with other people and groups (Frith & Frith, 2007). Disruption of social cognition may lead to impairments in interpersonal communication abilities; including poor perception and comprehension of faces and emotions, difficulties understanding mental states in others, and reduced ability to engage in reflective thought and discussion (Adolphs, 2003). These impairments can have a profound impact on an individual's social participation and therefore quality of life.

1.4.1. History of Social Cognition

Social cognition itself is a relatively young concept within neuropsychology; but the notion of social skills and 'social intelligence' was initially conceptualised by Thorndike in 1920, identifying social skills (the ability to "act wisely in human relations", p.228) as one of the three central facets to human 'intelligence'. As the concept evolved, attempts were made to operationalise the idea of social intelligence (Hunt, 1928), and it was hypothesised that social intelligence was a stand-alone, separate function within human neuroscience. This notion was contested by others, including Wechsler (1958), who argued that social skills merely come from a general intelligence applied to social situations.

The concept was brought to the fore after Premack and Woodruff (1978) wrote about 'theory of mind' (ToM) – a term they coined for the ability to ascribe separate mental states to oneself and others. Shortly after, Baron-Cohen, Leslie and Frith (1985) applied this concept to observations made of children with Autism Spectrum Conditions (ASC). This study brought into question how social intelligence may or may not be linked with other domains after findings showed that children diagnosed with ASC showed deficits on a ToM task, but that this was not related to overall IQ scores. The conclusion that children with an ASC diagnosis tend to show deficits on a measure of ToM, despite often having 'high

intelligence', reflects the complexity of the concept. The question of whether or not social cognition is a separate faculty from non-social cognition is, however, still under debate (Kihlstrom & Cantor, 2000). Moving away from a reductive understanding of these processes; recent literature advocates for a more mechanistic approach, emphasising the coordination of several cognitive domains which facilitate our social understanding and communication (Frith & Frith, 2012).

1.4.2. Facets of Social Cognition

Social cognition is now thought of more as a multi-faceted concept, which Frith and Frith (2012) argue is made up of implicit and explicit processes. Implicit processes occur automatically, and often include unconscious biases and stereotypes (Adolphs, 2009), which may include behaviours such as mirroring/imitating others with no awareness of doing so (Heyes, 2011). Explicit processes, however, are more under the individual's control; allowing for conscious navigation of social situations, such as choosing to behave altruistically despite having feelings of prejudice towards certain people (Frith & Frith, 2008). As illustrated, the two strategies can be conflictual, or complementary. Furthermore, Frith and Frith (2012) describe that as well as explicit and implicit processes, social cognition is made up of receptive and expressive factors. While it is beyond the scope of this study to provide a comprehensive overview of each process, three of the main facets will be explored below.

1.4.2.1. Receptive factors. Receptive factors are concerned with the perception and comprehension of social information. Frith and Frith (2012) distinguish between the perception of different information – with focus placed on the perception and comprehension of faces; including the recognition of familiar and different faces, reading of eye gaze and sensitivity to human faces over other visual stimuli. Another distinction was made for the perception and comprehension of others actions, including mirror neurons (the implicit mimicking of others), as well as the detection of biological motion (versus non-biological).

A third distinction is made in the perception of others' emotional states. This includes understanding of language and tone to convey emotion, as well as posture, gesture and facial expressions, often termed "affect recognition".
A final receptive factor is the comprehension and perception of others' mental states. While this may have issues with morality and deception, two areas commonly studied and associated with neurological deficits are of mentalisation and empathy.

Mentalising - the term mentalising is used to describe a person's ability to appreciate the mental states of others. Frith and Frith (2006) argue that mentalisation can involve both implicit and explicit processes, both of which rely on other domains of cognitive functioning. Implicit processes involve automatic perspective taking and tracking the intention of others' behaviour. Whereas explicit processes involve the distinction between the self and other, and our understanding that mental states can differ between agents.

The term "theory of mind" (ToM) is commonly used in literature to convey a person's ability to mentalise, both in their ability to use abstract reasoning to comprehend the mental states of others (cognitive empathy), and the social-perceptual understanding of non-verbal emotional processing (affective empathy) (Stone et al., 1998). However, as many propose, the term ToM is limited in its language to solely explicit processes, whilst regularly being used as a catch-all phrase to describe many aspects of social cognition (Shanker, 2004; Frith & Frith, 2012). Therefore, many authors use the term mentalising instead, in the hope that it better represents the specific processes occurring.

Empathy - this is a person's ability to be sensitive to others' emotions, and experience emotional reactions to others' displays of emotion; this may occur as sympathy, compassion or empathy. Although it's a widely used concept, and described by some as the most important mechanism contributing to overall social cognition (Blakemore & Frith, 2004), there is no consensus on the scientific definition for empathy, and therefore no operationalised definition (Reniers, Corcoran, Drake, Shryane & Völlm, 2011). There has been debate on this issue within literature, namely whether empathy involves the recognising of

emotion or the experiencing of emotion; or both (Gini, Albiero, Benelli, & Altoè, 2007; Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004).

Reniers et al., (2011) draws these together and defines these as two separate, dissociable aspects of empathy – cognitive empathy and affective empathy. Although even these vary in definition from one source to the next. The most widely used definition in the literature is of cognitive empathy involving an individual's capacity to mentally represent the mental states of others; and affective empathy as being sensitive to, and experiencing, the affective states of others (Spinella, 2005; Young, Gudjonsson, Terry, & Bramham, 2008).

Despite the terminology, cognitive and affective empathy may act on explicit and implicit neuropsychological processes. Over time, a map of cognitive and emotional states of others is generated, while being compared, contrasted, and mirrored with the individual's own responses. Reniers et al., (2011) describe the end results as a 'working model' that can be updated with new information, improving the empathic connection between the individual and others around them. This process allows individuals to have an emotional reaction to the emotional states of others through a process of self-reflection and insight, drawing on their 'working model' of emotional response.

Reniers et al., (2011) also highlight the contrast between ToM and cognitive empathy; and suggest that while cognitive empathy likely draws on many of the same underlying processes as ToM, cognitive empathy skills allow for understanding and attribution of others' emotions (as opposed to their cognitions).

1.4.2.2. Expressive factors. In addition to receptive factors, Frith and Frith (2012) discussed the production and execution of social competence as 'expressive' factors. These include use of language, observation of social rules, engagement with others, treating others morally, use of bargaining, contracting, showing empathy to others, sustaining relationships, manipulation of others to achieve a goal, and sexual functioning.

1.4.3. Deficits in Social Cognition

Deficits in social cognition present in a variety of manners, such as ASC (Baron-Cohen, Leslie & Frith, 1985), psychosis (Bertrand, Sutton, Achim, Malla & Lepage, 2007) and learning disabilities (Cebula, Moore & Wishart, 2010). Impairments have also been recorded in people with traumatic brain injury (McDonald, 2013) and frontotemporal dementia (Bertoux, de Souza, O'Callahan, Greve, Sarazin & Dubois, 2016). Social cognition is explored in new populations all the time, presenting in very different ways, with profiles reflecting neuropsychological domains affected in the respective conditions (Poletti, Enrici & Adenzato, 2012).

1.4.4. Assessment of Social Cognition

Assessments of social cognition are less readily available than assessments of other cognitive domains, however, some of the prominent tasks available in the literature will be discussed. It is beyond the scope of this study to explain and critique each and every test, but an overview of some of the main tests developed, and themes in operationalization of facets of social cognition, is provided below.

1.4.4.1. Cognitive. The development of social cognitive specific measures through time have been overwhelmingly focused on assessing deficits in ToM (or explicit mentalising ability) in people with ASCs. The first work that began to assess ToM was Wimmer and Perner's (1983) 'false-belief task', with the aim to assess and understand more about mental state attribution. The task was carried out by typically developing children, who were required to demonstrate an understanding that other people could poses beliefs and knowledges different from their own. This led to the formation of a developmental trajectory of ToM; and spurred the development of other measures to assess ToM in an ASC population (Baron-Cohen, Leslie & Frith, 1985), for which ToM deficits are considered a central facet and form part of the classic 'triad of impairment' (Wing & Gould, 1979).

Hill and Frith (2003) describe failure in the false-belief task to be a robust sign of ToM impairment and social and communication difficulties in ASC. This

assertion has been challenged though, owing to normal performance on false-belief tasks by older individuals with ASC (Bowler, 1992) – calling into question the validity of the measure. In response to this, more advanced measures were developed, including specific verbal and non-verbal tasks. One such non-verbal task includes Sarfati, Hardy-Bayle, Besche and Widlocher's (1997) cartoon strip tasks; in which the participant is required to understand a character's intentions based on a series of cartoon drawings and is then asked to choose the final cartoon to complete the story from three options. An advantage of non-verbal tasks is the lack of linguistic demands from the task; however, there remains a paucity of reliable normative data.

The Strange Stories Test (SST), first introduced by Happé (1994), developed as a means of assessing mentalising and ability to understand social rules and norms. In this task, participants are asked to read short vignettes and answer a question about the reasoning behind a character's behaviour. This task requires participants to demonstrate an understanding of the mental states of others, and identify subtle communication tools such persuasion, white lies and deception. Happé (1994), found that their sample of children with ASC had difficulties processing the non-literal language of the task and therefore provided inappropriate explanations for characters' behaviour.

The Faux Pas Test, first developed by Stone, Baron-Cohen and Knight, (1998) used similar mechanisms to test for deficits in adults. In this task, participants are read a short vignette and asked whether the characters said something socially inappropriate. Assessments such as the SST or Faux Pas Test place significant demands on other aspects of cognitive functioning; such as verbal comprehension, working memory and attention, due to participants being required to retain and integrate presented information, and then compare that with what they know about social norms and rules. Issues of validity surrounding the utilisation of other cognitive processes during these tasks was addressed by White, Hill, Happé and Frith (2009); who included a control group and made use of physical stories to account for potential deficits in memory, attention and comprehension. Despite attempts to improve the SST, ecological validity remains a problem in that participants are presented with static stimuli,

rather than life-like social situations. This test will be discussed further in the methodology section.

1.4.4.2. Affective. Much of human communication of emotion is done through non-verbal cues, such as eye contact, facial expressions, and tone of voice. Different instruments have been developed to assess deficits in affective SC, most of which were designed specifically to detect impairments in adults with ASC; however, many may be applied to other difficulties (Baron-Cohen, Jolliffe, Mortimore & Robertson, 1997).

Emotion recognition tasks require individuals to identify emotions on the basis of different stimuli, such as spoken phrases in the Reading the Mind in the Voice test (Rutherford, Baron-Cohen & Wheelwright, 2002), computer-generated faces (Scrimin, Moscardino, Capello, Altoè & Axia, 2009), or recognition of facial expression in photographs of actors, such as the Reading the Mind in the Eyes Test (RMET; Baron-Cohen, Wheelwright, Hill, Raste & Plumb, 2001), or the ACS Affect Naming task (Pearson, 2009).

The Ekman Faces task (Ekman & Friesen, 1976) is intended to evaluate affect recognition using just the expressions of the face. Participants are asked look at photographs of actors' faces and chose from named emotions which the actors were displaying. Recent extensions to detect more subtle cues in adults have included the RMET – where participants are required to discern emotions from picture of actors' eyes - key features in determining mental states (Adams et al., 2010). More recent updates include the ACS Affect Naming subtest (Pearson, 2009). Participants are asked to choose from a list of emotions (e.g. happy, sad, angry, disgusted etc.) - thought to be universal basic emotions, and expressed in very similar ways across different cultures, thus limiting ethnocentrism. These basic emotions are therefore used in most of the available measures regarding affect recognition.

One significant difficulty in the use of emotion recognition tasks using actors is establishing ecological validity. Various sources have debated the idea of 'Duchenne's smile' – the idea that different muscles are used in real versus fake

smiles (Duchenne, 1990) and that incorrect scores may not necessarily represent inability to perceive emotional states, but in the skills of the actors involved to produce a 'real' enough display of the emotion. Indeed, many tests of affect recognition are criticised for their lack of ecological validity as the tasks involved are insufficiently reflective of genuine social interactions (Bell, Fiszdon, Greig & Wexler, 2010; Byom & Mutlu, 2013). Attempts have been made by some to increase ecological validity by designing life-like assessments involving simulated social situations (Andrist, Pejsa, Mutlu & Gleicher, 2012) and perspective taking (Dumontheil, Apperly & Blakemore, 2010). However these are highly dependent on laboratory equipment and other resources and are therefore impractical for routine clinical use.

The ACS Affect Naming has particularly well-established norms, and correlates well with similar tests, such as the RMET and Ekman Faces test. This test will also be discussed in section 2.6.

1.4.4.3. Self-report measures. In addition, self-report questionnaires have been developed to understand what sense an individual has about their own social cognition. Most self-report measures in this field aim to assess empathic experience and behaviour, examples of which include the Hogan Empathy Scale (Hogan, 1969), Interpersonal Reactivity Index (Davis, 1994), Balanced Emotional Empathy Scale (Mehrabian, 2000), and Empathy Quotient (Baron-Cohen, Richler, Bisarya, Gurunathan, & Wheelwright, 2003). However, these questionnaires do not differentiate between cognitive and affective facets. The Questionnaire of Cognitive and Affective Empathy (QCAE; Reniers, Corcoran, Drake, Shryane & Völlm, 2011) offers a separation of items in both affective and cognitive empathy, and provides norms for each separately, as well as separation of gender. The QCAE will be discussed further in section 2.6.

1.4.4.4. Problems in assessment of social cognition. Assessment of social cognition presents researchers and clinicians with several challenges, and as identified below, tests of social cognition are not without their drawbacks. Most of the tests below focus on the perceptual and receptive facets rather than expressive competence or problem-solving aspects, and many of the

assessments also have absent or limited norms. Many of the tests are based on small student samples which tend not to break down descriptive data into sex, education or age. In addition, many of the assessments were developed specifically with ASC population in mind, which calls into question their generalisability.

Some have claimed that specific assessments of social cognition can be done using standard general neuropsychology batteries. For example, in one study recruiting from a general population, RMET was associated with line orientation and general cognitive status (McKinlay, Albicini & Kavanagh, 2013). They suggested that social cognition, or at least the domain of affect recognition, may be correlated with general functioning, worsening together. This notion has been contested by other studies and the general consensus presents that standard neuropsychological assessments lack the precision to inform performance in social cognition specifically (Martory, Pegna, Sheybani, Métral, Pertusio & Annoni, 2015).

A number of studies have suggested that deficits in executive functioning may contribute to reduced performance in tests of social cognition, due to both domains sharing neural networks. Pennington et al., (1997) for example, argued that ToM tasks involve specific executive functioning skills, specifically working memory, and others have highlighted the role of language ability (de Villiers, 1999), verbal fluency (Eddy, Beck, Mitchell, Praamstra & Pal, 2013), and processing speed (German & Hehman, 2006) in studies controlling for their respective processes.

1.4.5. Neuronal Correlates of Social Cognition

The neural basis of social cognition is widely contested, with several studies claiming that central components depend upon a discrete neural network; others argue that social cognitive functioning is dependent on general cognitive processes, such as language, memory or executive function. Early studies indicated a link between social cognition and the amygdala, frontal and temporal cortices, however, these primarily involved data from samples of non-human primates (Brothers, 1990). Nevertheless, this led to further study and

subsequent debate over processes involved in social cognitive skills, leading to conceptualisation of ‘mirror neurons’ in humans (Rizzolatti & Craighero, 2004). These helped to provide a physiological basis of social processes, such as imitation, emotional resonance, and empathy; and led the way toward quantifying and operationalising social cognitive neural processes (Frith & Frith, 2006).

Meta-analysis of 73 functional brain imaging studies on ToM was conducted by Schurz, Radua, Aichhorn, Richlan and Perner (2014). The meta-analysis revealed activation of the medial prefrontal cortex (mPFC; especially in false-belief and strategic tasks) and temporo-parietal junction (TPJ; particularly in tasks of perspective-taking) for all ToM tasks. The authors then posit that their findings are consistent with the ‘core-network’ hypothesis of ToM, in that all ToM tasks consistently activate a particular brain network (Mitchell, 2009). This hypothesis is also supported with data from neuropsychological assessments, which shows people with damage to the prefrontal cortex tend to have difficulty in tasks of mentalisation (Stuss et al., 2001).

Much of the research around executive dysfunction and social cognition has been done in a population of people with frontotemporal dementia. In their study, Bertoux, O’Callaghan, Dubois and Hornberger (2015) conclude that social cognition acts distinctly/separately from executive functioning; with the exception of empathy and intention tasks, which showed relationships to measures of executive function (notably verbal abstraction, working memory and attention). Of note were the study’s limitations though, including absence of a matched control group and only using one measure – the Faux Pas Test, which is not a reflection of the full range of social cognitive processes. Nevertheless, other studies in the field of frontotemporal dementia have revealed similar findings (Lough, Gregory & Hodges, 2001), and one single-case study reported that, although their participant showed damage local to the medial Pre-Frontal Cortex (mPFC), this did not lead to impaired performance on mentalisation tasks (Bird, Castelli, Malik, Frith & Husain, 2004). Frith and Frith (2006) offer a hypothesis that executive processes may be activated when thinking about others mental states, but may not actually be necessary in

performance of mentalising tasks. Another possible explanation for the variability in findings is that different aspects of social cognition engage distinctive neural mechanisms, and that different tests engage different areas of executive functions (Ahmed & Miller, 2011). Similarly, Völlm et al., (2006) suggest that aspects of social cognition rely on networks associated with making inferences about the mental states of others; however, each requires the additional use of other domains involved in emotional processing. More research in this area is needed to shed light on this widely debated topic.

1.5. ARBD and Social Cognition

1.5.1. Alcohol Use Disorders and Social Cognition

The effective understanding and interpretation of one's social environment can have a large effect on an individual's daily life, and has been found to be impaired in a range of conditions, including AUDs. The profile of social cognition within AUDs is particularly characterised by difficulties in emotional facial expression decoding (Donadon & Osório, 2014; D'Hondt, Campanella, Kornreich, Philippot & Maurage, 2014), and these deficits are also associated with relapse (Thoma, Friedmann & Suchan, 2013). In their meta-analysis of social cognition and AUDs, Bora and Zorlu (2017) found facial emotion recognition was significantly impaired, especially in detecting disgust and anger. They also found that a longer drinking history and more depressive symptoms were associated with increased impairment in this area. They asserted that the studies showed significant deficits in aspects of ToM, particularly decoding and reasoning of social information (Maurage, de Timary, Tecco, Lechantre & Samson, 2015). In addition to recognition of emotion in facial expressions, several studies have also found deficits in AUDs to decode emotional prosody (Maurage, Campanella, Philippot, Charest, Martin & de Timary, 2009; Uekermann, Daum, Schlebusch & Trenckmann, 2005) and social problem solving (Schmidt, Roser, Juckel, Brüne, Suchan & Thoma, 2016).

Bora and Zorlu offer hypotheses around the aetiologies of such impairments in AUD, primarily regarding the neurotoxic effect of alcohol on the brain. In

response, Kornreich (2017) offered an alternative idea that non-verbal language processing difficulties may partly precede AUDs. Owing to these difficulties also being present in addictions of behaviour, such as gambling and of other substances (e.g. opiates; Kornreich et al., 2003; Kornreich et al., 2016), Kornreich suggests that attachment plays a large role in a person with AUD comprehending non-verbal emotional cues. Kornreich asserts that due to the associations between insecure attachment and AUDs (De Rick, Vanheule & Verhaeghe, 2009), coupled with the link between insecure attachment and deficits in social cognition (Dadds et al., 2012), deficits may occur in this population due to individuals using alcohol as a strategy to cope with ongoing difficulties associated with attachment (including social difficulties). This hypothesis is also supported by studies assessing social cognition in young people considered to be at high risk of AUD, including those from families with a history of alcohol dependence (Glahn, Lovallo & Fox, 2007; Hill et al., 2007).

1.5.2. Alcohol Related Brain Damage and Social Cognition

Despite the growing literature concerning social cognition and AUDs, studies specifically with populations of ARBD are sparse. The literature search described in section 1.1 revealed only four studies specifically addressing social cognition and ARBD, each of which were published within the last 16 years (half within the last year) and focus on affect recognition in individuals with KS.

Montaigne, Kessels, Wester & de Haan (2006) assessed 23 people with KS using a computer-based Emotion Recognition Task, where individuals were asked to identify the emotion displayed on an actor's face. Faces displayed varying degrees of subtlety in emotional states, which were computer generated. The results indicated that the KS sample showed deficits inferring the facial expressions of anger, fear and surprise, compared to controls; but not to the facial expressions of happiness, disgust or sadness, showing some similarities with data from AUD studies discussed above. Authors suggest impairments may be due to dysfunction in the amygdala and frontal lobe. There are a number of strengths of this study including the use of a control group matched on age, education level and gender. KS participants and controls were also asked to complete the Benton Face Recognition Task (Bention, Sivan, Des

Hamsher, Varney & Spreen, 1994) to control for face recognition deficits. However, the authors provide no further information on the selection of the control group which could present problems with generalisability. In addition, the assessment tool used actors, and intermediate expressions (between neutral expression and full emotional expression) were computer generated, leading to issues with ecological validity discussed above.

Snitz, Hellinger and Daum (2002) took a slightly different approach and looked at the processing of affective prosody in KS by using three subgroups where participants listened to an actor read statements (both neutral and with emotional content) using congruent, incongruent and neutral prosody. They found that affective (happy, sad, angry, fearful and neutral intonation) prosody identification was impaired when semantic content was neutral or incongruent with prosody. The authors suggest that people with KS may have difficulty interpreting affective prosody when unaccompanied by semantic cues and that this is local to comprehension of emotional information. However, there appear to be some limitations to the study. Firstly, due to the small, male-only sample which limits generalisability. Furthermore, the authors argue that poor verbal working memory did not have an impact on test scores due to no deficits being observed within the congruent semantic subtest, however it could be argued that incongruent semantic content places more demands on verbal working memory. In addition, the tasks were likely to require executive functions to 'sort' presented information into two separate categories and to avoid becoming distracted by incongruent information. The authors compare this aspect of the test with the Stroop Task, and argue that due to deficits observed in the neutral semantic content subtest, that deficits in the incongruent tests cannot be due to distraction alone. One may argue that presenting verbal information with 'emotionless' prosody could present as distraction in and of itself and does not necessarily mean impairment is localised to emotional sense-making of verbally presented information. The authors also highlight that the study does not ascertain whether or not their results are specific to KS patients or not and encourage further research using an AUD control.

Responding to this recommendation, a related study by Brion, de Timary, de Wilmars and Maurage (2018) gleaned similar results using a KS group, an AUD group and a healthy control. The study reports that participants with KS showed impairments in identifying prosody, especially in anger and fear identification. However, results were not significantly different from an AUD group, indicating that any impairment may be present before significant ARBD takes place.

People with physical and mental health comorbidities or histories of poly-drug use were excluded from the study, limiting the generalisability of the findings to a significant proportion of the population of ARBD with wide and varying comorbidities. An additional problem with this study was that educational differences between groups was statistically significant, with controls having an average of 5.8 years more education than the KS group, and 3.3 years more than the AUD group. This has clear implications for the findings of this study as education level, and other social issues linked with educational opportunities may impact on affective prosody comprehension.

As part of the same project, Brion, D'Hondt, Lannoy, Pitel, Davidoff and Maurage (2017) also published a further study looking at prosody and facial affect recognition; as well as cross-modal processing (prosody and facial recognition at the same time) of emotions in the same sample of AUD, KS and in healthy controls. They identified that both KS and AUD groups showed decreased performance for decoding emotional facial expressions when incongruent with prosody; however, again there were no significant differences between AUD and KS groups. In addition to the limitations listed for the above, linked study, the authors highlight that due to the limitations of the study, no causal factors can be ascertained, and therefore it remains unclear whether these findings are as a result of chronic alcohol use, or if they are a premorbid factor, contributing to excessive alcohol use.

The paucity of research in the area may be due, in part, to the adoption of the 'continuity theory' (Butters & Brandt, 1985). This suggests that, in addition to nutritional causes, the neurotoxic effect of alcohol has a gradually deleterious effect on the brain, therefore cognitive impairment may be observed in AUDs

and gets worse over time. This may lead some researchers to consider the social cognitive deficits observed in AUD to worsen in ARBD, however, as the limited ARBD research suggests, this may not be the case.

Although they include various limitations, the studies outlined above point towards some difficulty in social cognitive domains in an ARBD population. The results of which are still not understood and further research is needed to understand the link between social cognition and other affected domains in ARBD. In addition, in an attempt to increase the validity of the procedure, studies have excluded those with comorbidities, which, as discussed means results cannot be generalised to the population, of which roughly 87% experience comorbid conditions.

1.6. Study Rationale

Social cognition is thought to be linked with damage to the prefrontal cortex, and subsequent difficulties with executive functioning. The existing literature shows that executive dysfunction is common and often profound in ARBD. A review of the literature suggests that social cognition is likely to be impaired in ARBD due to the crossover in areas of the brain usually affected. Despite the suggested link there have been few studies investigating this, despite clear implications for understanding and possible improvements in rehabilitation for people affected by ARBD.

Evidence suggests that impaired social cognition can lead to stress and discomfort in social situations (Kornreich et al., 2002), and difficulty forming and maintaining relationships and employment (Frith & Frith, 2007). These are linked to relapse (Marlatt, 1996) and dropout from drug and alcohol or similar support services (Foisy et al., 2007). In an already stigmatised population it is important that services are able to support people to be less isolated and have social support systems in place. It is therefore extremely important that more is known about if and how social cognition deficits present in ARBD.

At the service level, revealing deficits in social cognition may help with care-planning and rehabilitation, especially where managing interpersonal issues is a problem. Development of social-skills training programmes or psychoeducation may prove useful where deficits are identified.

1.7. Aims and Questions

The overall aim will be to see whether, and if so, to what extent there are social cognition problems in the ARBD population; and therefore, whether this would be a useful addition to the routine neuropsychological assessment of ARBD; and if so, which kinds of tasks it would be most useful to include.
This study intends to answer the following questions:

- Do people with ARBD show deficits on tasks addressing social cognition?
- If so, what is the profile of social cognition in people with ARBD? That is, are observed impairments associated with specific domains of function, such as affect recognition or theory of mind?
- Are there associations between deficits in social cognition and impairments in other domains of neuropsychological functioning in ARBD? Or are the social cognitive deficits independent?
- Where they occur, do people with ARBD show insight into deficits in social cognition? Do people with ARBD self-report problems in interpersonal functions?
- Are there correlations between drinking history and level of impairment in social cognition in ARBD?

2. METHODOLOGY

2.1. Epistemology

Consideration of the philosophical context of research is important, especially when designing a study. Barker, Pistrang and Elliott (2002) highlight that the epistemological stance of the researcher ultimately guides the methodological design and analysis of the data. Epistemology is concerned with the *acquisition of knowledge* and how we come to know things as truths; while ontology relates to the *philosophical study of reality*. One approach to research is to take a 'positivist' epistemological position, which assumes that truth and knowledge are directly observable, and that through research one may accurately measure the world around us and consequently may assert an objective truth about the world. This approach is generally concerned with declaring objective knowledge about social phenomena, endeavouring to seek out cause and effect relationships. However, positivism has been widely criticised for reducing human experience to superficially observable facts and mathematical relationships between them, while ignoring wider contextual information (Hindess, 1973).

In contrast, other epistemological frameworks have been developed which aim to consider how context may impact upon what we know about the world. Drawing on a 'realist' perspective (which posits that a 'real world' exists, irrespective of human understanding or sense of reality) the epistemological position of 'critical realism' was developed (Cook, Campbell & Day 1979; Bhaskar, 1997). This approach assumes that a real and consistent world exists, however we can never truly know it with certainty.

While critical realism recognises an independent reality, it also stresses that our assumptions of this reality are fallible owing to our own subjective construction of the world from our own perspective (Archer, Bhaskar, Collier, Lawson & Norrie, 2013).

The present study draws on a critical realist epistemological perspective. By adopting this stance, the author assumes a reality of ‘brain damage’ and of associated cognitive domains (e.g. attention, working memory and social cognition), as well as the capacity for humans to begin to understand them. Alongside this though, it is also acknowledged that ‘true’ measurement is not possible, as these concepts are not physical or material properties of the world - rather they are manifestations of human thought, and have been formed and operate in a specific time and place in history, and are born out of a specific socio-cultural context. The author identifies that data retrieved in this study merely measures what we understand to be observable effects of impairment and any findings we may conclude are based on signs of likely manifestations of damage, not the damage itself. Therefore, any findings made should be held tentatively as the best approximation we can currently make and acknowledge that this view is subject to change.

2.2. Design

The study adopted a cross-sectional, between groups approach to attempt to gain a sense of differences occurring between a sample of people with ARBD, compared to pre-existing normative data.

The study also used a cross-sectional correlational approach - whereby within-group variables relating to social cognition will be analysed against other areas of interest, to determine any signs of relationships or patterns between variables. This design offers the advantage of offering a starting point to exploration of the area, while avoiding the need to manipulate variables as this design offers a snapshot of data as it occurs. The use of this design does mean, however that any correlation observed does not signify cause and effect relationships, and misses out the nuances of individual profiles.

Therefore, in addition, a case series analysis was then used to explore data specific to individual profiles, allowing for in-depth analysis to aid understanding

of the cognitive mechanisms at work. It is especially beneficial to use this approach with an ARBD population due to the heterogeneous nature of the condition.

2.3. Sample Size

The sample size was informed by cohorts in similar studies of neurocognitive impairment - which have used fewer than 30 participants (Bosco, Capozzi, Colle, Marostica & Tirassa, 2013; Montaigne, Kessels, Wester & de Haan, 2006; White, Hill, Happé & Frith, 2009). In addition, a power calculation was performed to determine an appropriate sample size; however, using available means, it proved difficult to obtain a reliable result for non-parametric procedures that contrast distributions. A closely related procedure (also a non-parametric one sample test) revealed a sample of 28 would be required when d=0.5 and power (1-ß) =0.8 for differences to show significance at a 0.05 level.

All efforts were made to collect data from as many participants as possible within the recruiting window (July 2017 – March 2018), in line with the notion that a larger sample size provides more reliable results, and therefore more robust conclusions (Coolican, 2017). For various reasons including slow turnaround of residents at the unit, a smaller sample of 16 was collected. The smaller sample size does allow the author to conduct more in-depth analyses of the data and to outline each participants' profile as individual case studies – allowing for greater exploration of the data.

2.4. Ethics

2.4.1. Ethical Approval

Ethical approval was sought out and granted by NHS research ethics committee (Appendix B & C). An application was then made to the research and development team of the relevant NHS health board (Appendix D), and approval was granted to commence data collection.

2.4.2. Participant Recruitment and Consent

The purpose of the study was explained to each participant and they were asked to read through the participant information sheet (Appendix E). Participants were given the opportunity to ask any questions before signing a consent form (Appendix F). Participants were encouraged to keep a copy of the information sheet and were informed that one copy would be stored in their care notes.

Participants were informed that taking part in the research was voluntary and had no negative impact on the support they received from the unit or wider care provision whether they consented to take part or not. Residents deemed to lack capacity to consent by the nursing team and unit psychologist were not asked to take part. Participants were also informed that they may withdraw their data from the study up until analysis (March 2018).

2.4.3. Confidentiality

Participants were notified of confidentiality procedures (see Appendix E). Results were shared with the recruiting psychologist, for feedback to the team. Participants were also informed that the researcher would access their patient notes to gain other information relating to the research, done under supervision of a member of the nursing team to protect patient confidentiality.

Data was anonymised after scoring and stored on an encrypted device when away from the unit.

2.4.4. Protection from Harm

Participation in neuropsychological testing can be tiring and may be anxiety provoking (Lezak, Howieson, Bigler & Tranel, 2012). For this reason, the researcher chose tests of short duration, while attempting to ensure validity. Some additional tests were added onto the existing battery used on the unit to correspond with the research questions, but these were kept to a minimum. The additional burden on participants' time was therefore minimised to approximately 30 minutes and participants were encouraged to take breaks as

needed. Testing environments were comfortable and rapport was established to ease anxiety. Participants were reminded to contact the recruiting clinical psychologist or a member of the nursing team if they had any concerns following their assessment. Patients not wishing to take part were still given the opportunity for routine assessment by the clinical psychologist. In addition, unit staff helped to identify participants who were unsuitable due to issues of capacity, and where taking part may have caused some emotional distress for the participant. Participants were invited to take part at a later date when risk of harm was reduced (e.g. when they had time to settle into the unit or if decisions about capacity had changed).

2.5. Recruitment

Participants were recruited from a specialist ARBD unit. The unit provides step-down care for people with a diagnosis of ARBD who are leaving hospital but require further inpatient support before moving on to independent living. Staff at the unit provide multidisciplinary support to encourage enablement for difficulties associated with ARBD, including cognitive rehabilitation, physical and mental health support, and social care.

2.5.1. Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were utilised in an attempt to reduce possible impact from confounding factors and increase the validity of the study.

Participants had to meet the following criteria to be included in the study:

- ARBD diagnosis - As previously discussed, classification of ARBD can be vague and includes disparate presentations (e.g. Korsakoff's Syndrome, alcoholic dementia). The unit stipulates that clients must have been assessed and been given a formal diagnosis of ARBD in their referral criteria. For example, during recruitment one resident's diagnosis was being queried as Alzheimer's Disease rather than ARBD, therefore they were not asked to take part in the study.

- Participants had to have a good English language facility (both speaking and reading).
- Participants must have been over the age of 18.
- Abstinence from alcohol - Participants must have been through a period of detoxification from alcohol and must have had at least 3 weeks' abstinence at the point of assessment to measure enduring neurological damage more accurately (Lezak, Howieson, Bigler & Tranel, 2012). Participants must also have been free from illicit drugs.
- Comorbidities - As previously discussed, ARBD is associated with many health comorbidities, including traumatic brain injury, hepatic disorders, mental health difficulties and endocrine disorders (Sumransub, 2012). Due to this commonality, recruiting a cohort of people without comorbidities would be almost impossible, and also would represent a minute proportion of the general ARBD population. However, residents were not invited to take part if they had marked and active comorbidities which would greatly impact the validity of the data, such as
    - Autism Spectrum Condition (ASC)
    - Active psychotic symptoms
    - Learning disability
    - Human Immunodeficiency Virus (HIV) infection

  People with other comorbidities were not excluded, but it was ensured that any other comorbidities were noted and considered at the stage of data analysis.

2.5.2. Recruiting

Participants meeting the criteria were approached at the unit by staff members and asked whether they would like to meet with the author to discuss taking part in a research study. If residents were agreeable, we then met in a private meeting room to discuss the study and residents were given the opportunity to read the information sheet (Appendix E) and ask any questions before giving their consent to take part. If residents wished to take part they were asked to complete the consent form (Appendix F) before commencing the assessments.

2.5.3. Procedure

Demographic information was gathered from the client, including date of birth, nationality, years of education, previous employment and latest scores on the Clinical Outcomes in Routine Evaluation-10 (CORE-10 - a depression and anxiety screening tool used routinely on the unit). Residents were asked to recall approximations of the date of their last alcoholic drink and units routinely consumed - however, residents were often unable to recall this information.

Assessments were then completed in the following order (with the opportunity to take a break between each test):

- Test of Premorbid Functioning (TOPF)
- Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)
- Frontal Assessment Battery (FAB)
- ACS Emotion Recognition Task
- Strange Stories Task (SST)
- Questionnaire of Cognitive and Affective Empathy (QCAE)

Assessments took an average of 1.5 hours to complete. Participants were then thanked for completing the assessments and for participating in the study and were reminded about what would happen to the data and their right to withdraw. The author then asked staff to answer any additional information needed from the resident's notes, including details of any current prescribed medication which may affect cognitive performance, report any marked and active comorbidities and to provide an estimated date of last alcoholic drink consumed. Data collection process generally took around 2 – 2.5 hours for each participant in total, including participant breaks.

2.6. Materials

The majority of the tests administered to participants were part of the routine neuropsychological assessment battery at the unit. The existing battery

included the TOPF, RBANS, FAB and CORE-10, which was reviewed by the author against the domains needed for the study. The author deemed the tests to be appropriate for the study, with the addition of other suitable measures (discussed below).

The RBANS (Randolph, Tierney, Mohr & Chase, 1998) is a short battery of 11 tests measuring the domains of immediate memory, delayed memory, visuospatial/constructional, attention and language.

The battery is normed on a sample of 540 North American men and women aged 18-89 and allows for comparisons to be made between individual subtests (Randolf, Tierney, Mohr & Chase, 1998). The RBANS requires less time to administer than similar tests, minimising fatigue for the participant, and shows good test-retest reliability in the assessment of neurological disorders, including Alzheimer's disease (Karantzoulis, Novitski, Gold & Randolph, 2013) and in assessment of people presenting with AUDs (Green, Garrick, Sheedy, Blake, Shores & Harper, 2010).

Although the reliability of the RBANS has not been researched in an ARBD population to date, the RBANS includes many tests which feature in other methods of assessment and show good reliability and validity in assessment of ARBD - including the digit span and logical memory subtests in the Weschler Memory Scale (Oscar-Berman, Kirkley, Gansler & Couture, 2004) and figure recall in Rey Osterreith Complex Figure Test (Brand et al., 2005).

While the study focuses on social cognition, it is also useful to carry out a full neuropsychological battery to ascertain the level of current versus premorbid functioning. This helped to verify the ARBD diagnosis; but also, due to the breadth of the term and disparity in severity of impairment, helped the author to understand the overall cognitive picture. Establishing a fuller cognitive picture allows for cross-domain and componential analysis - to explore links and relationships with social cognition and other areas of cognitive functioning. In line with the critical realist strategy of 'triangulation' (Barker, Pistrang & Elliot, 2002), three separate measures of social cognition are used (including a self-

report measure) in order to increase validity and aid in exploration of the concept as a whole.

Owing to the paucity of research in this area the selected tests have not been validated for use with ARBD (Horton, Duffy, Hollins-Martin & Martin, 2015). Therefore, appropriate care was taken upon analysis and making recommendations. That being said, these measures provide a good starting-point to research in this area.

2.6.1. Assessment of Premorbid Function

Premorbid functioning is an estimate of an individual's level of cognitive functioning before onset of ARBD. The TOPF (Pearson, 2011) was selected for the present study and involves presenting participants with a list of irregularly spelled English words (e.g. homily, whole) which they are asked to pronounce one at a time. Participants are scored on how many they pronounce correctly. The list is designed so that standard English pronunciation rules make it difficult for the participant to answer correctly without having prior contact with each word.

Scores are compared with normative data to establish an estimation of premorbid general cognitive function. The cognitive skills to perform well on this type of test are considered to be preserved in ARBD presentations (Fujiwara, Brand, Borsutzky, Steingass & Markowitsch, 2008) and should therefore provide an approximate estimate of functioning before the individual's functioning began to be affected.

The test has well-established reliability and validity, and similar versions of the test (National Adult Reading Test by Nelson & Willison, 1991) show high reliability when assessing people with ARBD (Maharasingham, MacNiven & Mason, 2013). Possible limitations of the test include the assumption of normal development of reading abilities prior to onset of impairment (i.e. the absence of conditions such as dyslexia or a learning disability), access to education as a child, and exposure to English reading materials. None of the participants' records showed indication of learning difficulty or disability, and all except one

of the participants were born and educated in the United Kingdom. All had English as their primary language. The remaining participant was educated in the United States and was also likely to have similar access to education. Naturally, learning difficulties and disabilities can sometimes go undetected; therefore, years of full time education were also recorded and considered at analysis and scores interpreted with caution.

2.6.2. Assessment of Working Memory

Working memory was assessed using the following measures:

- RBANS Digit span forward - Participants are asked to repeat back to the examiner a string of numbers, requiring the participant to access short term memory stores and communicate retention verbally.
- Digit span backward - Participants were asked to repeat a string of numbers backwards. This test assesses working memory and attention, requiring participants to access short term memory stores and manipulate information.

2.6.3. Assessment of Processing Speed

Processing speed was assessed using the RBANS symbol coding subtest - whereby participants were asked to fill in as many missing numbers which match corresponding symbols as they can in 90 seconds. This test measures processing speed and attention via amount of numbers completed and deducts points for inaccurate answers.

2.6.4. Assessment of Learning and Memory

Learning and memory abilities were assessed using the following measures:

- RBANS word list learning - Participants were asked to repeat back a string of 10 words immediately after hearing them, requiring participants to access short term memory stores and communicate retained information verbally.
- RBANS word list delayed recall - Participants were asked to repeat back the string of words from the word list learning task following a 20-minute delay.

- RBANS word list recognition - Participants were asked to recall whether or not presented words featured in the word list learning task.
- RBANS story learning - Participants were asked to repeat back a short story using the same or very similar wording.
- RBANS story delayed recall - Participants were asked to recall the story following a 20-minute delay.
- RBANS figure delayed recall - Assessing delayed visual memory. Participants were asked to recall and draw the figure from the figure copy task, following a 20-minute delay.

2.6.5. Assessment of Visuo-Spatial Skills

Visuo-spatial abilities were assessed using the following measures:

- RBANS Line orientation - Participants were asked to identify the two matching lines from an array of 13 lines positioned at different angles.
- RBANS Figure copy - Participants were asked to draw a copy of a complex figure design, assessing how accurately aspects of the figure were drawn and their placement.

2.6.6. Assessment of Verbal-Conceptual Abilities

Verbal-conceptual abilities were assessed using the following measures:

- RBANS Picture naming - Participants were asked to verbally name pictures of 10 common objects.
- FAB Similarities - Participants were asked to verbally name how two objects are alike. This also acts as a measure of executive functioning, assessing the participants' ability to conceptualise words.

2.6.7. Assessment of Executive Functioning

The FAB (Dubois, Slachevsky, Litvan & Pillon, 2000) is a brief battery of 6 tests of executive functioning, measuring the domains of conceptualisation, programming, sensitivity to interference, mental flexibility, inhibitory control and environmental autonomy. The authors report suitable inter-rater reliability and internal consistency (Dubois, Slachevsky, Litvan & Pillon, 2000), which is supported by follow-up studies (Slachevsky et al., 2004). Authors suggest a cut-off score of 12/18 to help identify deficits in FTD and AD populations

(Slachevsky, Villalpando, Sarazin, Hahn-Barma, Pillon & Dubois, 2004). There are no cut-off guidelines available for testing in ARBD however, and presentation of deficits in executive function is likely to be dissimilar. This will be considered during discussion of the results. Where participants do not gain full scores this will be considered on a case-by-case basis.

Verbal executive functioning was assessed using the following measures:

- Category fluency - This test assesses participants' ability to group like items and lexical access speed. Participants were asked to say as many names of fruit and vegetables as they can in 60 seconds. Point are assigned based on number of words generated.
- FAB Letter fluency - Assesses the participants' vocabulary, mental flexibility, lexical access speed and inhibition. Participants were asked to say as many words beginning with the letter 's' as they could in 60 seconds while following pre-defined rules. Scores are based on number of words generated.

Motor executive functioning was assessed using the following measures:

- Bimanual alternation – This test was added to the administration as the FAB only assesses right hand motor control. Participants were instructed to watch the examiner perform a motor task (alternating between clenching fist and flattened hand using both hands alternately), the participant was then instructed to complete the task with the examiner, and then to complete 6 alternations alone. Scores are based on number of swaps performed alone.
- FAB Motor series – Similar to bimanual alternation, participants were first asked to watch the examiner perform a short motor series with their hands (fist, chop, slap). Participants were then asked to perform with the examiner and then to perform the task alone. This test assessed participants' motor programming abilities. Scores are based on number of cycles performed alone.
- FAB Conflicting instructions – This assesses participants' sensitivity to interference. Participants were asked to tap the table with their hand

twice when the examiner taps once, and once when the examiner taps twice. Scores are based on number of errors.

- FAB Go no-go – Following the conflicting instructions task, the rules were changed and participants were asked to tap the table with their hand once when the examiner taps once, but not at all when the examiner taps twice. This assessed participants' inhibition control and mental flexibility. Scores are based on number of errors.
- FAB Prehension behaviour – This test assessed participants' autonomy over their environment. Participants were asked to hold out their hands and asked not to take hold of the examiners when their palm is touched. Scores are based on whether or not the participant takes the examiners hands or hesitates.

2.6.8. Assessment of Social Cognition

While there are many facets to social cognition (see introduction), for the purposes of this study two aspects will be addressed: perspective taking and affect recognition. The tests outlined below were used to generate an understanding of social cognition in people with ARBD and were compared against published norms to answer research questions 1, 2 and 4. Results were then compared against other tests and participant history in response to questions 3 and 5.

2.6.8.1. Emotion perception. Emotion perception was assessed using the ACS Emotion Recognition Task whereby participants are presented with photographs of 24 actors faces and asked to identify, from a list of seven emotions, which one each person is displaying.

ACS Emotion Recognition Task (Pearson, 2009) is a measure of facial affect recognition. Participants are presented with a list of seven named emotions - angry, sad, happy, disgusted, surprised, afraid and neutral. They were then asked to view 24 photographs, showing an actor displaying one of the seven presented emotions. Participants were asked which emotion the actor was displaying from the list provided. Responses were scored and compared against the normative data.

The ACS Emotion Recognition Task was chosen as it is considered to offer more culturally sensitive than others in that it focuses on seven emotional states which are believed to be recognised universally (Ekman & Cordaro, 2011) and includes faces from men and women of different ages and from a range of ethnic groups and both sexes. The ACS Emotion Recognition Task is one of few standardised measures available for evaluating affect naming and shows good reliability against other measures of social cognition (Kandalaft et al., 2012). The test does have limitations, including the lack of dynamic stimuli, relying heavily on participants' ability to detect emotional state from a still photograph, neglecting the many other aspects used in the communication of emotions, and therefore compromises the ecological validity of the measure.

2.6.8.2. Mentalising. The SST (White et al., 2009) is a measure of mentalising, assessing second-order mental state inferences, adapted from the original version by Happé et al., (1994). The task consists of sixteen short vignettes (see Appendix G for excerpts). Eight of which intended as measures of ToM, which require an understanding of the intentions of others (e.g. elicitation of sympathy, and comprehension of subtle communication acts such as irony). The remaining eight vignettes are physical stories and did not require the participant to use mentalising abilities. This acted as a componential control, for verbal short-term stores and basic conceptual skills required to understand the story content and questions, as well as retain information needed to answer the question. As highlighted, the physical stories were designed to allow the administrator to compare against the mentalisation task and differentiate low scores indicating poor mentalising ability or indicating impaired performance because of other confounding domains. The SST was chosen due to its prior use in other neurological conditions such as Alzheimer's Disease (Castelli et al., 2011). The test has been validated against six other measures of theory of mind in adults and children with autism (White et al., 2009), and allows for greater rigidity owing to the inclusion of the physical control questions.

Participants were asked to read the vignette and then asked a question about the character's behaviour (see Appendix G) requiring them to comprehend the

characters state of mind. Participants had constant access to the written vignettes to reduce the effect of any potential memory difficulties. Participant responses to SST were recorded verbatim and scored 0, 1 or 2 based on the extent to which the answer demonstrated mentalisation with the mind of the character in the story, or the answer to the physical stories (with each story having specific scoring criteria outlined in the manual). Scores were then compared against normative data which was based on a small sample of 40 British participants (White et al., 2009), and was therefore interpreted with caution. See Appendix G for examples of vignettes and questions.

2.6.8.3. Empathy. The QCAE (Reniers, Corcoran, Drake, Shryane & Völlm, 2011) is a self-report questionnaire which aims to measure several aspects of the construct of empathy: perspective taking, emotion contagion, online simulation, peripheral responsivity and proximal responsivity. Participants are asked to what extent they agree with 31 given statements (circling strongly agree, slightly agree, slightly disagree or strongly disagree), and scores can be separated into two subscales: affective empathy (experiencing others' emotional states) and cognitive empathy (recognising and understanding others' emotional states).

The self-report nature of the measure allows the authors to compare the performance-based measures with the views of the participant and their own understanding of their social functioning with regards to empathising with others. Including multiple and varied methods of assessment allows for greater exploration of the topic and a more rigorous analysis of performance measures.

The QCAE was normed against a sample of 925 University students in the UK. Although normed on a student population, the QCAE has been validated against many other measures (Reniers, Corcoran, Drake, Shryane & Völlm, 2011), and the authors derived many items from pre-existing validated measures - including the Hogan Empathy Scale (Hogan, 1969), and the Interpersonal Reactivity Index (Davis, 1980).

2.6.9. Assessment of Mood

Anxiety and low mood have been shown to have a deleterious effect on cognitive test performance (Chepenik, Cornew & Farah, 2007). As discussed, such difficulties can be common in people with ARBD. Although a very brief screening tool, the CORE-10 offers some insight into the level of anxiety and low mood experienced, allowing the author to consider possible effects on the data.

The CORE-10 (Connell & Barkham, 2007) offers a brief, standardised and validated measure assessing signs of anxiety and depression. Participants are asked how often in the past week they have experienced each of the 10 items, e.g. “I have felt panic or terror”. Participants’ answers on each item are scored from 0-4 based on the frequency they experienced the item, and scores are added up to a total score out of 40. Scores are interpreted against norms ranging from ‘healthy’ to ‘severely distressed’. The measure was normed against a sample of over 2500 people (Connell & Barkham, 2007), and included clinical and non-clinical samples and is therefore considered to have good reliability. Other advantages of the measure include the short length of time taken to complete and was considered the least intrusive option due to the existing routine usage at the unit.

2.7. Analysis

Raw scores from each subtest were converted to age-matched scaled scores (Appendix H) to control for cognitive decline that typically occurs with ageing. Scaled scores and participant characteristic data was input into Statistical Package of Social Science (SPSS) version 22. Chi-square analyses were used to explore participant characteristics.

Non-normal distribution was assumed due to the small N of the study, coupled with the use of primarily ordinal data, therefore a Kolmogorov-Smirnov (non-

parametric) test was used to analyse the data against UK normative data. Scaled score data were analysed together to reduce family wise-error rates.

Spearman's rho correlation analyses were then conducted to analyse relationships between ARBD and social cognition (see Appendix I for full correlational matrix). Finally, a case series analysis was performed to explore individual participant profiles.

2.8. Participant Characteristics

2.8.1. Demographics

Sixteen participants took part in the study, aged between 42 and 68 – representing older working age adults. Three of the participants were female (18.75%), reflecting the representation in the unit. All of the participants were White British (one mixed white British and North American) and all were native English speakers. The group had an average of 11.91 years full time education (typical for a UK sample) and had been staying at the unit for an average of 10 weeks. See section 3 for more demographic information.

2.8.2. Comorbidities

All participants were diagnosed with ARBD as criteria for admission into the unit, although, as has been discussed, aetiology and nature of ARBD diagnosis can differ somewhat between individuals. Comorbidities occurring in more than one participants included: Alcohol Related Liver Disease (ARLD; four participants); diabetes (four participants); peripheral neuropathy (three participants); stroke (including TIA, lacunar and haemorrhagic stroke; three participants); asthma (two participants); epilepsy (two participants) and COPD (two participants), all of which are typical of the ARBD population (Sumransub, 2012). Each of these comorbidities can affect cognitive functioning to varying degrees and is discussed further in the case series analysis. Mental health comorbidities were less common, but frequently occurring diagnoses included depression (six participants) and self-harm (two participants). It should also be noted that each of these comorbidities appears

on individuals' clinical notes, however most diagnoses were given before admittance onto the unit, therefore current presentation at time of participation in the study may not have reflected diagnostic labels.

3. RESULTS

3.1. Participant Characteristics and Initial Measures

Descriptive statistics and histograms were utilised for exploratory data analysis and to identify outliers, missing data and any input or scoring errors. Table 1 shows descriptive statistics for demographic information and initial measures. The mean age (M=56.44) is comparable to other studies of ARBD (Blansjaar et al., 1992; Fujiwara, Brand, Borsutzky, Steingass & Markowitsch, 2008); however, the low standard deviation for this variable (SD=6.71) suggests data is limited in its application beyond older working age adults. The mean years of full-time education was 11.91, which is typical for a UK population. The average length of admission at point of testing was 10 weeks, although standard deviation is high, and the mean was likely skewed by one participant who had been staying at the unit for 51 weeks. The median value for weeks since admission was 6.5.

While each participant had not consumed alcohol for at least 3 weeks prior to taking part (as part of inclusion criteria), it was problematic getting accurate data regarding the specific date of their last alcoholic drink; therefore, the estimated data (by the participant and unit staff) has been included within the case series analysis, but it is not possible to gain more accurate insight.

Mean CORE-10 scores fell just within the ‘mild distress’ classification; however, the overall range of scores was large. TOPF index scores fell around the normative average of 100; with 14 out of 16 scores within the ‘average’ or ‘low average’ range. Of the remainder, one score fell just within the ‘borderline’ range (78), and another fell within the ‘high average’ range (113).

A chi-square analysis of participants’ sex showed that the sample is not equally representative of both sexes (X^2 (1, N=16) =4.00, p=.07). The results should

therefore be considered with this in mind, although this reflects the general male/female split in diagnosis and treatment of ARBD (Ridley & Draper, 2015).

Table 1: Descriptive Statistics for Participant Characteristics and Initial Measures on Day of Testing

	Mean	SD	Min	Max
Age	56.44	6.713	42.0	68.0
Education (years)	11.91	1.200	10.5	13.5
Weeks since admission	10.00	12.318	1.0	51.0
CORE10 total score	10.75	6.213	0.0	24.0
TOPF index score	94.31	8.220	78.0	113.0

3.2 Analysis of Neuropsychological Data

As discussed, nonparametric analyses were used due to the small sample size of primarily ordinal data and as the data does not follow a normal distribution. Therefore, descriptive statistics and Kolmogorov-Smirnov analyses were used to examine performance on the neuropsychological battery and to compare test scores to age-matched normative data (where M=10, SD=3). Descriptive statistics and distribution data are presented in Table 2.

3.2.1. Cognitive Domains

Visual review of the mean scaled scores implied that the participants showed below-typical scores on many of the individual subtests (see table 2). The most difficulty was observed in the RBANS Word List tasks (namely Word List Learning, Delayed Recall and Recognition), which involved immediate memory and delayed memory. Significant impairments were also observed in Story Learning (immediate memory), Story Delayed Recall and Figure Delayed Recall (delayed memory), Category and Letter Fluency (language), Symbol Coding (attention) and Digit Span Backwards (attention and executive functioning) – which all fell more than one standard deviation below the mean of 10.

Conversely, the mean scaled scores for Figure Copy and Line Orientation were close to the mean; suggesting that visuospatial/constructional skills were generally preserved. Performances in the Digit Span Forwards and Picture Naming tests also fell within one standard deviation of age-matched means; indicating relative strengths in these areas – although the range for the Digit Span test was broad, suggesting wide variability across participants. General cognitive and intellectual abilities appeared intact.

One-sample Kolmogorov-Smirnov test analyses confirmed that Figure Copy, Digit Span Forwards, Picture Naming and Line Orientation fell within the normative range. Mean scores on all other subtests were significantly lower than the age-matched normative sample.

As can be observed in Figure 1, score ranges tended to be wide, even where means were low, illustrating the large variability in the scores and differences in individual profiles.

Although not reportable as a scaled score, performance on the FAB revealed 14 out of 16 participants showed impairment in executive functioning, especially on the Go No-Go and Letter Fluency subtests (see Figure 2).

RBANS scoring allows for subtests to be grouped by domain in order to produce domain specific index scores. Mean index scores across the sample are given in figure 3. While TOPF and scores from the tests of visuospatial/constructional abilities fell within the average range, language and attention index scores fell just below this into the low average range. Of significance are the index means for immediate and delayed memory, both of which dropped into the borderline range suggesting participants had deficits in these areas. As discussed, deficits in the areas of immediate and delayed memory are common in the general profile of ARBD (Harper, 2009).

Table 2: Descriptive and Distribution Data for Subtest Scaled Scores.

Test	Mean	SD	Min	Max	Kolmogorov -Smirnov	P
Social Cognition						
ACS Affect Naming	9.06	1.843	5	12	1.250	.088
SS Mentalisation	5.31	3.646	1	11	2.240	.000
SS Physical	10.50	2.852	5	14	0.772	.590
QCAE Affective	8.44	2.250	5	12	1.272	.790
QCAE Cognitive	10.13	2.778	7	17	0.772	.590
RBANS Subtests						
Digit Forward	8.50	3.688	2	14	1.385	.043
Digit Backward	6.69	2.243	2	12	2.490	.000
Symbol Coding	6.25	3.235	2	12	2.365	.000
Letter Fluency	6.50	3.933	1	13	1.990	.001
Category Fluency	5.62	2.419	2	11	2.740	.000
Figure Copy	10.50	2.530	6	14	1.000	.270
Line Orientation	9.75	3.066	5	14	0.635	.815
Picture Naming	11.44	1.632	6	12	2.490	.000
List Learning	4.63	3.202	1	11	2.885	.000
List Delayed Recall	4.44	3.881	1	13	2.409	.000
List Recognition	4.81	4.400	1	12	2.385	.000
Story Learning	6.94	3.415	1	12	1.615	.011
Story Delayed	5.12	3.202	1	10	2.385	.000
Figure Delayed	6.88	4.319	1	15	1.635	.010

Figure 1: Box and Whisker Plot of Group Subtest Scaled Scores

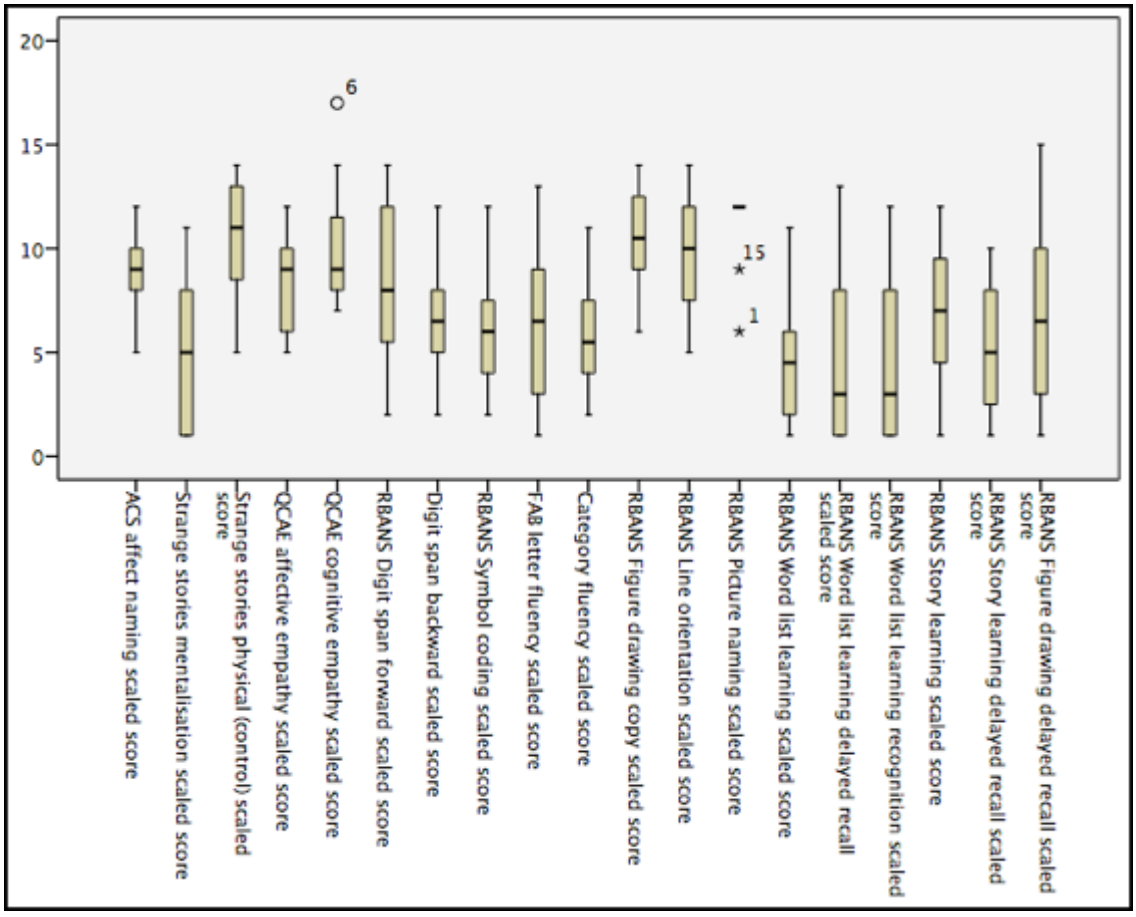


Figure 2: Index Mean Scores for Individual Domains on RBANS and TOPF Assessments.

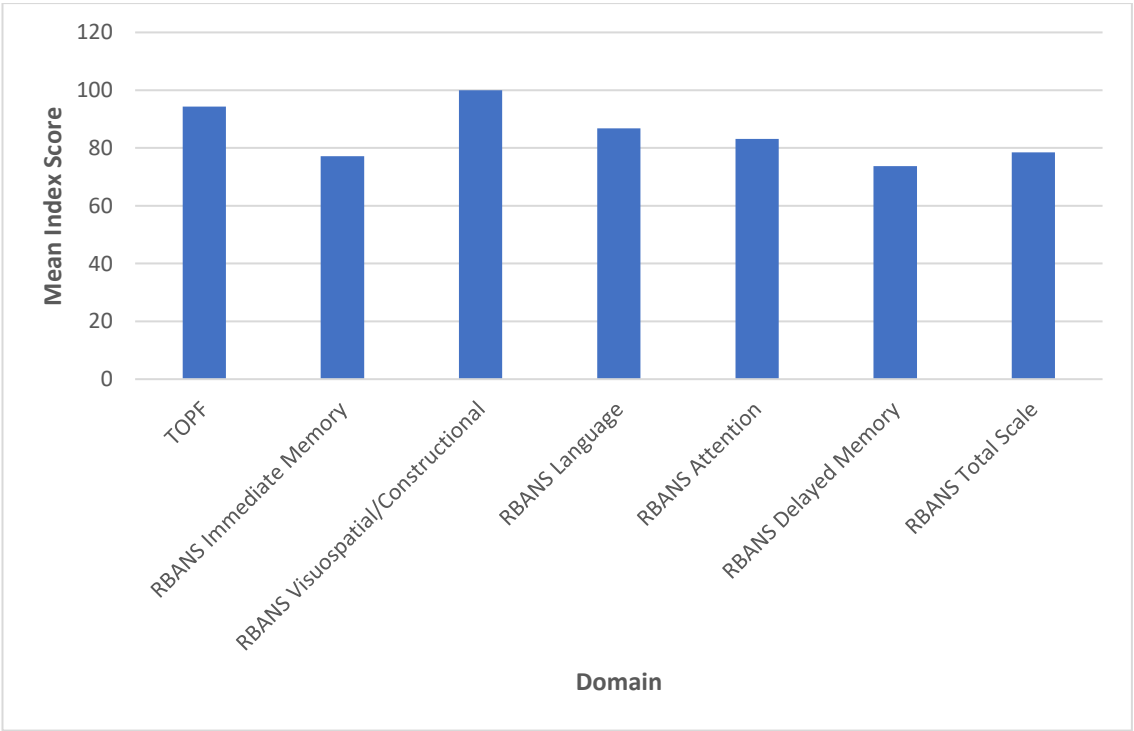
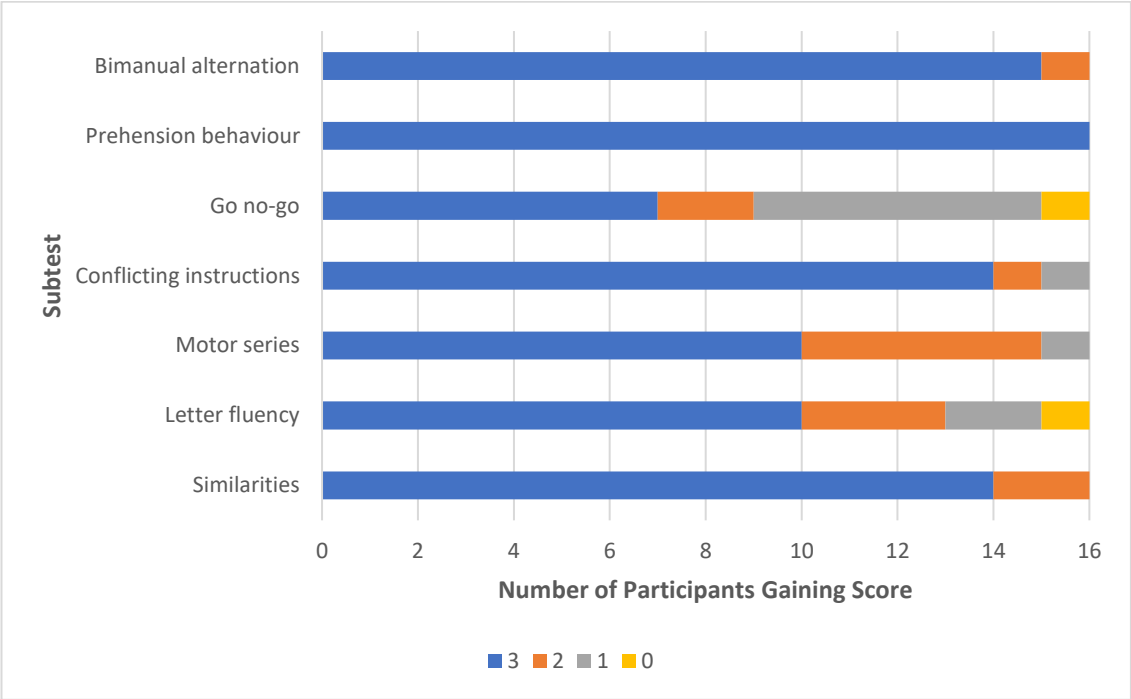


Figure 3: Group Frequency of Scores in Tests of Executive Function



3.2.2. Social Cognitive Function

Inspection of the measures of social cognition suggested that all but one of the four subtests fell within the normal range. The SS Mentalisation subtest, however, fell more than one standard deviation below the mean. This is suggestive that there were impairments in this domain among participants. This result is supported by significant values gained from the Kolmogorov-Smirnov analyses ($D=2.240$, $p<0.01$), suggesting the data distribution significantly differs from the normative data.

3.3. Relationships Between Tests

Spearman's rho correlational analysis was used to explore the relationships in neuropsychological test performance between domains. Spearman's rho (a non-parametric test) was chosen for its suitability to smaller samples and is commonly used where the majority of the variables in a data set are not normally distributed. Significant relationships were identified using r, following guidelines for interpreting effect size (Cohen, 1977), rather than p value. A full correlation matrix is given in Appendix I detailing r, and p values for all variables.

3.3.1. Mentalising

The SS Mentalisation task was found to be positively associated with QCAE cognitive ($r=.500$, $p<.05$) and affective ($r=.720$, $p<.01$) empathy scores, as well as the TOPF ($r=.517$, $p<.05$) index score. Smaller correlations were also noted in Figure Copy ($r=.417$), Line Orientation ($r=.463$), List Learning ($r=.382$) and List Recognition ($r=.358$).

3.3.2. Affect Naming

ACS Affect Naming was found to be positively correlated with attention index scores ($r=.517$, $p<.05$) and FAB total scores ($r=.538$, $p<.05$); but was, however, found to be negatively correlated with delayed memory index scores ($r=-.548$, $p<.05$) and Figure Delayed Recall ($r=-.612$, $p<.05$).

3.3.3. Self-Report Measure

QCAE cognitive and affective empathy scores were strongly positively correlated with one another (r=.801, p<.01), which is expected based on initial analysis of 925 participants by authors Reniers, Corcoran, Drake, Shryane & Völlm (2011). Despite this, affective empathy was consistently rated lower than cognitive empathy, indicating that participants associated themselves more with statements of cognitive empathy than with qualities of affective empathy.

3.3.4. Other Notable Correlations

Negative correlation was revealed between the CORE-10 scores and Digit Span Forwards (r=.661, p<.01), as well as Letter Fluency and TOPF index scores (r=.633, p<.01).

3.4. Individual Case Analyses

As is common in clinical neuropsychology, a case series analysis was also conducted. Owing to the relatively small number of participants and the heterogeneous nature of ARBD, individual profile analyses allow exploration within group data to identify patterns and relationships between scores (Schwartz & Dell, 2010). Individual scores for each participant were analysed against demographic and contextual factors, as outlined below. In line with criteria, all participants had a diagnosis of AD and ARBD prior to entering the unit, in addition to any comorbidities listed.

The case series analyses highlighted differences and similarities amongst the participant group. While the majority of the sample shared many characteristics including ethnicity, gender, education level and premorbid estimates – overall the sample highlighted aspects of heterogeneity, particularly in comorbidities, and overall cognitive profiles of people diagnosed with ARBD. In total, 11 out of 16 participants showed impairment on the SS Mentalisation task relative to norms and respective scores on the SS Physical Control task. These results will be considered in more depth in the discussion section.

3.4.1. Participant 1

3.4.1.1. Background information. Participant 1 is a 55-year-old, white British female who attended full-time education until the age of 16. Her previous employment included factory work.

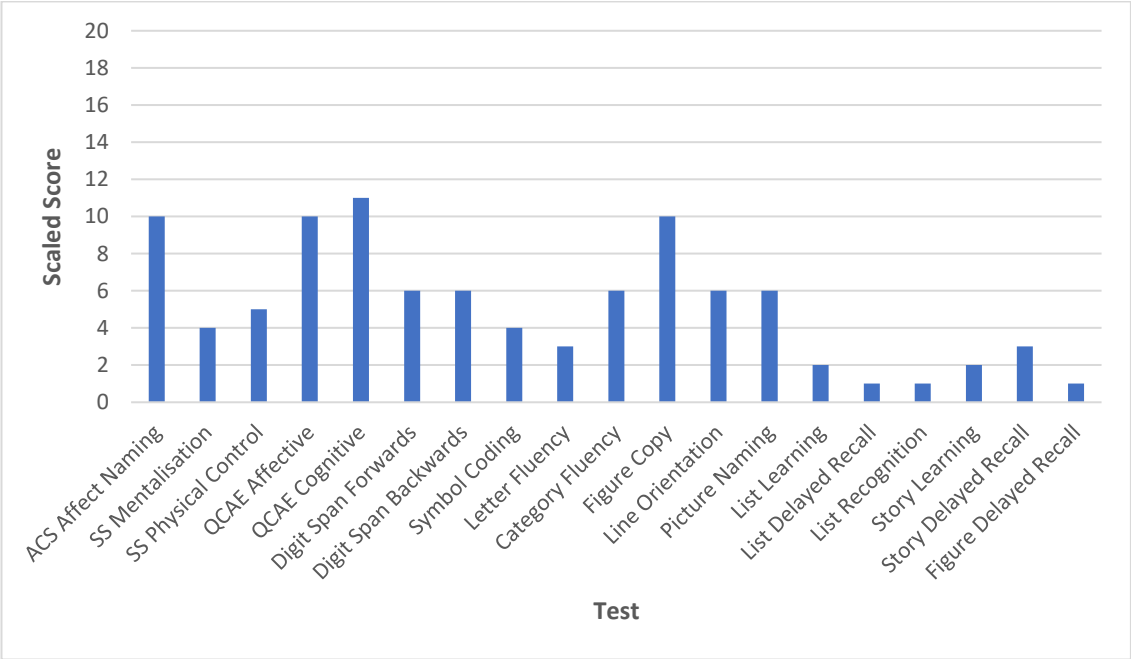
At the time of testing she had been staying at the unit for 10 weeks and reported that her last alcoholic drink was 15 weeks prior to testing. Recorded comorbidities were depression and asthma. Conclusions regarding the links between depression and impaired cognition are mixed; with some studies reporting poor motivation and concentration affecting test performance (Castellon et al., 2006), whereas other studies show no discernible differences in neuropsychological assessment (Carter et al., 2003). Similarly, although some small studies show signs of asthma affecting cognitive functioning in severely affected individuals, there is not enough evidence to make definitive conclusions (Irani, Barbone, Beausoleil & Gerald, 2016). Therefore, it is unclear how these two comorbidities may affect this participant's scores – however, they are kept in mind throughout analysis.

3.4.1.2. Preliminary measures. Participant 1 scored 14 on the CORE-10, indicating that a mild degree of emotional distress was experienced in the week prior to testing. She scored 15 out of 18 on the FAB, indicating that there may be some degree of difficulty in the domain of executive functioning – specifically in the Letter Fluency, Motor Series and Go No-Go subtests. Scores on the TOPF are suggestive of a low average premorbid ability.

3.4.1.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 1 are shown in Figure 4. Participant 1 showed significant decline in immediate and delayed memory (in both verbal and visual measures), as scores fell in the profound impairment range. Scores on tests of attention also indicated a mild level of impairment. Her visuospatial skills and working memory scores were a relative strength and fell in line with premorbid estimates. Language scores fell within the borderline range, but were, however, a strength relative to other domains.

Participant 1 showed no impairment in Affect Naming; and self-report scores on the QCAE were in the average range. This participant did, however, show some impairment in SS Mentalisation Stories and Physical Stories, both falling within the borderline range. Due to the low scores in the physical control subtest, scores on the SS task may not be indicative of impaired mentalisation but are likely to be reduced by other domains such as difficulties in working memory or executive function deficits.

Figure 4: Participant 1 - Subtest Scaled Scores



3.4.2 Participant 2

3.4.2.1. Background information. Participant 2 is a 62-year-old, white British male who attended full-time education until the age of 17. His previous employment included managerial work.

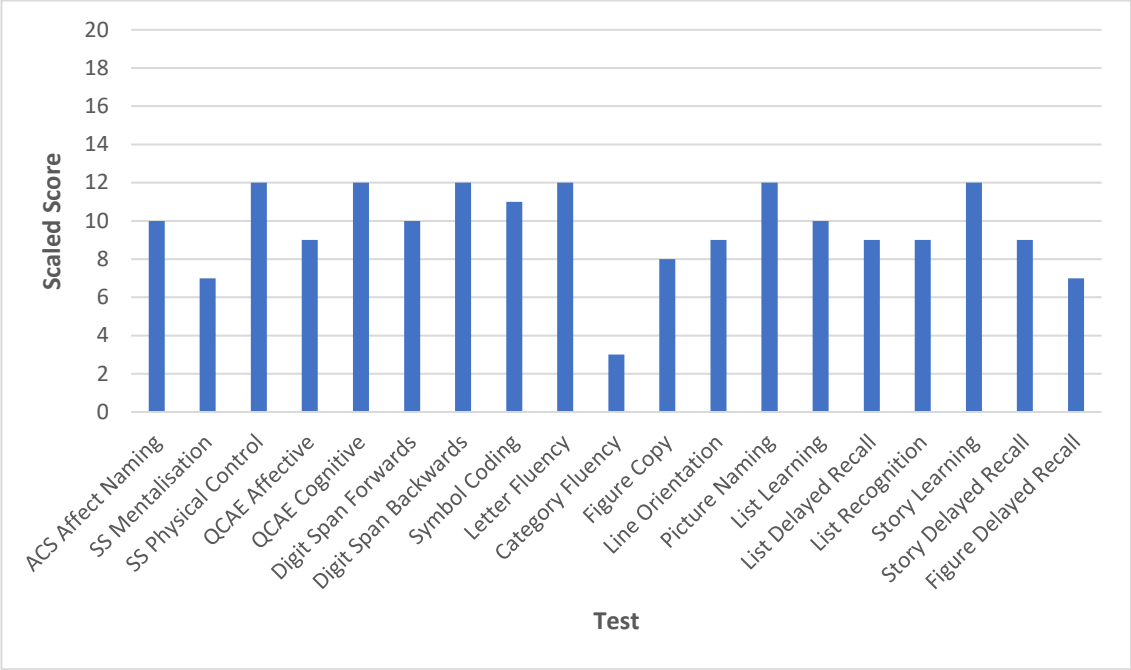
At the point of testing he had been staying at the unit for 16 weeks and reported that his last drink was 19 weeks prior to testing. The participant had epilepsy as a listed comorbidity, however, no further information was available. Lee & Clason (2008) discuss that epilepsy can have an effect on general intellectual functioning and may show especially on tests of learning and memory; however, it is difficult to say to what extent scores may have been affected in this case due to lack of additional contextual information.

3.4.2.2. Preliminary measures. Participant 2 scored 0 on the CORE-10, indicating little distress was experienced in the week prior to testing. He scored 14 on the FAB, indicating some degree of difficulty in the domain of executive functioning – specifically on the Motor Series and Go No-Go subtests. Scores on the TOPF are suggestive of an average premorbid ability.

3.4.2.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 2 are shown in Figure 5. This participant's scores were largely preserved across domains within the average or low average range. The participant did show some difficulty with the Category Fluency task – forgetting the rule half way through and naming animals instead of fruit and vegetables. This could be due to the participant briefly losing concentration and continuing the task in the most familiar way (the Addenbrook's Cognitive Examination is used to assess residents monthly, in which they are asked to complete the Category Fluency task using names of animals). This suggests the participant had difficulties with perseveration.

This participant had well-preserved functioning of social cognition, in tests of mentalising, affect recognition, and on self-report measures.

Figure 5: Participant 2 - Subtest Scaled Scores



3.4.3. Participant 3

3.4.3.1. Background information. Participant 3 is a 66-year-old, white British male who attended full-time education until the age of 15. His previous employment included engineering.

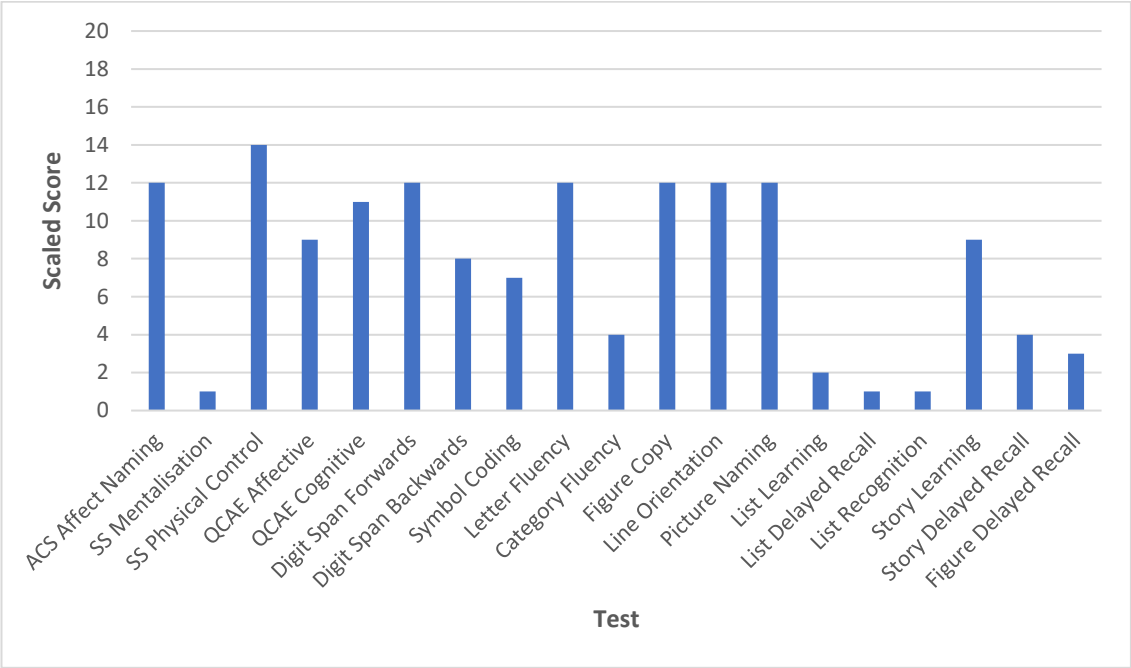
At the point of testing the participant had been staying at the unit for 6 weeks and reported that his last alcoholic drink was at least 6 weeks prior to testing. The participant had no known conditions occurring alongside ARBD and AD.

3.4.3.2. Preliminary measures. Participant 3 scored 13 on the CORE-10, indicating a mild level of psychological distress. He scored 17 on the FAB, losing one point on the Motor Series task. Scores on the TOPF are suggestive of an average premorbid ability.

3.4.3.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 3 are shown in Figure 6. This participant showed preserved functioning on measures of visuospatial ability, processing speed, working memory and language; although scores in Category Fluency fell within the borderline range. Despite average functioning visuospatial skills, visual tasks involving memory indicated moderate levels of impairment (Figure Delayed Recall), as well as verbal tasks of delayed memory (Story and List Recall and Recognition). Scores for immediate memory were also in the impaired range for List Learning (involving learning of unlinked information), however, fell in the average range for Story Learning (linked, contextualized information).

This participant scored in the profoundly impaired range in SS Mentalisation stories; and scores on the physical controls fell in the high-average range, indicating that the participant demonstrated specific impairment in mentalisation skills. Scores in Affect Recognition and self-rated empathy scores were in the average range.

Figure 6: Participant 3 - Subtest Scaled Scores



3.4.4 Participant 4

3.4.4.1. Background information. Participant 4 is a 62-year-old, white British male who attended full-time education until the age of 15. His previous employment was as a delivery driver.

At the point of testing he had been staying at the unit for 23 weeks and his last drink was at least 23 weeks prior to testing. Comorbidities include alcohol-related liver disease, chronic obstructive pulmonary disease (COPD), a history of transient ischemic attacks and insulin dependent diabetes mellitus. Although there remains a paucity of research in the area, Ganzer, Barnes, Uphold & Jacobs (2016) question whether transient ischemic attacks may have lasting and long-term neuropsychological effects, especially in executive functioning. Some studies have also investigated possible links between liver disease and cognitive decline; however, it has proven difficult to distinguish to what extent alcohol-related and non-alcohol related liver disease differ from each other, and how much the cognitive decline is related to ARBD rather than effects of liver disease (Collie, 2005).

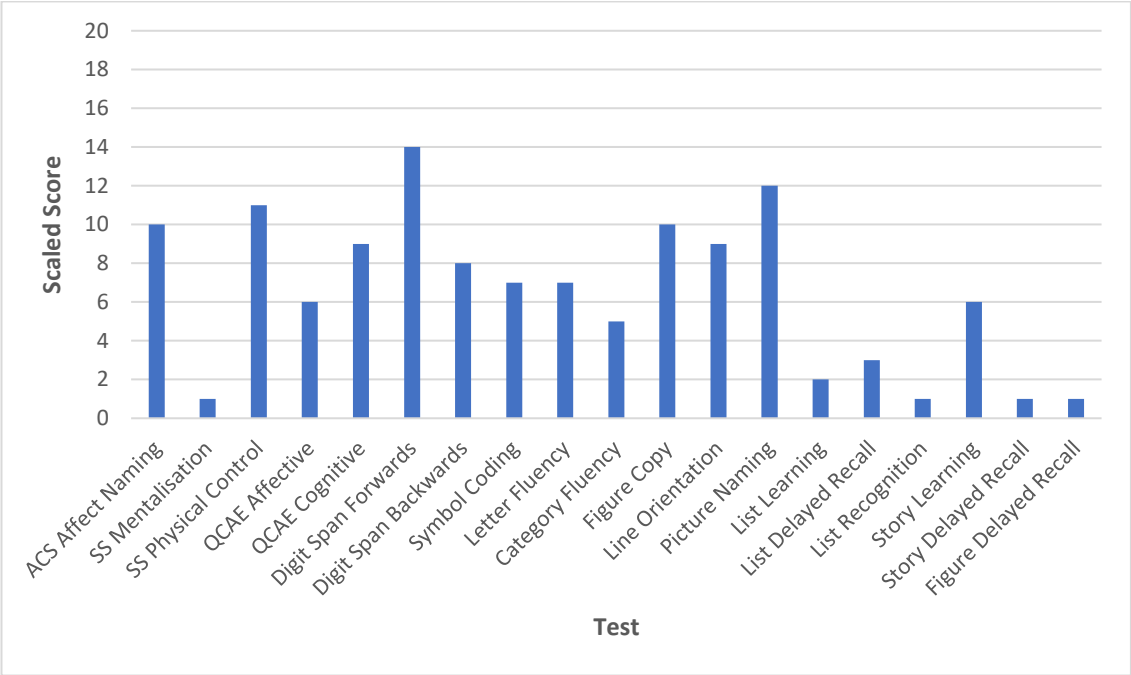
3.4.4.2. Preliminary measures. Participant 4 scored 6 on the CORE-10, indicating a low level of distress was experienced in the week prior to testing. He scored 17 on the FAB, losing one point in the Similarities subtest. Scores on the TOPF are suggestive of a low average premorbid ability.

3.4.4.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 4 are shown in Figure 7. This participant's scores on tests of attention, language and visuospatial abilities fell within the average range, in line with premorbid estimates with the exception of the Category Fluency task. Structural and functional imaging have shown that deficits on Category Fluency, while displaying preserved Letter Fluency, are often indicative of temporal lobe damage over frontal lobe damage (Gourovitch et al., 2000), as the category fluency task relies more heavily on central knowledge reserves (Chertkow & Bub, 1990). Scores in tasks of immediate and delayed memory (Lists, Stories and Figure Delayed Recall), however, fell well below the average range –

especially tests of delayed memory falling into the profoundly impaired range, even when prompts were given (List Recognition).

This participant scored in the profoundly impaired range in SS Mentalisation stories; while scores on the Physical controls fell in the average range, indicating some difficulty localised to mentalisation skills. Scores in Affect Recognition were in the average range, and self-rated empathy scores fell in the average or low average ranges.

Figure 7: Participant 4 - Subtest Scaled Scores



3.4.5 Participant 5

3.4.5.1. Background information. Participant 5 is a 57-year-old, White British male who attended full-time education until the age of 15. His previous employment was as a forklift driver.

At the point of testing he had been staying at the unit for 1 week and his last drink was at least 3 weeks prior to testing. Comorbidities listed in the participant's clinical notes included paranoid persecutory delusions, COPD and a history of self-harm and overdose. Studies suggest a link between COPD and cognitive decline, evidently due to the low level of oxygen saturation in the brain due to respiratory insufficiency (Andrianopoulos, Gloeckl, Vogiatzis & Kenn, 2017). In addition, depending on a number of factors, overdose has also been linked with decline in cognitive functioning (Dassanayake, Michie, Jones, Carter, Mallard & Whyte, 2012). These comorbidities need to be kept in mind when considering the data.

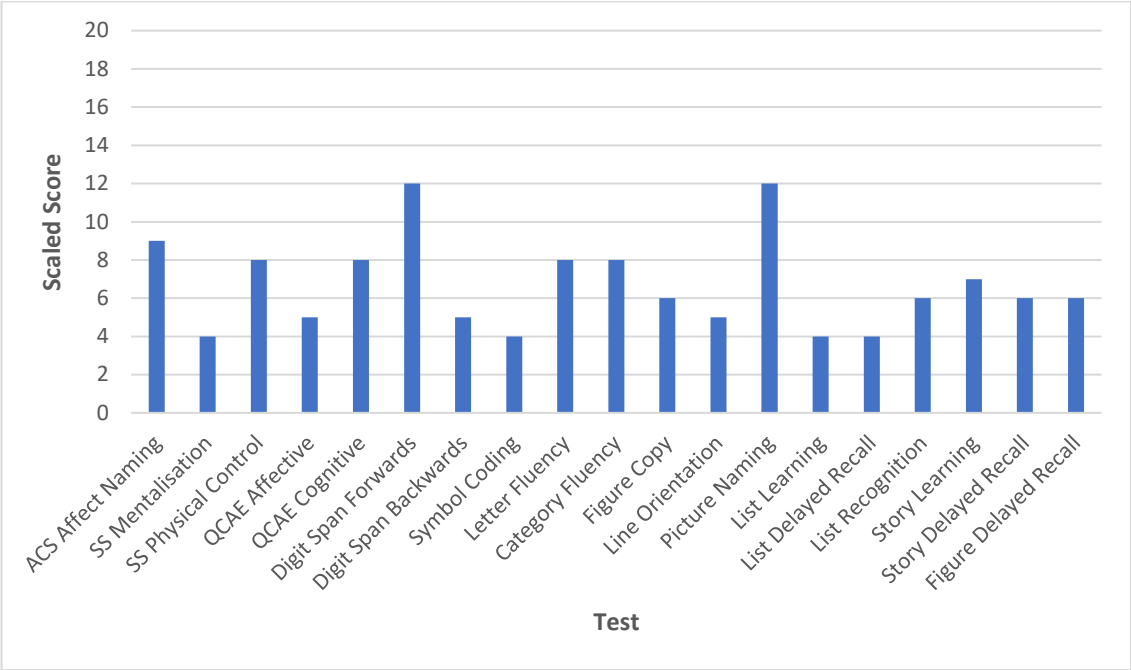
3.4.5.2. Preliminary measures. Participant 5 scored 4 on the CORE-10, signifying little psychological distress. He scored 16 on the FAB, indicating that there may be some degree of difficulty in the domain of executive functioning – specifically on Motor Series and Conflicting Instructions subtests. Scores on the TOPF are suggestive of an average premorbid ability.

3.4.5.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 5 are shown in Figure 8. This participant's scores on tests of Verbal Fluency, Digit Span Forward and Picture Naming fell within the average range, in line with premorbid estimates. In tests of Symbol Coding and Digit Span Backwards, scores fell within the borderline range. The participant also fell within this range on tests of visuospatial abilities. Memory scores were also lower than premorbid estimates, particularly in tasks involving learning of unlinked information (Lists Learning and List Delayed Recall).

Participant 5 showed average scores on Affect Naming and self-reported cognitive empathy. However, SS Mentalisation scores did display impairment

relative to the physical control subtest, indicating some level of difficulty with mentalisation abilities. Self-rated scores on affective empathy also fell below average.

Figure 8: Participant 5 - Subtest Scaled Scores



3.4.6 Participant 6

3.4.6.1. Background information. Participant 6 is a 51-year-old, white British female who attended full-time education until the age of 17. Her previous employment was in nursing.

At the point of testing this participant had been staying at the unit for 51 weeks and reported that their last alcoholic drink was at least 51 weeks prior to testing. A hospital discharge letter noted a previous stroke (lacuna infarct); but little more information was provided, therefore it is unclear how much of an impact this may have had on the participant's assessment scores, secondary to any damage relating to ARBD. Studies show this type of stroke can have an effect on general cognitive functioning, including memory and executive functioning (Arboix & Blanco-Rojas, 2014).

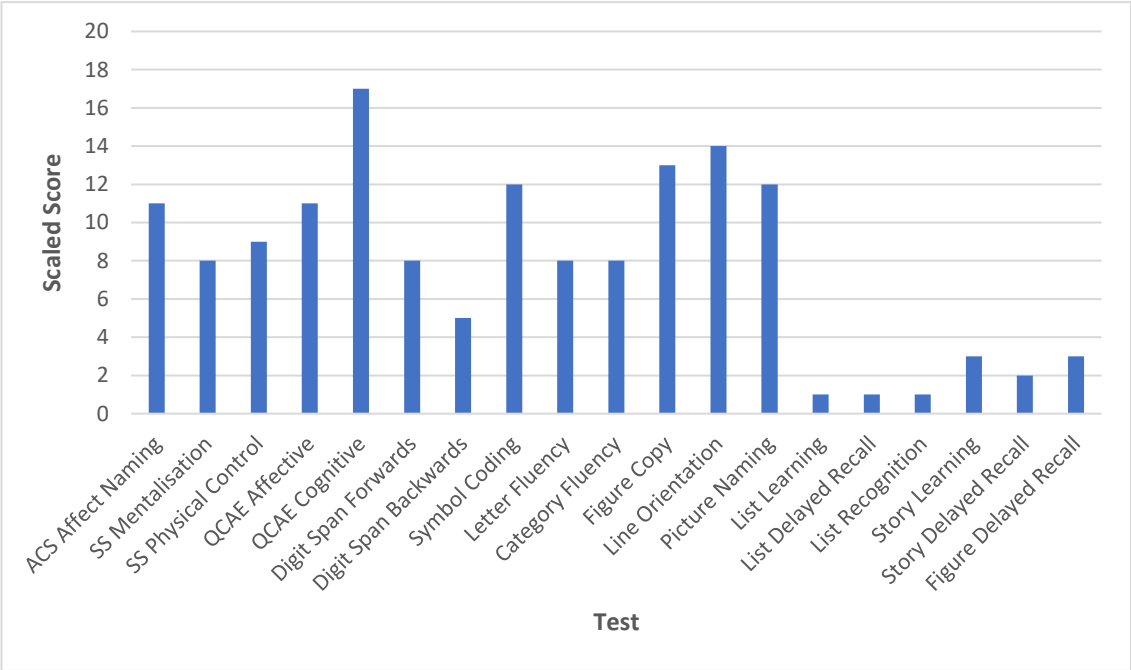
3.4.6.2. Preliminary measures. Participant 6 scored 10 on the CORE-10, indicating that a low level of psychological distress was experienced in the week prior to testing. She scored 18 on the FAB, which is suggestive of preserved executive functioning. Scores on the TOPF are suggestive of an average premorbid ability.

3.4.6.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 6 are shown in Figure 9. This participant scored within the average range for language and attention-based tests and scored highly on Figure Copy and Line Orientation tasks – signifying that visuospatial and constructional skills were a strength for her. Conversely, however, the participant's scores on measures of immediate and delayed memory fell within the profound impairment range, both on verbal and visual measures indicating a large decline in memory functioning. The participant's score on the Digit Span Backwards task was also diminished, although to a lesser degree.

This participant had well-preserved functioning of social cognition in tests of mentalising, affect recognition, and on self-report measures. Of note was the

participant's self-rated cognitive empathy, which fell into the very superior range.

Figure 9: Participant 6 - Subtest Scaled Scores



3.4.7 Participant 7

3.4.7.1. Background information. Participant 7 is a 61-year-old, white British male who attended full-time education until the age of 18. His previous employment was in engineering.

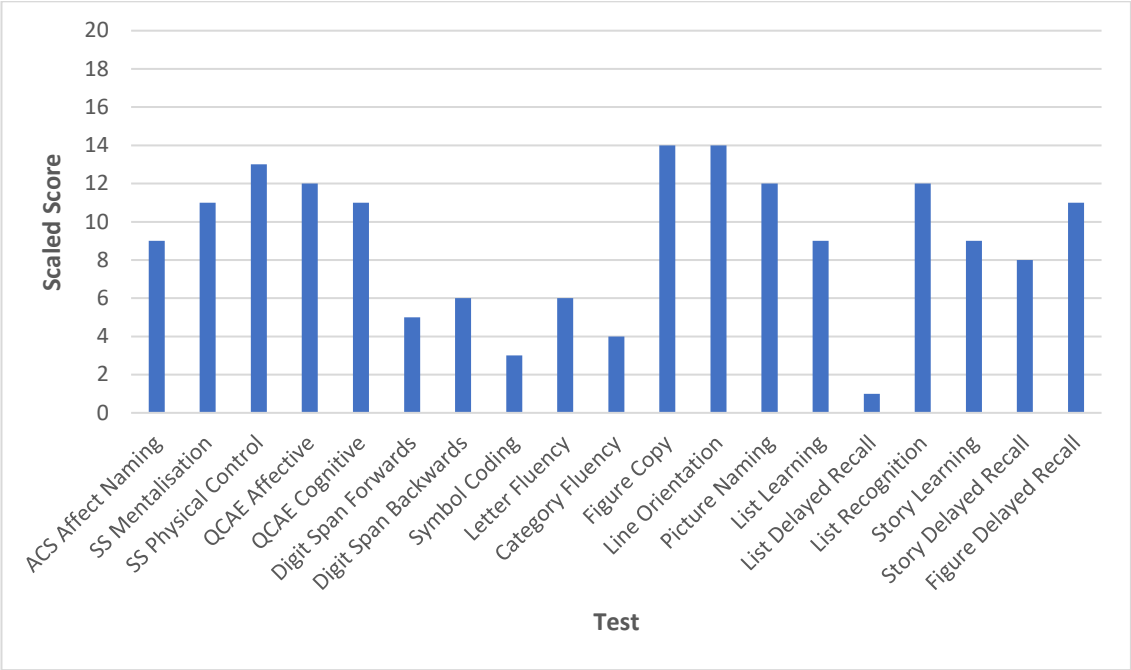
At the time of testing the participant had been staying at the unit for 8 weeks and his last alcoholic drink was at least 8 weeks prior to testing. The participant was previously involved in a road traffic accident and had a subsequent head injury. Little additional information was available; therefore, it is difficult to say how this may have affected the participants assessment scores. The participant also had a diagnosis of depression.

3.4.7.2. Preliminary measures. Participant 7 scored 16 on the CORE-10, indicating moderate distress. He scored 15 on the FAB, indicating some degree of difficulty in the domain of executive functioning – specifically on Motor Series and Go No-Go subtests. Scores on the TOPF are suggestive of an average premorbid ability.

3.4.7.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 7 are shown in Figure 10. This participant demonstrated strengths in the domains of immediate and delayed memory and visuospatial ability. There did appear to be one anomalous result from the List Delayed Recall subtest (in the profound impairment range). It is hypothesized that this may have been due to fatigue or lack of effort, as the participant seemed to fatigue during this part of the assessment and took a break soon after. It is common for people with brain damage to fatigue easily (van Zomeren and Brouwer, 1990). It is also worth noting that the participant's CORE-10 scores were indicative of distress, which may also have affected fatigue and concentration. This may account for the low score on this subtest, which occurred around 40 minutes into the assessment process. Language scores were slightly lower than premorbid estimates, and verbal tests of executive functioning also showed decline. Scores on the Symbol Coding test indicated a slowed processing speed, and overall scores for the domain of attention were in the profoundly impaired range.

Scores on the tests of social cognition suggested an average level of functioning across mentalisation and affect recognition domains.

Figure 10: Participant 7 - Subtest Scaled Scores



3.4.8. Participant 8

3.4.8.1. Background information. Participant 8 is a 55-year-old, white British male who attended full-time education until the age of 16. His previous employment was in painting and decorating.

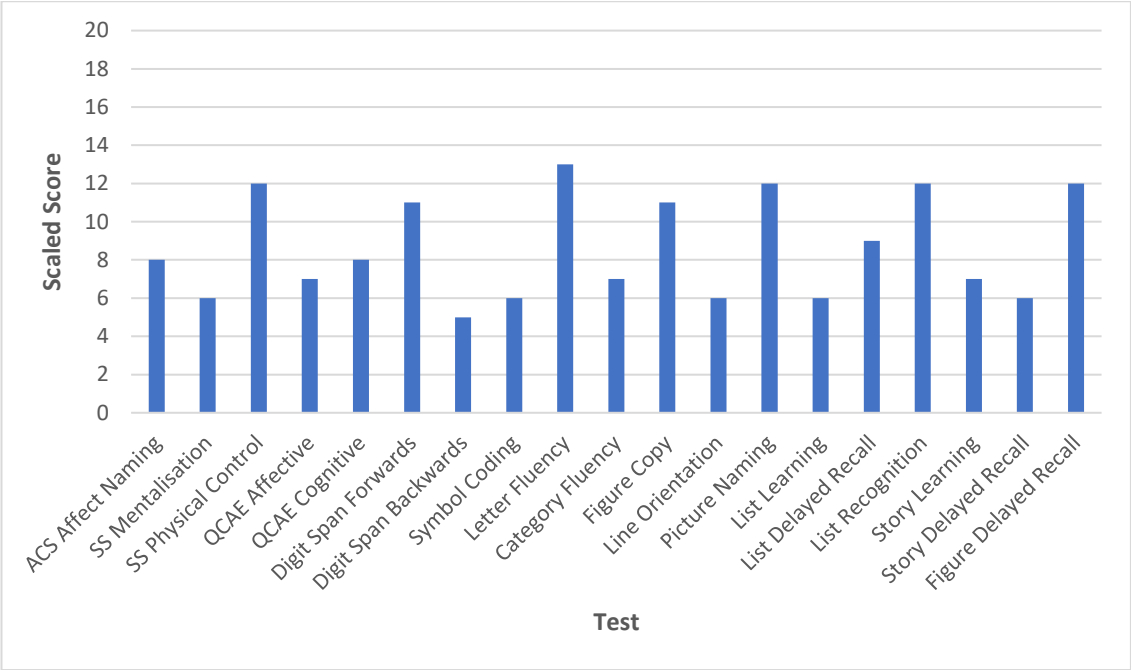
At the point of testing the participant had been staying at the unit for 4 weeks and his last drink was 4 weeks prior to testing. Comorbidities included asthma and depression.

3.4.8.2. Preliminary measures. Participant 8 scored 8 on the CORE-10, indicating a low level of distress was experienced in the week prior to testing. He scored 16 on the FAB, specifically losing two points in the Go No-Go subtest. Scores on the TOPF are suggestive of an average premorbid ability.

3.4.8.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 8 are shown in Figure 11. Participant 8's scores suggested preserved functioning in most domains. In tests of attention this participant scored within the low average range for Symbol Coding, indicating a reduced processing speed. Scores on Digit Span Forwards were preserved, however, Digit Span Backwards fell below premorbid estimates into the borderline range. Scores in the domain of language were generally preserved relative to other domains, falling within the average or low average ranges. Line Orientation fell into the low average range, however, other tasks of visuospatial abilities appeared preserved even following a delay (Figure Drawing and Recall). Other measures of delayed memory fell into average and low average ranges, while immediate memory scores also fell into the low average range.

This participant scored in the low average range in SS Mentalisation stories, while scores on the physical controls fell in the average range indicating some difficulty in mentalisation skills. Scores in affect recognition and self-rated empathy scores were in the average range.

Figure 11: Participant 8 - Subtest Scaled Scores


20
18
16
14
12
10
8
6
4
2
0
Scaled Score
ACS Affect Naming
SS Mentalisation
SS Physical Control
QCAE Affective
QCAE Cognitive
Digit Span Forwards
Digit Span Backwards
Symbol Coding
Letter Fluency
Category Fluency
Figure Copy
Line Orientation
Picture Naming
List Learning
List Delayed Recall
List Recognition
Story Learning
Story Delayed Recall
Figure Delayed Recall
Test

3.4.9 Participant 9

3.4.9.1. Background information. Participant 9 is a 59-year-old, white British male who attended full-time education until the age of 16. His previous employment was as an electrician.

At the point of testing he had been staying at the unit for 2 weeks and his last drink was at least 3 weeks prior to testing. Comorbidities include recurrent encephalopathy, epilepsy and alcohol-related liver disease with cirrhosis. The participant experienced a haemorrhagic stroke in 2015, although no information was available regarding how this may have affected the participants cognitive functioning.

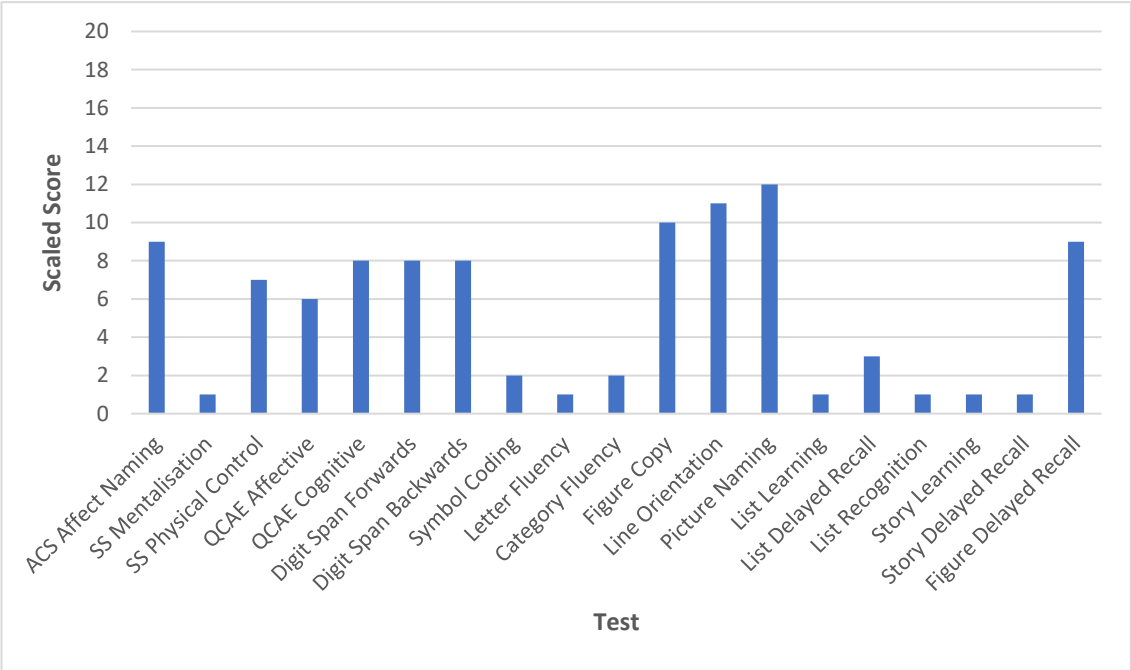
3.4.9.2. Preliminary measures. Participant 9 scored 6 on the CORE-10, indicating a low level of distress was experienced in the week prior to testing. He scored 14 on the FAB, losing two points each on Letter Fluency and Conflicting Instructions subtests – indicating that there may be some degree of difficulty in the domain of executive functioning. Scores on the TOPF are suggestive of an average premorbid ability.

3.4.9.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 9 are shown in Figure 12. Participant 9's scores on visuospatial tasks fell in line with premorbid estimates, even after a delay (in the Figure Delayed Recall task). Scores on Digit Span Forward and Backward also indicated that working memory was a relative strength for this participant. Scores on language and verbal fluency, however, were very low, falling into the profoundly impaired range. Symbol Coding was also low, indicating difficulty with slow processing speed; and scores of immediate and delayed memory on verbal tests also fell into profound and moderate impairment respectively.

This participant scored in the profoundly impaired range in SS Mentalisation stories; while scores on the Physical Controls fell in the average range, indicating specific and marked difficulty in mentalisation skills. Scores for affect

recognition and self-rated empathy scores were in the average or low average ranges.

Figure 12: Participant 9 - Subtest Scaled Scores



3.4.10. Participant 10

3.4.10.1. Background information. Participant 10 is a 50-year-old, white British female who attended full-time education until the age of 18. Her previous employment was in medical research.

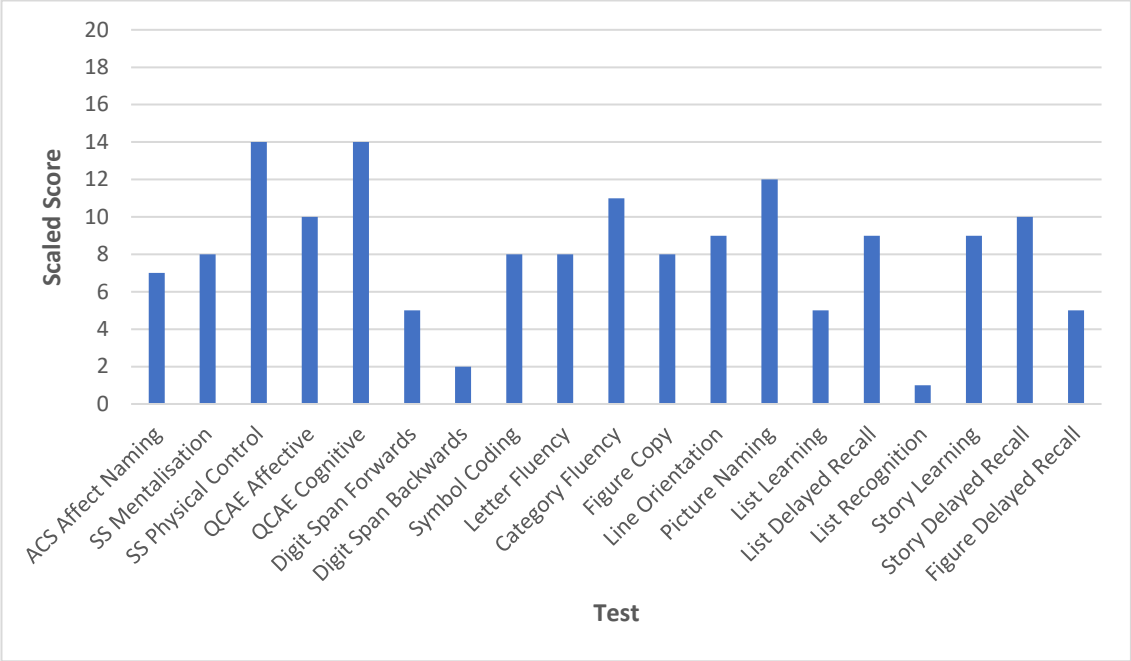
At the point of testing this participant had been staying at the unit for 3 weeks and reported that her last drink was 20 weeks prior to testing. Comorbidities included peripheral neuropathy, duodenal ulcers and recurrent falls. It is not known to what extend any falls may have had on cognitive functioning.

3.4.10.2. Preliminary measures. Participant 10 scored 8 on the CORE-10, indicating a low level of psychological distress. She scored 15 on the FAB, losing one point on the Motor Series task and two points on the Go No-Go task. Scores on the TOPF are suggestive of an average premorbid ability.

3.4.10.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 10 are shown in Figure 13. Participant 10's performance on tests of language and verbal fluency was in line with pre-morbid estimates and were her main strengths relative to other domains. Scores on tasks of visuospatial ability also fell in the average range, as well as verbal tasks of delayed memory. Despite this, performance on the visual task of delayed memory fell below predicted, into the borderline range; and a verbal recognition task (List Recognition) fell into the profoundly impaired range. Contextual tasks of verbal immediate memory fell within the average range, however, performance on List Learning (non-linked information) fell into the borderline range. While processing speed appeared to be preserved (Symbol Coding), working memory tasks (Digit Span Forwards and Backwards) were more difficult for her – within the borderline and profound impairment ranges respectively.

This participant's social cognition scores fell in the average range. Of note was the participant's self-rated cognitive empathy and SS Physical Control scores, which fell into the very superior range.

Figure 13: Participant 10 - Subtest Scaled Scores



3.4.11. Participant 11

3.4.11.1. Background information. Participant 11 is a 68-year-old, white British male who attended full-time education until the age of 15. He was previously employed as a blacksmith.

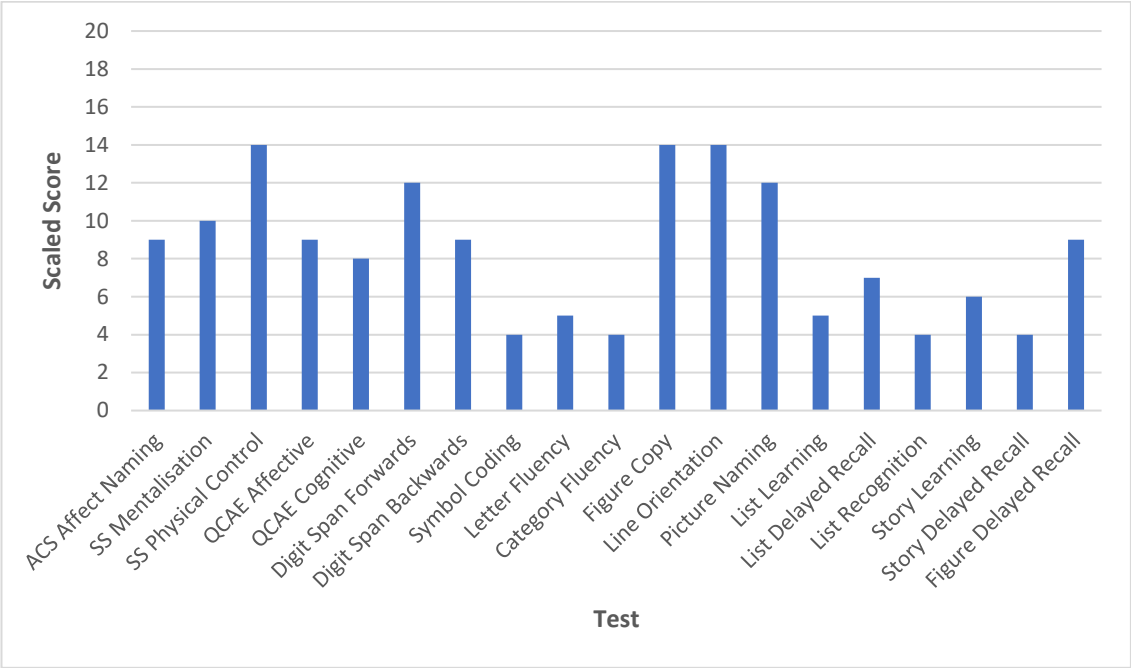
At the point of testing he had been staying at the unit for 10 weeks and his last drink was at least 10 weeks prior to assessment. Comorbidities include type II diabetes, Gilbert's syndrome and peripheral neuropathy of the feet. Studies have shown some acute effects of diabetes on cognitive function due to blood flow regulation in the brain (Huber, 2008). However, it is likely this was minimised due to the condition being well controlled while the participant resided at the unit.

3.4.11.2. Preliminary measures. Participant 11 scored 3 on the CORE-10, indicating little psychological distress was experienced in the week prior to testing. He scored 15 on the FAB, losing one point on the Motor Series task, and two points on the Go No-Go task. Scores on the TOPF are suggestive of an average premorbid ability.

3.4.11.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 11 are shown in Figure 14. In line with premorbid functioning, this participant's language, attention and visuospatial skills appeared intact. Scores on the Symbol Coding task indicate a slowing of processing speed relative to premorbid estimates. This may also have had an impact on scores in the domains of immediate and delayed memory (scoring in the borderline or low average range for all subtests). Scores on verbal tasks of executive function also fell in the borderline range, revealing some impairment in this domain, as well as in non-verbal tests of executive function as scored by the FAB.

This participant showed preserved social cognition abilities across subtests.

Figure 14: Participant 11 - Subtest Scaled Scores



3.4.12. Participant 12

3.4.12.1. Background information. Participant 12 is a 48-year-old, white British female who attended full-time education until the age of 16. She was previously employed as a social worker.

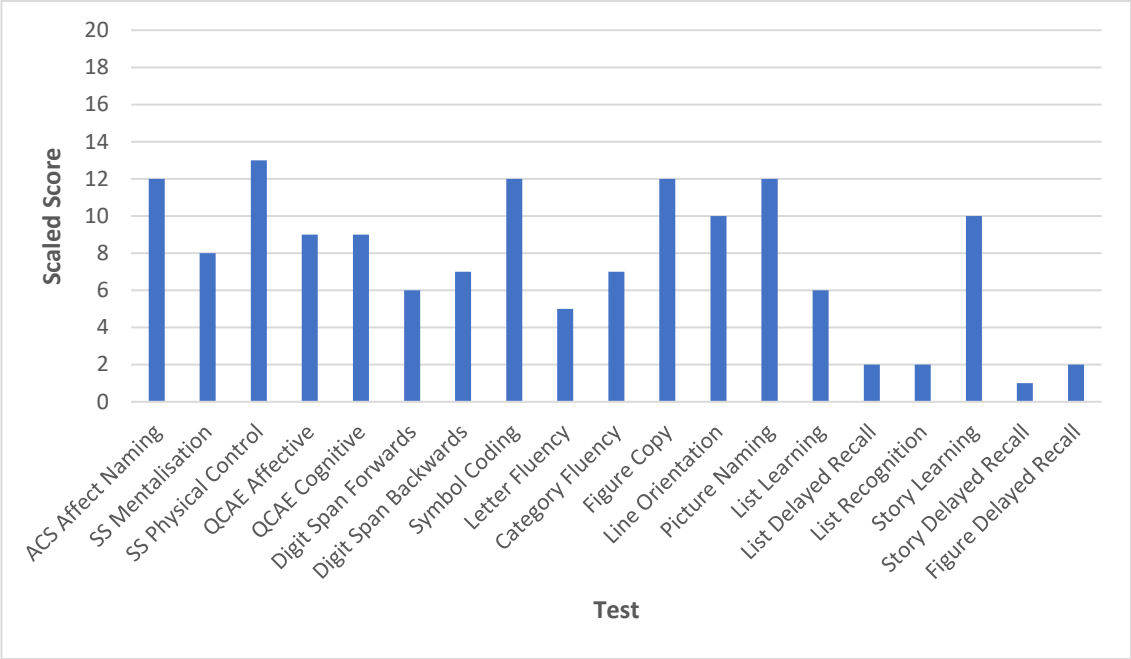
At the point of testing this participant had been staying at the unit for 1 week and reported her last drink was 7 weeks prior to testing. Participant's hospital notes reported that she had previously experienced a meningioma, but there was little accompanying information, therefore it is not known if this had an impact on the participants cognitive functioning and assessment scores.

3.4.12.2. Preliminary measures. Participant 12 scored 16 on the CORE-10, indicating moderate levels of distress. She scored 18 on the FAB, which is suggestive of preserved executive functioning. Scores on the TOPF are suggestive of an average premorbid ability.

3.4.12.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 12 are shown in Figure 15. This participant's scores in domains of immediate memory, visuospatial, attention and language revealed no impairment relative to premorbid functioning. The participant did, however, show difficulty across subtests relating to delayed memory (List Delayed Recall, List Recognition, Story Recall and Figure Recall), all of which fell well below premorbid estimates within the profound impairment range. She also showed some degree of difficulty in tests of verbal fluency, digit span forwards, and list learning. This may indicate some degree of difficulty in working memory. Although the participant was able to name a high volume of words on tests of verbal fluency, she found it difficult to hold in mind words she had already said, repeating several words throughout Category and Letter Fluency tasks.

The participant scored within the average ranges for all tests of social cognition, giving no indication of impairment within this domain.

Figure 15: Participant 12 - Subtest Scaled Scores



3.4.13. Participant 13

3.4.13.1. Background information. Participant 13 is a 54-year-old, white British male who attended full-time education until the age of 16. His previous employment had been in the British Army and more recently as a window cleaner.

At the point of testing the participant had been staying at the unit for 7 weeks and reported that his last alcoholic drink was at least 7 weeks prior to testing. Comorbidities include post trauma stress from combat, hypertension and previous self-harm when intoxicated.

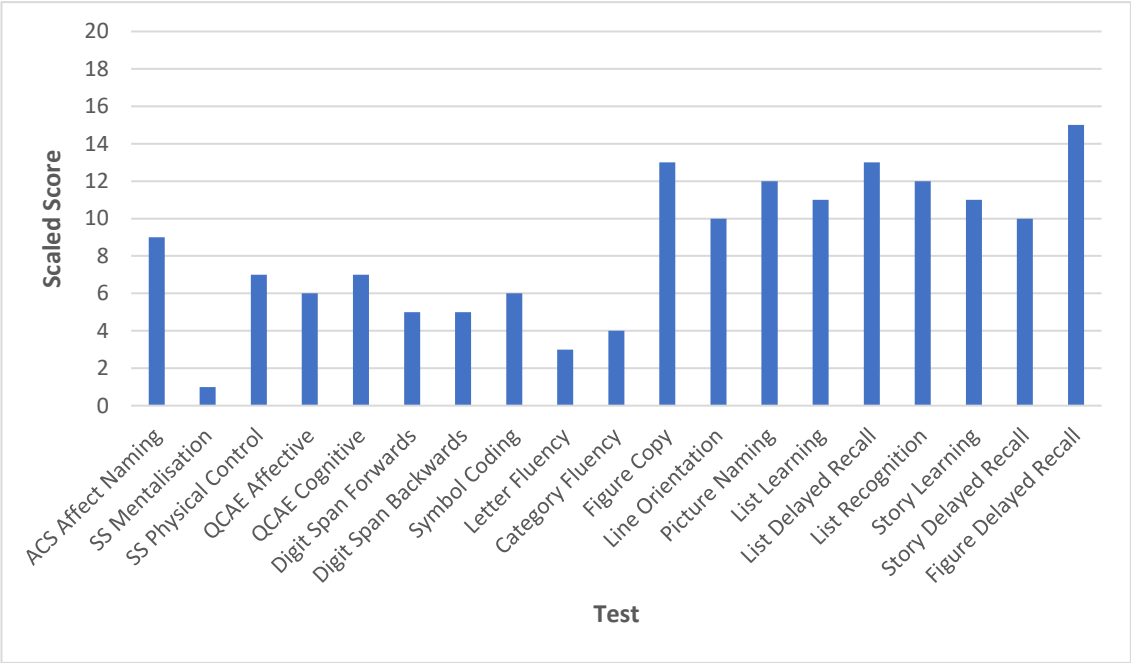
3.4.13.2. Preliminary measures. Participant 13 scored 16 on the CORE-10, indicating moderate levels of distress were experienced in the week prior to testing. He scored 16 on the FAB, indicating that there may be a small degree of difficulty in the domain of executive functioning – losing one point each on Letter Fluency and Go No-Go subtests. Scores on the TOPF are suggestive of a low average premorbid ability.

3.4.13.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 13 are shown in Figure 16. This participant's scores on immediate and delayed memory, visuospatial and language domains revealed no impairment relative to premorbid functioning. Scores of attention, however, fell below premorbid estimates into the borderline range. This participant experienced difficulty in Digit Span Forwards and Backwards subtests – indicating some level of difficulty in the domain of working memory. The participant also fell into the borderline range in tests of verbal fluency, which also affected executive functioning scores, as well as overall scores of attention.

This participant's ACS scores fell within the average range, however, the participant's self-reported measurement under-estimated affective empathy skills, falling into the low-average range. Self-report of cognitive empathy was also in the low-average range, however, scores on the SS Mentalisation subtest indicate a level of impairment in this domain. Scores on the Physical Control

suggest this impairment is local to social cognitive ability (control scores fell within the low average range) and may reflect difficulty mentalising.

Figure 16: Participant 13 - Subtest Scaled Scores



3.4.14. Participant 14

3.4.14.1. Background information. Participant 14 is a 42-year-old, white British male who attended full-time education until the age of 18. His previous employment was in IT.

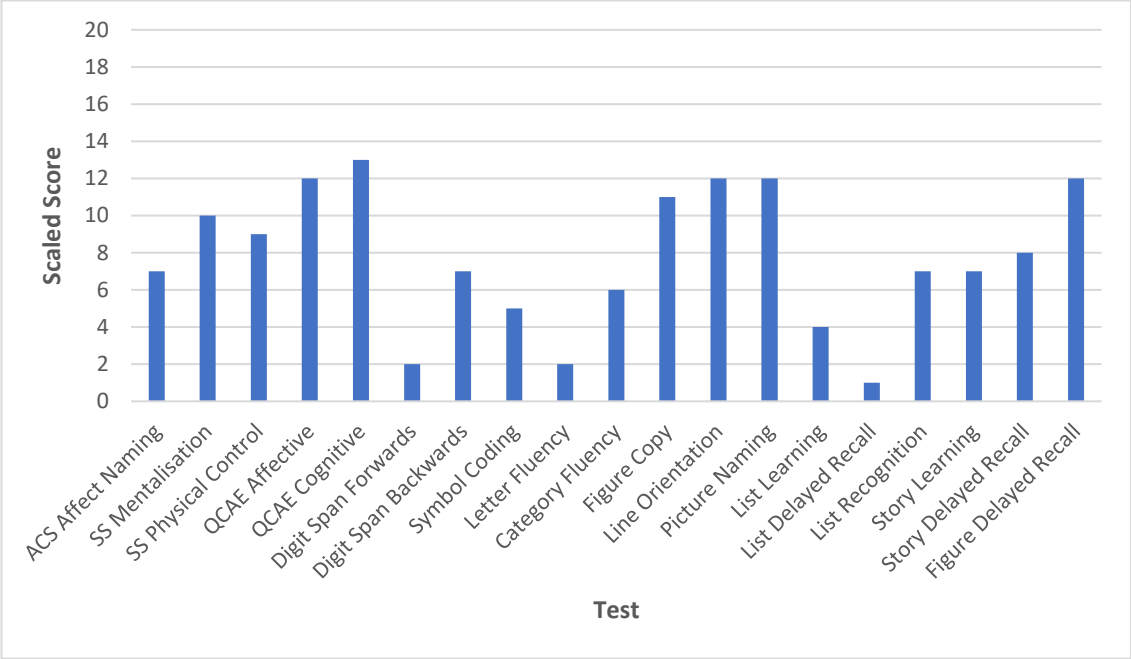
At the point of testing he had been staying at the unit for 6 weeks and his last drink was at least 7 weeks prior to testing. Comorbidities include depression, alcohol-related liver disease, peripheral neuropathy and type II diabetes. As previously discussed, these comorbidities may have had an impact on the participants assessment scores and will be taken into consideration.

3.4.14.2. Preliminary measures. Participant 14 scored 24 on the CORE-10, indicating a moderately severe level of psychological distress was experienced in the week prior to testing. He scored 16 on the FAB, losing two points on the Letter Fluency task. Scores on the TOPF are suggestive of an average premorbid ability.

3.4.14.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 14 are shown in Figure 17. Participant 14's visuospatial scores fell in line with premorbid estimates, even after a delay (on the Figure Recall Task). In tests of attention, his score fell into the low-average range in the Digit Span Backwards subtest; however, performance in Symbol Coding and Digit Span Forwards was impaired. In tests of language, he scored in the borderline range for Category Fluency, but profound impairment range for Letter Fluency. Scores on tests of immediate memory (Story Learning and List Learning) fell within the borderline and low average ranges respectively. Similarly, in tests of delayed memory, this participant performed better on the Story Recall task (average range) and List Recognition than List Recall task (profoundly impaired range).

This participant displayed well-preserved functioning of social cognition, on tests of mentalising, affect recognition, and on self-report measures.

Figure 17: Participant 14 - Subtest Scaled Scores



3.4.15. Participant 15

3.4.15.1. Background information. Participant 15 is a 56-year-old, white British male who attended full-time education until the age of 17. He was previously employed as a builder.

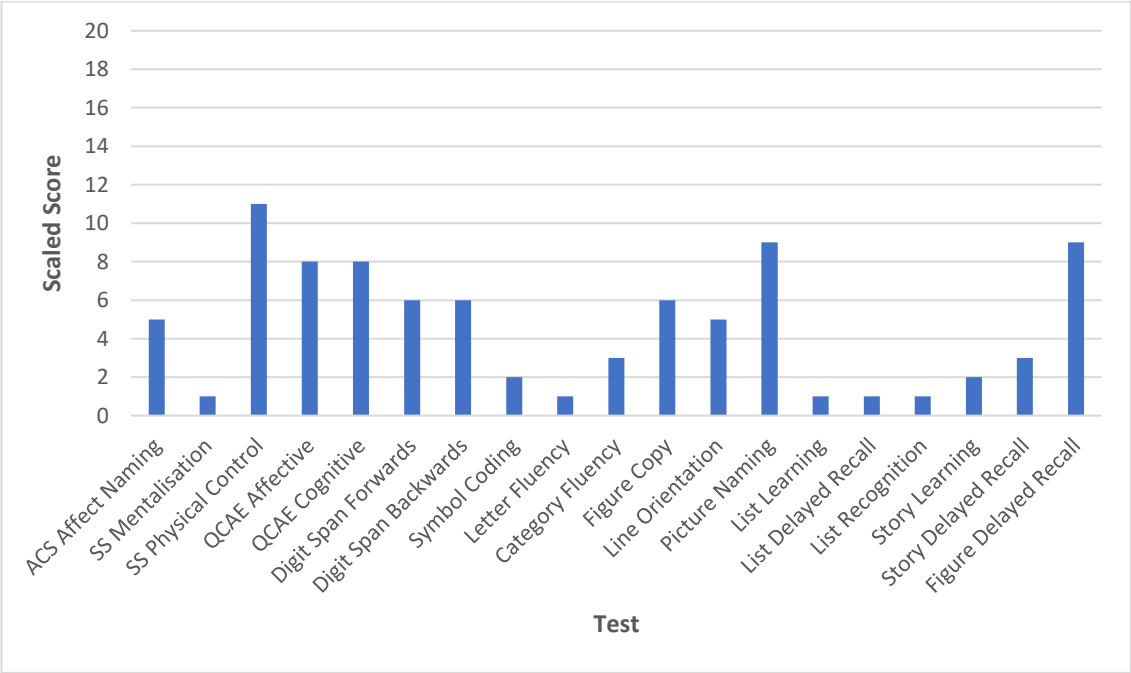
At the point of testing the participant had been staying at the unit for 7 weeks and his last drink was 13 weeks prior to testing. Listed comorbidities included decompensated alcohol-related liver disease, previous Paroxysmal Atrial Fibrillation (PAF) and low mood. Studies propose a link between cognitive decline and PAF (Singh-Manoux et al., 2017), suggesting that this may have had an impact on participant's assessment scores.

3.4.15.2. Preliminary measures. Participant 15 scored 15 on the CORE-10, indicating mild levels of distress. He scored 12 on the FAB, indicating some degree of difficulty in the domain of executive functioning – scoring zero on tasks of Letter Fluency and on the Go No-Go subtest. Scores on the TOPF are suggestive of a borderline premorbid ability.

3.4.15.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 15 are shown in Figure 18. In light of premorbid estimates, this participant's visuospatial, working memory and language abilities were relatively preserved – falling within the borderline or low average range. Measures of delayed memory, however, suggest impairment in verbal subtests, and measures of attention and immediate memory fell within the profoundly impaired range. Measures of visual memory, however, fell within average ranges, suggesting that impairment is local to verbal functioning. As the participant's language scores were preserved, this suggests specific difficulty in verbal memory domain, rather than global language impairments. This is also reflected in the participant's verbal fluency scores (both Category and Letter Fluency indicating impairment) and may have had an impact on their overall FAB score.

Scores on measures of social cognition are indicative of impairment in this domain. Scores fell within the profoundly impaired range on SS Mentalisation, versus the average range in the SS Control subtest, signifying significant impairment in mentalising ability. Scores also indicated some level of impairment in affect naming on the ACS. This participant appeared to have difficulty naming surprise and neutral expressions and misattributed many to disgust and surprise. QCAE scores were in the normal range, indicating little insight into any deficits of social cognition.

Figure 18: Participant 15 - Subtest Scaled Scores



3.4.16. Participant 16

3.4.16.1. Background information. Participant 16 is a 57-year-old, white British/North American male who attended full-time education until the age of 18. He had previously been employed as a carpenter.

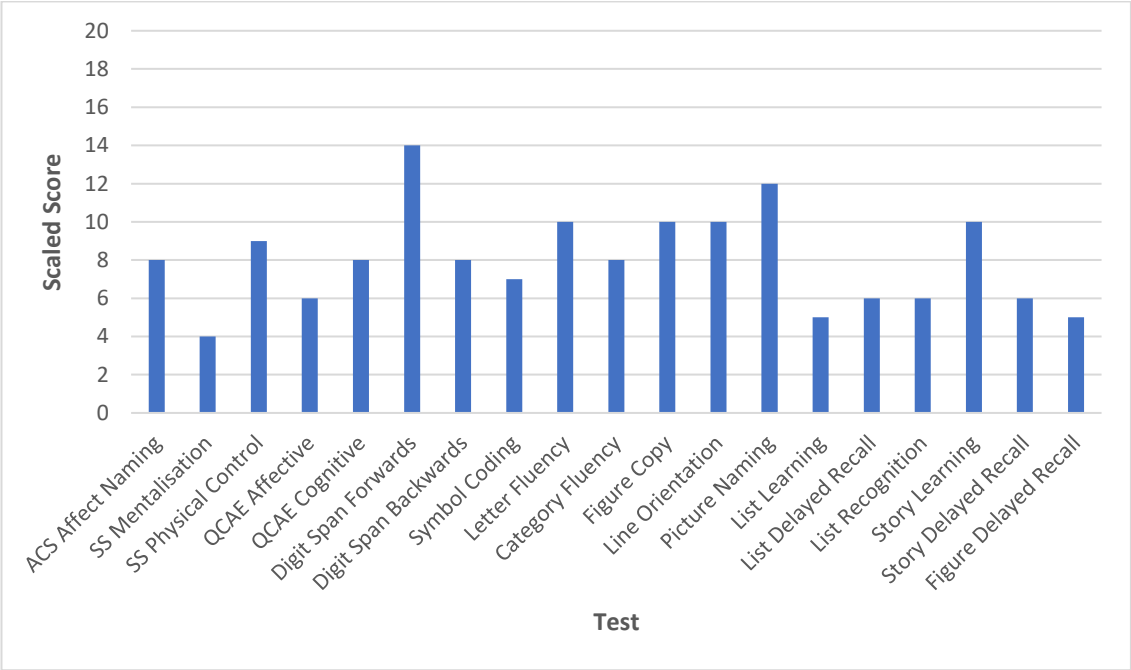
At the point of testing the participant had been staying at the unit for 5 weeks and his last drink was 6 weeks prior to testing. Comorbidities include primary hyperparathyroidism, type II diabetes mellitus, mild bilateral diabetic retinopathy and recurrent depressive disorder. Studies of hyperparathyroidism and cognitive functioning suggest mixed results, with some suggesting a link and others finding no evidence for cognitive decline (Coker et al., 2005). The presence of bilateral diabetic retinopathy suggests there may be some mild effect on visuospatial and general functioning (Crosby-Nwaobi, Sivaprasad, Amiel & Forbes, 2013).

3.4.16.2. Preliminary measures. Participant 16 scored 13 on the CORE-10, indicating a mild level of psychological distress was experienced in the week prior to testing. He scored 15 on the FAB, losing one point on the Similarities test and two points on the Go No-Go task. Scores on the TOPF are suggestive of a high average premorbid ability.

3.4.16.3. Neuropsychological assessment scores. Neuropsychological scores for Participant 16 are shown in Figure 19. This participant showed high average premorbid functioning, therefore a higher cognitive reserve is to be expected. With this in mind, measures of working memory, visuospatial ability, attention and language remained relatively intact, falling within the average or high average ranges. The only exception to this was Symbol Coding, which fell just inside the cut-off for low average performance. Tests of immediate memory were somewhat impaired, mostly falling within the low average or borderline range, with the exception of Story Learning (which fell within the average range). Tests of delayed memory were also indicative of low average performance, with Figure Delayed Recall falling into the borderline range.

This participant's ACS scores fell within the average range, however, the participant's self-reported measurement under-estimated this, falling into the low-average range. Self-report of cognitive empathy was in the average range, however, scores on the SS Mentalisation subtest indicate some level of impairment in this domain, scoring within the borderline range. Scores on the SS Physical Control suggest this impairment is local to social cognitive ability (control scores fell within the average range), and minimally affected by the participant's diminished executive functioning and memory abilities.

Figure 19: Participant 16 - Subtest Scaled Scores



4. DISCUSSION

Due to gaps in the literature, this study was designed to provide a preliminary investigation of social cognition in the realm of ARBD. In particular, the research questions relate to the profile of social cognition (focusing on mentalisation and affect recognition) using neuropsychological assessment procedures and to observe any associations with other domains; as well as measuring subjective accounts of empathy in self-report questionnaires.

The results revealed that the sample of 16 adults with ARBD diagnoses demonstrated significantly lower performance on a measure of mentalisation versus standardised norms and a control task. Overall, the cohort performed within the average range on a measure of affect recognition and a self-report empathy questionnaire. Group analysis showed that these results occurred within the context of a sample showing impaired performance on a number of cognitive tasks; particularly in the domains of immediate memory, delayed memory and executive functioning which are characteristic of the neuropsychological profile of ARBD (Wilson et al., 2012). A correlational analysis revealed that aspects of social cognition were related with other measures, which will be discussed.

Individual case analysis revealed the heterogeneity of the cohort, especially in the comorbidities presented. There were also issues with the homogeneity of some features, such as diversity of sex, age and ethnic background, which affect the generalisability. These are discussed along with issues of validity and reliability of the results.

The discussion below offers a summary of the individual findings and their implications for furthering understanding of social cognition in ARBD. Recommendations for clinical practice, policy and further research are then outlined before concluding.

4.1. Discussion of Results

Due to the nature of neuropsychological testing, the analysis outlined in the previous chapter was used to identify deficits, and also to measure relationships between variables in order to identify co-occurring processes during tests. As discussed, neuropsychological assessments are rarely task pure and often other deficits in other domains can cloud results. Correlatory relationships, while not necessarily reflective of causality, help to highlight possible relationships or trends, putting deficits in context and helping to identify areas for further study.

The case series analysis was carried out to observe the extent to which group deficits and correlations applied to individual profiles – allowing for deeper exploration into context of any deficits found and to address incidence of deficits in a small sample.

4.1.1. Summary of Cognitive Tests

Index scores for attention fell within the low-average range, in line with the literature, indicating that participants did not show impairment in attending to information (Moscovitch, 1982; Baddeley & Warrington, 1970). Difficulty was observed in the storage and delayed retrieval of presented information, with immediate and delayed memory index scores falling below normal. The most significant decline was observed in the Word List tests and Story Delayed Recall. This suggests participants had more difficulty with verbal tasks and found it more difficult to recall information without context (unlinked, random words), which is also supported by literature (Mayes & Downes, 1997; Horton, Duffy, Hollins Martin & Martin, 2015a).

A total of 15 out of 16 participants showed decline on at least one measure of executive functioning with the majority of participants losing marks on several of the executive functioning subtests. The greatest difficulty was noted on tests which mainly draw on skills of inhibition, mental flexibility, rule deduction and categorisation. Group level analysis was representative of individual case analysis, and the data suggest further study into the frontal lobe hypothesis

(Harper, 2009) is warranted as the majority of participants lost at least two points in tests of executive functioning. Indeed, numbers of affected individuals reflected those found by Van Oort and Kessells (2009), in addition to areas of divided attention and verbal fluency. The frontal lobe hypothesis supposes that the executive functions are the most vulnerable domains to the effects of alcohol; and deficits may impede performance on other assessed domains which require flexible thought, regulation, judgement and inhibition. The implications of participants poor executive functioning performance on social cognition measures will be discussed below.

4.1.2. Summary of Social Cognition

The group level analysis revealed average scores on the test of affect recognition. Individual case analysis reflected group averages, with 15 out of 16 participants scoring within the average range or above. This finding is at odds with much of the ARBD literature regarding affect recognition, with two studies finding significant impairment of visual facial affect recognition in groups with KS (Montagne, Kessels, Wester & de Haan, 2006; Brion, D'Hondt, Lannoy, Pitel, Davidoff & Maurage, 2017). This may have links with the differences in tests used; or could reflect a publication bias whereby studies revealing inconclusive or null results are not submitted for publication.

In addition, scores from affect naming showed a positive correlation with Symbol Coding, Figure Copy and FAB total scores; possibly indicative of the visual element to the test, as well as a relationship with executive functioning skills – the latter of which is widely debated and requires more focused research to ascertain specific commonalities between affect recognition and executive functioning skills.

The group demonstrated impaired performance on the SS Mentalisation task relative to norms, and scores were significantly lower than the SS Physical Control task. Individual analysis revealed 11 out of 16 participants showed diminished scores relative to the control task; with many scores falling more than two standard deviations below their physical controls.

The SS Mentalisation task relies on several complex cognitive demands, including memory, verbal functioning, the ability to identify social norms and when they are broken, and explicit mentalising skills. This means that impaired performance can be due to a number of other deficits – hence why a well-matched control is used. Deficits were not observed on the SS Physical Control items, indicating that social cognitive deficits occurred independently of the cognitive processes required to complete the physical control. Correlational analysis revealed that verbal memory aspects of the test may be implicated due to the participants impairment in this area impeding on the demands of the task to keep multiple pieces of information from the story in mind in order to answer.

Correlational analysis revealed positive relationships between SS Mentalisation and QCAE scores both on the cognitive and affective empathy measures, which may indicate that participants were aware when they did not perform well on the SS Mentalisation task, or that individuals show insight into difficulty mentalising.

SS Mentalisation was also strongly correlated to TOPF scores. TOPF was also correlated to the SS Physical Control. This indicates some relationship between the tasks and verbal reasoning due to the tasks being highly dependent on the participant's ability to read and comprehend the material. This is likely to have links to the participant's English facility, literacy and access to education. Although years in full-time education did not have a strong relationship with TOPF scores, there was a correlation between years of full-time education and SS Mentalisation scores.

Group performance fell in the average range for both QCAE subscales; and the two subscales exhibited a strong correlation with one another, which is to be expected based on initial analysis by authors Reniers, Corcoran, Drake, Shryane and Völlm (2011). Additional correlates suggest that visuospatial difficulties may have an affect an individual's ability to read and comprehend the QCAE questions.

Overall, the data shows that problems in the domain of social cognition do not occur at a perceptual level in the area of affect recognition, but may occur in

higher level processes, and affect social competence. To explore this further, future research should focus on tests which address more subtle deficits, such as the Faux Pas test (Stone, Baron-Cohen & Knight, 1998) in order to more fully differentiate between areas of difficulty. Further research may also include assessments of social competence, such as Channon's Predicaments Test (Channon, Charman, Heap, Crawford & Rios, 2001) in order to explore social problem-solving in relation to common social predicaments. The test also utilises video rather than relying on reading ability, increasing validity of the measure when people have difficulty with language comprehension.

4.2. Critical Review

Although this study revealed statistically reliable results on one test of social cognition, there are also several factors to keep in mind which may have affected the reliability and validity of the study, highlighting the preliminary nature of the study and considerations for progressing research in this field.

4.2.1. Generalisability

4.2.1.1. Sample size. Although in keeping with the exploratory design of the study, the sample size for this study was small. One of the main implications of this is the limitation on generalisability. The small sample means any findings cannot be applied to the wider population of ARBD.

While the size of the sample did impact the power of statistical analysis, a strong relationship was observed between mentalising ability and ARBD. One benefit of the smaller sample size was the time allowed for a case series analysis, which adds to the richness of the study, and opens up this widely under-researched topic to new avenues of further investigation.

4.2.1.2. Age. The mean age of the participants in the current study reflected, broadly, the mean age of people with ARBD in the UK (Cox, Anderson & McCabe, 2004). However, coupled with the small sample size, the limited range of ages meant that application to other age groups, other than older working

age adults, is restricted. A more age-diverse sample would help to provide a better understanding of ARBD as experienced across other age groups.

4.2.1.3. Sex. Similarly, although ratio of male to female participants reflected rates of diagnosis and ratios in other studies (Chiang, 2002), the large proportion of men in the study made it difficult to generalise the findings to women with ARBD. So, although representative of the gender divide within ARBD, the results should therefore be considered with this in mind (Ridley & Draper, 2015).

4.2.1.4. Language, education and ethnicity. The sample was also limited in terms of language, ethnicity and education; with all participants being white British, having English as a first language and having a similar level of education. This was due, in part, to recruitment being limited to one region in the UK, where 87.4% of the population is white British, 98.4% speak English fluently, 21% of the population have no academic qualifications and 33.7% are educated to degree level or higher (National Records of Scotland, 2011).

4.2.1.5. Single recruitment site. Due to limited resources available for this study a single recruitment site was used. This presents further problems with generalisability, due to the site being an inpatient, step-down unit. This means that the participants of this study may have presented with a higher degree of comorbidities, including social care issues (e.g. social housing, benefits, etc.), and cognitive decline than other people diagnosed with ARBD, who are able to live independently. Research shows that a large percentage of ARBD cases go undiagnosed (Harper, Krill & Sheedy, 1998), so it is likely that studies such as this one are not representative of the cognitive profile of the many unknown men and women in the UK with undiagnosed ARBD.

4.2.1.6 Comorbidities. In keeping with other studies in the ARBD population, there was a high prevalence of physical comorbidities in the sample. Comorbidities occurring in more than one participant included: ARLD; diabetes; peripheral neuropathy; stroke (including TIA, lacunar and haemorrhagic stroke); asthma; epilepsy and COPD. Many of the comorbidities listed are known, or

hypothesised, to have an impact on cognitive performance; however, it has been difficult in the present study to ascertain exactly how these comorbidities affected the performance of each individual, although it is likely that issues may have been reduced by using an inpatient sample who's comorbidities are likely to be well managed e.g. with regular medication. While attempts to separate out ARBD from coexisting conditions would lead to issues in generalisability in and of itself, this does mean that there is likely to be variability between the profiles of the assessed participants and others in the ARBD population.

Mental health comorbidities, while less common, included depression and self-harm. The mean CORE-10 indicated that the group reported a mild level of psychological distress, however, the range was large. The case series analysis revealed four participants scores fell within the moderate, or moderately-severe range of distress. In light of this, it may be possible that these scores on the CORE-10 could have influenced scores on neuropsychological assessments, however, no correlatory relationships were revealed. With most scores within the normal range, and difficulty ascertaining when participants were given depression diagnoses, in addition to the literature suggesting low rates of depression amongst people with ARBD (Horton, Duffy & Martin, 2015b), effects on neuropsychological measures are likely to be minimised.

The nature of ARBD can lead to difficulties ascertaining accurate information from participants about some issues, such as last alcoholic drink. This made it more difficult to draw any firm conclusions around length of abstinence and severity of cognitive impairment. Although beyond the scope of this study, it may be helpful to map cognitive skills over time and observe how this interacts with social cognition.

4.2.2. Test Materials

Questions may be raised about the test materials themselves, especially in terms of ecological validity and construct validity. Building on the epistemological stance of critical realism, this study has come from the idea that we cannot measure social cognition itself, only its effects on certain tests. However, we do need to know we are measuring these effects as accurately as

possible, rather than the effects of impairment of other domains. Although the SST had a control group, there are still questions about its applicability to real-life situations, and hence may not reflect an individual's social functioning when not in a testing environment.

Ecological validity is a common issue for neuropsychological assessments. Highlighting the problem in assessing executive functioning, Manchester, Preistley and Jackson (2004) comment that neuropsychological assessments are dependent on data gained from office-based environments which do not reflect real-world situations – therefore making it possible that inferences about the person's level of functioning in real-world situations is flawed. They argue that attempts should be made to increase ecological validity by taking assessments into real social situations.

It may also be beneficial for further studies to utilise qualitative data from participants to gather subjective information from people regarding how confident they feel in social situations (corresponding to different areas of social cognition), and contrasting this with quantitative assessment measures. It may also be helpful to have an informant give an account of the participants' social functioning (for example nursing staff, family members), as this would create a richer picture of the real-life manifestations and implications of any impairment.

4.3. Reflexivity

As with any research project, this study may have been subject to a number of biases. As previously discussed, publication bias is common in scientific study, as too is the bias of the researcher to find significant results. The author of the study recognises their own bias to add something of value to the area of ARBD, which will help people to gain effective support. This may be heightened by the authors previous experience of working clinically with people affected by ARBD and their families, and feeling frustrated at the paucity of public and academic knowledge of this area, despite it's devastating effects on the lives of individuals. As identified in the introductory chapter, underreporting of non-significant results is problematic within scientific enquiry. While this study

gleaned results which indicated significant links between ARBD and social cognition, it is equally as important to recognise the variables which did not appear to link with ARBD and how this impacts on the literature.

4.4. Implications and Recommendations for Clinical Practice, Research and Policy

The current study highlighted possible impairment on a test of mentalising on a sample of participants with ARBD. While issues with the testing materials have been discussed, these results show that further research into social cognition and ARBD is required in order to better understand this relationship. Where impairments do occur, this can have a limiting effect on people's social wellbeing, support systems and relationships, as well as employment and relapse.

Thoma, Friedmann and Suchan, (2013) point out that difficulties experienced in empathy and social problem solving can be predictors for relapse back into drinking in AUDs. It can be expected therefore that the same impairments observed in ARBD may cause individuals to relapse. In light of the present findings, coupled with the high risk to physical health associated with relapse in ARBD, it is crucial then that more is understood about the deficits shown in this sample in order to provide better treatment and prevent relapse.

While the results from this study may be too tentative to make concrete recommendations for policy and procedure, revealing any relationship could have a large impact on the treatment and rehabilitation for people with ARBD. In this already stigmatised group, a lack of understanding around social cognition could lead to difficulties providing the right support, and services run the risk of individuals being seen as 'difficult', or 'unresponsive to treatment'.

While the importance of developing social relationships and community engagement is already outlined in relevant ARBD policy in the UK (Cox, Anderson & McCabe, 2004), further exploration could help professionals to

understand the barriers people may face in this area, and treatment plans can be utilised with this in mind. In order to enhance understanding, future studies should seek to replicate findings with a larger sample. It may also be beneficial to have a more diverse sample, such as including outpatients, people from more diverse ethnic and cultural backgrounds, and a more evenly balanced gender and age ratios.

Test selection should also be considered in future studies, including consideration of the Faux Pas test and Channon Predicaments tests outlined above to explore more subtle deficits in the area of mental inference and social competence. The present study also highlighted the implications of using assessment tools which rely heavily on verbal reasoning skills; and although some non-verbal tests of mentalisation exist, most were primarily developed for children and are therefore inappropriate to use with an adult sample. In response to this, it is recommended that measures are developed with this in mind. This would aid construct validity by reducing confounding variables. Future measures should also aim to improve ecological validity by creating more true-to-life assessment techniques. Validity could be further improved by checking predictive validity i.e. do results correlate with real-world social function as observed by others. Further research could utilise clinician or informant rated social competence and compare this against scores on neuropsychological measures of social cognition.

The current study also revealed inconsistencies in the literature around affect recognition in ARBD. As discussed, this may be due to a number of factors, however, this clearly warrants further study, as impairment may be subtler than previously thought, and careful considerations of each individual test and its construct validity needs to be made.

In order to maximise the potential of the findings the author will aim to disseminate the results of this study directly to the recruitment site and further afield.

4.5. Concluding Statement

Although there is still a lot left to understand about social cognition and the mechanisms that underpin its multiple facets, it is clear that humans rely heavily on social processes in order to successfully navigate daily life. The present study hoped to contribute towards this relatively novel area of research within the wider understanding of ARBD. Group analysis revealed disadvantages in performance on a measure of mentalising; which was interpreted in comparison to normative scores, and in context of individual profiles, including general cognitive functioning, comorbidities and other demographic information. The sample also showed average performance on the affect naming portion of the battery, challenging existing literature on ARBD and affect recognition. Despite various limitations affecting the generalisability of the findings, there is a clear case for further research into how social cognition is affected in ARBD and offers direction to future considerations within clinical practice and further research. While understanding of the relationship between social cognition and ARBD continues to develop, these findings indicate further investigation could lead to significant improvements to treatment, recovery, and ultimately to the quality of life of people affected by ARBD.

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6. APPENDICES

Appendix A: Literature Search Criteria

The literature search was conducted using PubMed, Science Direct and Psychinfo databases to identify relevant published literature, which included journal articles and book chapters. The following key words and terms were used: ("ARBD" or “ARBI” or "Korsakoff" or "alcohol related dementia" or "alcoholic dementia" or "alcohol amnesic disorder") AND ("social" or "affect recognition" or "emotion recognition" or "theory of mind" or "mentalisation" or "mentalization" or "strange stories"). However, due to the paucity of research relating specifically to the subject under study, the author extended the search to include non-traditional academic work and unpublished material. The author then used a snowball search methodology – scanning reference lists for previously unidentified papers, contacted key researchers in the field to request any additional unpublished findings, and contacted professionals registered as currently conducting relevant systematic reviews on the PROSPERO database.

Additional parameters used:

- Species – humans
- Ages – 19+
- Language – English

Additional parameters filtered out non-human participants, participants under 19 years of age and studies which were not published in English. Initial database searches yielded 286 items. Titles and abstracts of the initial results were then screened for relevance to social cognition in adults with ARBD which yielded 6 relevant pieces. After screening the papers’ methodology and results for applicability and robustness, this left 3 articles which were deemed suitable, and 1 article was gleaned from reference lists.

Appendix B: NHS Ethics Committee Letter of Approval 1

[redacted]

[redacted]

[redacted]

Miss Jodie Hill
Trainee Clinical Psychologist
Camden and Islington NHS Foundation Trust
University of East London, Water Lane
London
E15 4LZ

Date 21 June 2017

Direct line
E-mail [redacted]

Dear Miss Hill

Study title: **Alcohol Related Brain Damage and Social Cognition**
REC reference: **17/WS/0127**
IRAS project ID: **224040**

Thank you for your response received on 20 June 2017. I can confirm the REC has received the documents listed below and that these comply with the approval conditions detailed in our letter dated 15 June 2017.

Documents received

The documents received were as follows:

Document	*Version*	*Date*
Participant consent form [Consent form]	1.02	20 June 2017

Approved documents

The final list of approved documentation for the study is therefore as follows:

Document	*Version*	*Date*
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only) [Indemnity Cert]		11 May 2016
Non-validated questionnaire [Additional info form]	1.01	20 May 2017
Other [Research Proposal feedback]		
Participant consent form [Consent form]	1.02	20 June 2017
Participant information sheet (PIS) [PIS]	1.01	19 March 2017
REC Application Form [REC_Form_26052017]		26 May 2017
Research protocol or project proposal [Protocol (v2.0 20May)]	2.0	20 May 2017
Response to Additional Conditions Met		
Summary CV for Chief Investigator (CI) [Jodie Verdun Hill CV (v1.01 20May)]	1.01	20 May 2017
Summary CV for supervisor (student research) [Matthew Jones Chesters CV]		
Validated questionnaire [Data Record Form - tests and questionnaire]	1.01	20 March 2017

You should ensure that the sponsor has a copy of the final documentation for the study. It is the sponsor's responsibility to ensure that the documentation is made available to R&D offices at all participating sites.

17/WS/0127 **Please quote this number on all correspondence**

Yours sincerely

[redacted]

[redacted]
REC Manager

Copy to: [redacted] University of East London
[redacted]

Appendix C: NHS Ethics Committee Letter of Approval 2

[redacted]

[redacted]

[redacted]

Miss Jodie Hill
Trainee Clinical Psychologist
Camden and Islington NHS Foundation Trust
University of East London, Water Lane
London
E15 4LZ

Date 15 June 2017

Direct line [redacted]
E-mail

Dear Miss Hill

Study title: **Alcohol Related Brain Damage and Social Cognition**
REC reference: **17/WS/0127**
IRAS project ID: **224040**

The Proportionate Review Sub-Committee of the [redacted] reviewed the above application on 14 June 2017.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this favourable opinion letter. The expectation is that this information will be published for all studies that receive an ethical opinion but should you wish to provide a substitute contact point, wish to make a request to defer, or require further information, please contact hra.studyregistration@nhs.net outlining the reasons for your request. Under very limited circumstances (e.g. for student research which has received an unfavourable opinion), it may be possible to grant an exemption to the publication of the study.

Ethical opinion

On behalf of the Committee, the sub-committee gave a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below.

Conditions of the favourable opinion

The REC favourable opinion is subject to the following conditions being met prior to the start of the study.

1. In the Consent Form, statement 5 should be removed as this is a duplication of statement 4.

You should notify the REC once all conditions have been met (except for site approvals from host organisations) and provide copies of any revised documentation with updated version numbers. Revised documents should be submitted to the REC electronically

Appendix C: NHS Ethics Committee Letter of Approval 2 (continued)

from IRAS. The REC will acknowledge receipt and provide a final list of the approved documentation for the study, which you can make available to host organisations to facilitate their permission for the study. Failure to provide the final versions to the REC may cause delay in obtaining permissions.

Management permission must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements. Each NHS organisation must confirm through the signing of agreements and/or other documents that it has given permission for the research to proceed (except where explicitly specified otherwise).

Guidance on applying for HRA Approval (England)/ NHS permission for research is available in the Integrated Research Application System, www.hra.nhs.uk or at http://www.rdforum.nhs.uk.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of management permissions from host organisations.

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database. This should be before the first participant is recruited but no later than 6 weeks after recruitment of the first participant.

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g. when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.

To ensure transparency in research, we strongly recommend that all research is registered but for non-clinical trials this is not currently mandatory.

If a sponsor wishes to request a deferral for study registration within the required timeframe, they should contact hra.studyregistration@nhs.net. The expectation is that all clinical trials will be registered, however, in exceptional circumstances non registration may be permissible with prior agreement from the HRA. Guidance on where to register is provided on the HRA website.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion").

Summary of discussion at the meeting

Appendix C: NHS Ethics Committee Letter of Approval 2 (continued)

The Committee asked whether patients will be aware of their diagnosis before they are invited to participate in this study.

You confirmed by email that the patients will be aware of the ARBD diagnosis and will have received it prior to admission to the unit as part of the unit's referral criteria. Patients will then be identified and invited to take part in the study following admission.

The Committee also noted a minor error in the Consent form. Statements 4 and 5 are the same.

Approved documents

The documents reviewed and approved were:

Document	*Version*	*Date*
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only) [Indemnity Cert]		11 May 2016
Non-validated questionnaire [Additional info form]	1.01	20 May 2017
Other [Research Proposal feedback]		
Participant consent form [Consent form]	1.01	19 March 2017
Participant information sheet (PIS) [PIS]	1.01	19 March 2017
REC Application Form [REC_Form_26052017]		26 May 2017
Research protocol or project proposal [Protocol (v2.0 20May)]	2.0	20 May 2017
Summary CV for Chief Investigator (CI) [Jodie Verdun Hill CV (v1.01 20May)]	1.01	20 May 2017
Summary CV for supervisor (student research) [Matthew Jones Chesters CV]		
Validated questionnaire [Data Record Form - tests and questionnaire]	1.01	20 March 2017

Membership of the Proportionate Review Sub-Committee

The members of the Sub-Committee who took part in the review are listed on the attached sheet.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document "After ethical review – guidance for researchers" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports

Appendix C: NHS Ethics Committee Letter of Approval 2 (continued)

- Notifying the end of the study

The HRA website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

User Feedback

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website: http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/

HRA Training

We are pleased to welcome researchers and R&D staff at our training days – see details at http://www.hra.nhs.uk/hra-training/

With the Committee's best wishes for the success of this project.

17/WS/0127	**Please quote this number on all correspondence**

Yours sincerely

[redacted]

Enclosures:	List of names and professions of members who took part in the review
	"After ethical review – guidance for researchers"
Copy to:	Catherine Fieulleteau, University of East London Professor Michael Seed, University of East London [redacted]

Appendix C: NHS Ethics Committee Letter of Approval 2 (continued)

[redacted]

Attendance at [redacted] meeting on 14 June 2017

Committee Members:

Name	*Profession*	*Present*	*Notes*
[redacted]	Consultant Physician & Gastroenterologist (CHAIR)	Yes	
[redacted]	Consultant Anaesthetist	Yes	
[redacted]	Retired (Research Chemist)	Yes	

Also in attendance:

Name	*Position (or reason for attending)*
[redacted]	[redacted] Manager

Appendix D: Health Board Research and Development Department Letter of Approval

[redacted]

[redacted]

[redacted]

FM/CF/approval

28 June 2017

Miss Jodie Hill
Camden and Islington NHS Foundation Trust
Trainee Clinical Psychologist
University of East London
Water Lane
London
E15 4LZ

Dear Miss Hill

[redacted] **R&D Project No:** 2017/0168 **REC No:** 17/WS/0127

Title of Research: Alcohol Related Brain Damage and Social Cognition

Participant Information Sheet:
Version 1.01, dated 19 March 2017

Consent Form:
Version 1.02, dated 20 June 2017

Protocol: Version 2.0, dated 20 May 2017

I am pleased to inform you this letter provides Site Specific approval for [redacted] for the above study and you may proceed with your research, subject to the conditions below.

This support is conditional on ensuring you have permissions to conduct the research on the [redacted] premises.

Please note that the [redacted] R&D Office must be informed of any changes to the study such as amendments to the protocol, funding, recruitment, personnel or resource input required of [redacted]

Substantial amendments to the protocol will require approval from the ethics committee which approved your study and the MHRA where applicable.

Please keep this office informed of the following study information:

1. Date you are ready to begin recruitment, date of the recruitment of the first participant and the monthly recruitment figures thereafter.
2. Date the final participant is recruited and the final recruitment figures.
3. Date your study / trial is completed within [redacted]

I wish you every success with your study.

[redacted]

Appendix E: Participant Information Sheet

PARTICIPANT INFORMATION SHEET v1.01 (19.03.2017)
IRAS ID: 224040

University of East London
School of Psychology
Stratford Campus
Water Lane
LONDON
E15 4LZ

Title of Project: **Alcohol Related Brain Damage and Social Cognition**

Name of Researcher: **Jodie Hill**

Email: **u1525464@uel.ac.uk**

You have been invited to take part in a research study which aims to see how people with Alcohol Related Brain Damage (ARBD) respond to different social situations. It is important for psychologists and healthcare professionals to understand more about this so we can help support people with ARBD as best we can. The findings of this research may change the way we help people at [redacted], for example helping people to understand social situations and improve their social skills.

What would I have to do?
If you agree to take part, you will be asked to complete 3 more tests, in addition to the tests you would usually take with the psychologist. These tests would take no more than 30 minutes extra to complete and you could have a break in between if you get tired.

One of the tests is a questionnaire which asks about how you feel about certain social situations.
Another involves telling you some short stories and asking you questions about them.
The third test involves you looking at pictures of people and saying what emotion the person in the photo is experiencing.
As part of the study I will also write down information about you, such as your age, sex, ethnicity, diagnosis, years of schooling, and information about how much you used to drink before you came to [redacted].

This information will be kept securely and will be password protected. Your name and any other identifiable details will not be kept by the researcher. Your participation in this research is completely voluntary. If you change your mind and decide you would not like to take part all of the information will be destroyed. This includes if you change your mind part way through the tests, or after you have completed the tests, up until when the data is analysed (around January 2018).

Are there any risks involved in taking part?
These tests can be tiring, but the researcher will ensure you can take regular breaks if you would like to. The tests will take no more than 30 minutes longer than usual, so although additional effort would be required, the study has been designed so that taking part should not be significantly more demanding than usual. Taking part, or not taking part in this study, will have no impact on the support you receive from staff

at [redacted] or [redacted].

What will happen to the results of the tests?
The results of the tests will be given to a member of the psychology team for them to feed back to you, as they would with any other test scores. If you have any questions about your test scores this can be discussed with the psychologist, as well as any changes to your care plan as a result of the tests.

The study aims to collect test scores for many residents at [redacted] and the results of the tests will be used in a doctoral thesis, submitted to the University of East London. The thesis may be published in an academic journal in the future, however, any identifiable data about you will not be included in any report or publication.

Who am I?
My name is Jodie Hill. I am a Trainee Clinical Psychologist studying at the University of East London. This research is part of my training to become a Clinical Psychologist and I'm especially interested in alcohol related brain damage

What happens afterwards?
I will be available to discuss any concerns or questions you have throughout and after the assessment session.

Who can I contact if I have any questions now?
You may wish to discuss your involvement in the research with the staff team at [redacted]; but if you have any further questions specifically about the study you can contact me via the email address stated above.

Thank you

Jodie Hill
Trainee Clinical Psychologist
University of East London

Supervised by:

Dr Matthew Jones Chesters
Deputy Programme Director
University of East London

Appendix F: Consent Form

CONSENT FORM v1.02 (20.06.2017) IRAS ID:22404

Participant Identification Number:

University of East London
School of Psychology
Stratford Campus
Water Lane
LONDON
E15 4LZ

Title of Project: **Alcohol Related Brain Damage and Social Cognition**

Name of Researcher: **Jodie Hill**

	Please tick the box to confirm
1. I confirm that I have read the information sheet version 1.01 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
2. I understand that relevant sections of my medical notes and data collected during the study, may be looked at by individuals collecting data for the study. I give permission for these individuals to have access to my records.	☐
3. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected.	☐
4. I understand that the information collected about me will be used to support other research in the future, and may be shared anonymously with other researchers.	☐

I agree to take part in the above study.

Name of participant	Date	Signature

Name of person taking consent	Date	Signature

When completed: 1 for participant; 1 for researcher site file; 1 to be kept in medical notes.

Appendix G: Strange Stories Task Exerpts

Strange Stories Mentalisation Question 8:

A burglar who has just robbed a shop is making his getaway. As he is running home, a policeman on his beat sees him drop his glove. He doesn't know the man is a burglar, he just wants to tell him he dropped his glove. But when the policeman shouts out to the burglar, "Hey, you! Stop!" the burglar turns around, sees the policeman and gives himself up. He puts his hands up and admits that he did the break-in at the local shop.

Q: Why did the burglar do that?

Scoring:
2 points – reference to belief that policeman knew that he'd burgled the shop.
1 point – reference to something factually correct in story
0 points – factually incorrect/irrelevant answers

Strange Stories Physical Control Question 1:

Two enemy powers have been at war for a very long time. Each army has won several battles, but now the outcome could go either way. The forces are equally matched. However, the Blue army is stronger than the Yellow army in foot soldiers and artillery. But the Yellow army is stronger than the Blue Army in air power. On the day of the final battle, which will decide the outcome of the war, there is heavy fog over the mountains where the fighting is about to occur. Low-lying clouds hang above the soldiers. By the end of the day the Blue army has won.

Q: Why did the Blue army win?

Scoring:

2 points - reference to both weather conditions and either relative ground superiority or inability of others army's planes to be useful in fog (names of armies unimportant)
1 point – reference either to weather or relative superiority on ground versus air (because it was foggy); nothing about why weather makes it especially difficult for planes or nothing about planes being affected more than tanks; reference to fog to justify incorrect response (the aeroplanes won because the fog meant they could hide from the tanks)
0 points – reference to irrelevant or incorrect information (they won because they had better planes); justifications for why tanks were better than planes.

Appendix H: Neuropsychological Assessment Score Conversion Table

Index Score	Scaled Score	Description
130 - 150	16 - 19	Very Superior
121 - 129	15	Superior
111 - 120	13 - 14	High-average
90 - 110	8 - 12	Average
80 - 89	6 - 7	Low-average
70 - 79	4 - 5	Borderline
68 - 69		Impaired
66 - 67		Mild
64 - 65	3	Moderate
62 - 63		Severe
50 - 61	1 - 2	Profound

Appendix I: Correlational Matrix of Variables Including Effect Size and Significance Level

		Age	Education	Weeks since admission	CORE-10	FAB Total
Age	Rho					
	Sig.					
Education	Rho	-.466				
	Sig.	.069				
Weeks since admission	Rho	.319	-.025			
	Sig.	.228	.927			
CORE-10	Rho	-.580	.426	-.110		
	Sig.	.019	.100	.684		
FAB total	Rho	-.290	-.358	-.019	.220	
	Sig.	.276	.174	.945	.414	
TOPF	Rho	.161	.253	.061	-.362	.077
	Sig.	.552	.344	.823	.168	.778
Affect Naming	Rho	.251	-.503	.281	-.125	.538
	Sig.	.348	.047	.292	.644	.031
SS Mentalisation	Rho	-.241	.468	.080	.113	.072
	Sig.	.369	.068	.769	.676	.792
SS Physical	Rho	.277	.016	-.016	-.139	.084
	Sig.	.298	.953	.954	.606	.758
QCAE Affective	Rho	-.291	.522	.340	.394	.053
	Sig.	.275	.038	.197	.131	.846
QCAE Cognitive	Rho	-.243	.414	.324	.079	.197
	Sig.	.364	.111	.221	.771	.466
Digit Span Forward	Rho	.658	-.570	.082	-.661	.130
	Sig.	.006	.021	.763	.005	.631
	Rho	.652	-.222	.246	-.299	-.227

Digit Span Backward	Sig.	.006	.408	.359	.261	.399
Symbol Coding	Rho	-.261	.076	.109	-.075	.572
	Sig.	.329	.779	.687	.784	.021
Letter Fluency	Rho	.182	-.055	-.051	-.390	.332
	Sig.	.501	.840	.851	.135	.209
Category Fluency	Rho	-.538	.189	-.280	.052	.492
	Sig.	.032	.484	.293	.847	.053
Figure Copy	Rho	.040	-.063	.273	.340	.436
	Sig.	.882	.817	.306	.198	.091
Line Orientation	Rho	.135	.161	.256	.196	.241
	Sig.	.618	.550	.339	.467	.369
Picture Naming	Rho	.106	-.032	-.213	-.244	.406
	Sig.	.695	.908	.429	.362	.118
List Learning	Rho	-.043	.193	-.102	.095	-.003
	Sig.	.874	.473	.707	.727	.991
List Delayed Recall	Rho	.068	-.103	-.193	-.476	-.158
	Sig.	.801	.704	.474	.062	.560
List Recognition	Rho	-.039	.232	-.087	.160	-.029
	Sig.	.887	.386	.748	.553	.914
Story Learning	Rho	-.054	.248	-.165	.152	.163
	Sig.	.842	.354	.541	.574	.547
Story Delayed	Rho	-.132	.479	-.061	.094	-.241
	Sig.	.627	.061	.822	.729	.368
Figure Delayed	Rho	-.077	.289	-.149	.181	-.334
	Sig.	.777	.279	.582	.503	.206

Appendix I: Correlational Matrix of Variables Including Effect Size and Significance Level (continued)

		TOPF	Affect Naming	SS Mentali-sation	SS Physi-cal	QCAE Affective
TOPF	Rho					
	Sig.					
Affect Naming	Rho	-.018				
	Sig.	.947				
SS Mentalisation	Rho	.517	-.081			
	Sig.	.040	.767			
SS Physical	Rho	.400	.065	.419		
	Sig.	.125	.811	.107		
QCAE Affective	Rho	.185	.074	.720	.341	
	Sig.	.493	.785	.002	.196	
QCAE Cognitive	Rho	.239	.253	.500	.273	.801
	Sig.	.372	.345	.049	.306	.000
Digit Span Forward	Rho	.358	.287	-.354	.094	-.585
	Sig.	.173	.281	.179	.728	.017
Digit Span Backward	Rho	.239	.297	-.074	.188	-.094
	Sig.	.372	.263	.785	.485	.730
Symbol Coding	Rho	.434	.469	.176	.310	.156
	Sig.	.093	.067	.515	.242	.564
Letter Fluency	Rho	.633	.276	.098	.421	-.079
	Sig.	.009	.300	.717	.104	.771
Category Fluency	Rho	.330	-.071	.323	.014	.088
	Sig.	.212	.793	.223	.960	.746
Figure Copy	Rho	.247	.345	.417	.249	.390
	Sig.	.357	.191	.108	.352	.135

Line Orientation	Rho	.425	.271	.463	.266	.478
	Sig.	.101	.310	.071	.320	.061
Picture Naming	Rho	.573	.138	.282	.329	-.118
	Sig.	.020	.610	.290	.214	.663
List Learning	Rho	.270	-.042	.382	.286	.026
	Sig.	.313	.878	.144	.282	.925
List Delayed Recall	Rho	.293	-.224	-.074	.081	-.495
	Sig.	.270	.404	.787	.765	.051
List Recognition	Rho	.292	-.237	.358	.003	-.040
	Sig.	.272	.377	.174	.991	.883
Story Learning	Rho	.346	.116	.190	.330	-.011
	Sig.	.189	.667	.481	.212	.967
Story Delayed	Rho	.307	-.452	.297	.140	.170
	Sig.	.247	.079	.264	.605	.530
Figure Delayed	Rho	.089	-.612	.164	-.057	-.033
	Sig.	.742	.012	.544	.835	.903

Appendix I: Correlational Matrix of Variables Including Effect Size and Significance Level (continued)

		QCAE Cogni-tive	Digit Span For-ward	Digit Span Back-ward	Symbol Coding	Letter Fluency
QCAE Cognitive	Rho					
	Sig.					
Digit Span Forward	Rho	-.312				
	Sig.	.240				
Digit Span Backward	Rho	-.059	.466			
	Sig.	.829	.069			
Symbol Coding	Rho	.477	.145	-.004		
	Sig.	.062	.591	.989		
Letter Fluency	Rho	.217	.513	-.016	.646	
	Sig.	.421	.042	.954	.007	
Category Fluency	Rho	.272	.062	-.552	.488	.445
	Sig.	.309	.820	.027	.055	.084
Figure Copy	Rho	.032	-.152	.062	.101	-.040
	Sig.	.906	.574	.819	.711	.882
Line Orientation	Rho	.280	-.122	.297	.144	-.096
	Sig.	.294	.653	.264	.674	.722
Picture Naming	Rho	.046	.207	.125	.424	.445
	Sig.	.865	.443	.645	.102	.084
List Learning	Rho	-.145	-.195	-.033	.252	.324
	Sig.	.593	.469	.903	.347	.221
List Delayed Recall	Rho	-.407	.189	-.058	.224	.341
	Sig.	.118	.483	.831	.405	.196
	Rho	-.275	-.164	-.066	-.059	.202

List Recognition	Sig.	.303	.543	.808	.828	.454
Story Learning	Rho	.037	-.067	.060	.544	.512
	Sig.	.891	.804	.826	.029	.043
Story Delayed	Rho	.092	-.369	-.286	.051	.239
	Sig.	.735	.160	.282	.852	.373
Figure Delayed	Rho	-.379	-.392	-.155	-.467	-.251
	Sig.	.148	.133	.566	.068	.349

Appendix I: Correlational Matrix of Variables Including Effect Size and Significance Level (continued)

		Cate-gory Fluency	Figure Copy	Line Orien-tation	Picture Naming	List Learning
Category Fluency	Rho					
	Sig.					
Figure Copy	Rho	-.080				
	Sig.	.769				
Line Orientation	Rho	-.139	.814			
	Sig.	.607	.000			
Picture Naming	Rho	.189	.360	.491		
	Sig.	.483	.171	.053		
List Learning	Rho	.046	.286	.043	.406	
	Sig.	.866	.283	.875	.119	
List Delayed Recall	Rho	.097	-.130	-.256	.422	.617
	Sig.	.719	.630	.339	.104	.011
List Recognition	Rho	-.033	.295	.074	.386	.823
	Sig.	.904	.268	.785	.014	.000
Story Learning	Rho	.147	.140	.076	.495	.829
	Sig.	.587	.606	.778	.051	.000
Story Delayed	Rho	.121	-.020	-.030	.248	.671
	Sig.	.655	.943	.912	.355	.004
Figure Delayed	Rho	-.345	.211	.138	.210	.404
	Sig.	.191	.433	.611	.436	.121

Appendix I: Correlational Matrix of Variables Including Effect Size and Significance Level (continued)

		List Delayed Recall	List Recog-nition	Story Learning	Story Delayed
List Delayed Recall	Rho				
	Sig.				
List Recognition	Rho	.429			
	Sig.	.097			
Story Learning	Rho	.473	.594		
	Sig.	.064	.015		
Story Delayed	Rho	.487	.645	.631	
	Sig.	.056	.007	.009	
Figure Delayed	Rho	.312	.697	.135	.557
	Sig.	.240	.003	.618	.025