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The Relationship between Apathy and Functional and Cognitive Decline in a Memory Clinic Outpatients.

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Abstract

Apathy is a neuropsychiatric disorder characterised by lack of motivation and attenuated goal-directed behaviour (Marin, 1991). The disorder is associated with significant deterioration in quality of life, specifically in elderly patients (Clarke et al., 2010). In this study we investigate the relationship between apathy symptoms and cognitive and functional decline while also controlling for the effects of depressive symptoms. We report significant associations between the presence of apathy symptoms and functional decline in patients in terms of capacity to carry out instrumental activities of daily living ($p < .001$), and between apathy and depressive symptoms ($p < .001$). A significant association between apathy and year-on cognitive decline was not found ($p = .56$). We discuss these results in relation to the contribution of apathy and depressive symptoms to functional and cognitive decline in cases of probable neurological changes. This study therefore addresses gaps in previous research and creates an introduction for further study pertaining to the relationship between apathy and functional decline as well as rate of cognitive decline.

Keywords: apathy, cognitive decline, functional decline, depression, dementia.

Researchers and clinicians have become more aware of the clinical significance of apathy symptoms in brain disorders. Studies show high prevalence rates for apathy in neurodegenerative diseases and other forms of acquired brain damage (Santangelo et al., 2014; Verlinden et al., 2014). Some studies have also reported significant apathy symptoms in older community dwelling populations (Cipriani et al., 2014; Evensen et al., 2012; Leroi et al., 2014; Santangelo et al., 2014; Verlinden et al., 2014) The operationalisation and diagnostic criteria for apathy remains an area of ongoing debate, although the dominant view at present is that apathy constitutes a lack of motivation or interest that follows pathological neurological changes and is not explained by deteriorating consciousness, emotional disturbance, or intellectual disability (Chase, 2011; Marin, 1991). The apathy syndrome or its symptoms are important for two reasons. Firstly, apathy is prevalent across a wide range of neurological disorders. Secondly, recent studies have shown that its presence associates with a decrease in quality of life for the patient, a heavy caregiver burden, more rapid cognitive decline, and poor prognosis (Clarke et al., 2010; Evensen et al., 2012; Leroi et al., 2014; Mortby et al., 2012). For instance, a study by Landes et al. (2001) showed that patients with Alzheimer's Disease (AD) who also presented with apathy symptoms were significantly more impaired in carrying out activities of daily living (ADLs) than those without these symptoms.

Apathy

Marin's (1991) view of apathy as an amotivation syndrome has gained a wider acceptance. The amotivation expresses in diminished goal oriented behaviour, decreased goal oriented cognition, and lower emotional related aspects of goal driven behaviour (Cipriani et al., 2014). This framework has been modified by Starkstein who extended the symptom profile to include deficits in action initiation, emotional reactivity, interest and motivation (Starkstein & Leentjens, 2008). Starkstein's position has in more recent years also been

questioned (see Cipriani et al., 2014). A “task force” established in 2019 with a mandate to create diagnostic criteria for apathy has proposed that a diagnosis of apathy should be made when diminished motivation is present for at least 4 weeks, with changes from the patient’s normal behaviour (Miller et al., 2021). There should be marked impairment in one of the following aspects of apathy: 1) diminished initiative, 2) decreased interest or 3) lowered emotional expression, and concomitant recognizable functional impairments (Cipriani et al., 2014; Miller et al., 2021).

The current diagnostic frameworks are largely recognised in clinical practice and research, but to date no major psychiatric classification system (Diagnostic and Statistical Manual of Mental Disorders (DSM) and the International Classification of Diseases: ICD-10) have dedicated criteria for apathy (Cipriani et al., 2014; Starkstein & Leentjens, 2008).

In one study, apathy has been linked to an increase in amyloid and tau protein deposits in the anterior cingulate cortex in geriatric patients with depression (Sozeri-Varma et al., 2018). Apathy symptoms have also been associated with pathophysiological alterations in areas of the frontal lobes responsible for the integration of affective components of motivated behaviour with higher order cognitive components involving planning and action initiating (Chase, 2011). Santangelo et al., (2014) also suggest that the ventromedial prefrontal cortex (vmPFC) plays an important role in interpreting emotional subcomponents of goal directed activity and in flexibly altering situation-contingent affective responses (Delgado et al., 2016). It is also plausible that the flat affect or lack of reactive emotional expression seen in patients with apathy likely results from disruptions to vmPFC circuits involved in the initiation and sustenance of goal directed behaviour and other frontal regions (Njomboro et al., 2014).

Apathy and Depression

Traditional neuropsychiatric assessment tools treat apathy as a symptom of depression. This is not surprising given that the two disorders share significantly high comorbidity rates (Groeneweg-Koolhoven et al., 2014; Mortby et al., 2012; Sozeri-Varma et al., 2018). In spite of the traditional position, there has been a growing appreciation among clinicians and researchers that the two disorders are clearly distinct. For instance, Starkstein and Leentjens (2008) explain how apathy and depression can often be confused due to some symptom overlap. For example, anhedonia and lack of motivation can relate to symptoms of both major depression and apathy (Chase, 2011; Sozeri-Varma et al., 2018; Starkstein & Leentjens, 2008). In clinical practice the symptom overlap between the two disorders has often resulted in apathy going undiagnosed, underdiagnosed or misdiagnosed, and consequently, likely to go untreated (Chase, 2011).

Research has also shown that apathy and depression have distinct phenomenological and neuropsychiatric correlates. For example, key clinical dysphoric symptoms of depression include hopelessness or sadness, whilst patients with apathy can describe their goals and interests with excitement despite being unmotivated to perform behaviour directed to achieving them (Mortby et al., 2012). The two disorders can also occur independent of each other. A study by Groeneweg-Koolhoven et al. (2014) found that 7.5% of older community dwelling persons had symptoms of apathy that were not comorbid with depression or cognitive impairment.

Apathy and Cognitive and Functional Decline

Activities of Daily Living (ADLs) are essential skills for managing daily needs. Basic activities of daily living include activities such as meal preparation and hygiene (Mlinac & Feng, 2016) and satisfy or fulfil primal human needs. On the other hand, instrumental activities of daily living are more complex skills that require higher levels of cognitive functioning than basic activities of daily living (Green et al., 2021; Mlinac & Feng,

2016). This includes activities such as those involved in managing one's finances and doing shopping. The presence of apathy symptoms has been associated more with functional decline and deficits in fulfilling instrumental activities of daily living than in basic activities of daily living (Clarke et al., 2010; Lechowski et al., 2009; Zahodne & Tremont, 2012). Although it's plausible that deficits in instrumental activities of daily living reflects dysfunction in the cognitive capacity required for these instrumental activities, Tierney et al. (2018) found a dissociation between functional decline in the activities of daily living (ADL) and cognitive functioning in patients who presented with severe apathy. Furthermore, Palmer et al. (2011) found that patients with severe apathy had higher levels of cognitive decline but were not at a risk for functional decline. A meta-analytic study by Green et al. (2021) on patients with acquired brain injury showed that higher levels of apathy associate with an increase in functional decline but have insignificant effects on cognitive decline (However see also Clarke et al., 2010). The disparities in findings reflect complex relations between apathy and cognition, as well as apathy and functional deterioration, and might also reflect on the use of dichotomous patient samples across studies.

Most of the research tends to focus solely on cognition and apathy or functional deterioration and apathy separately without factoring in all three. The interrelations between apathy, cognitive and functional deterioration require further investigation. This is an important area of research considering that a faster rate of functional or cognitive decline can lead to a state of dependence and need for early admission to a care facility, and that apathy itself leads to attenuated goal directed behaviour. Another important question in this area is also the relationship between apathy symptoms and rate of both cognitive and functional decline. A related study conducted by Carcaillon et al. (2011) found that patients with mild to moderate AD with Deterioration Cognitive Observee Scale (DECO) scores below 16 (for patients aged < 75 years) and those with scores below 14 (for patients aged > 75 years old)

predicted rapid cognitive decline within the next year (Ritchie & Fuhrer, 1996). Currently we are not aware of any study that has specifically investigated the relationship between apathy symptoms and rate of both cognitive and functional decline. In this study we address these gaps in the research and investigate the relationship apathy has with cognitive and functional decline as well as the rate of this decline. Understanding these relationships is important for the management of patients with apathy symptoms.

Research Aim and Hypotheses

The main aim of this study is to investigate the association between apathy and functional and cognitive decline. We also investigate the relationship between apathy and rate of cognitive decline. To do this we control for the influence of depressive symptoms because of the high rates of co-morbidity between apathy and depressive symptoms in neurological patients. Based on available studies, we hypothesize that:

i) There will be a significant positive association between apathy and decline in instrumental activities of daily living (IADLS) (Zahodne & Tremont, 2012).

ii) Apathy will show a significant positive association with year-on cognitive decline (Clarke et al., 2010)

iii) There will be a significant positive association between apathy and depressive symptoms.

iv) Depression will not be significantly associated with a deterioration in IADLS and cognition.

Methods

Design and Setting

The study has a cross-sectional design and is nested in an ongoing memory clinic study on neurocognitive effects of neurodegenerative disorders being run at the Albertina and Walter Sisulu Institute of Ageing in Africa (IAA) in the Department of Psychiatry and Mental

Health at Groote Schuur Hospital in Cape Town, South Africa. We used archival data obtained from the memory clinic out-patients who presented with subjective cognitive deficits, including memory loss. The variables we looked at in this study were Apathy Evaluation Scale scores, that assessed apathy, Deterioration Cognitive Observee Scale (DECO) scores, that assessed rate of cognitive decline, the Bristol Activities of Daily Living Scores (BADLS), that assessed functional decline, and lastly the Cornell Scale for Depression in Dementia (CSDD) scores, that assessed levels of depression.

Participants

The sample of participants within this study included people who presented at the Groote Schuur Memory Clinic with a differential diagnosis that included dementia. Most of the participants with dementia were most often referred from other hospitals or mental health care establishments. The original sample consisted of 94 participants, however four participants were excluded, resulting in an ultimate sample size of 90 people. As shown in Table 1, this sample comprised of 32 males (M = 66.94, SD = 10.75), 40 females (M = 72.65, SD = 9.71) and 18 people with unspecified/missing sex data. The participants ranged in age from 38 years old to 90 years old (M = 70.11, SD = 10.51).

Table 1

Age demographics of participants, according to sex.

Sex	*n*	*Range*	*M*	*SD*
Male	32	38-85	66.94	10.75
Female	40	56-90	72.65	9.71
Unspecified	18	-	-	-
Total	90	38-90	70.11	10.51

Note. Only 72 out of 90 patient folders contained demographic information related to sex.

We originally projected a significant sample size of 150 participants for this study based on our power analysis calculations, however due to time constraints, data for 90 participants was obtained. This was done through simple random sampling of patient files located at the Groote Schuur Hospital Memory Clinic to ensure the results obtained from our sample would closely represent the population and reduce selection bias.

Exclusion criteria

Participants who did not have scores in their patient files for each of the four key scales relevant in the study (Apathy Evaluation Scale, Deterioration Cognitive Observee Scale, Cornell Scale for Depression in Dementia and Bristol Activities of Daily Living Scale) were excluded from the coding process. Once we had coded all the data, we found that four participants had been double coded and the duplicates were deleted.

Power Analysis

To estimate how many participants our study required to detect a significant effect, we used the statistical program R version 3.6.1 to conduct a power analysis. Cohen's recommendations, however, were determined to be overly stringent in a meta-analysis by Gignac and Szodorai (2016). As a result, we selected a 0.25 medium effect size, as advised by Gignac and Szodorai (2016). Since our study was a one-tailed test, we utilized a significance level of 0.05. Our calculation produced an estimated sample size of 150 participants.

Measures

We used the Apathy Evaluation Scale (AES), to measure apathy, the Bristol Activities of Daily Living Scale (BADLS), to assess the daily living abilities of patients, the Deterioration Cognitive Observee Scale (DECO), to measure cognitive functioning ability and assess behavioural changes, and the Cornell Scale for Depression in Dementia (CSDD), to determine levels of depression.

The Apathy Evaluation Scale (AES)

The Apathy Evaluation Scale (AES) (Appendix A) was used to evaluate apathy symptoms. The 18-item scale has clinician (AES-C), informant (AES-I) and patient (AES-S) rated versions (Marin et al., 1991). Scores are based on a 4-point Likert scale, with the categories "Not at all, Slightly, Somewhat and Alot" (Marin et al., 1991). Scores range from a minimum of 18 to a maximum of 72, with higher scores indicating significant apathy (Marin et al., 1991). The AES-I version of the scale is more robust than the AES-S, and was used in this study (Marin, 1991).

The AES has generally recorded high internal consistency (Cronbach's α – 0.86 – 0.94), as well as test-retest reliability (α = 0.76. – 0.94) (Clarke et al., 2011; Marin et al., 1991). In addition, the AES-I version, which was used in this study, has been found to have better convergent validity than the two other versions ($r = 0.50$, $p = 0.001$), showing this measure is both reliable and valid (Clarke et al., 2011). Within the South African context, the AES is considered to be a reliable and valid measure, as it is used in conjunction with other scales to diagnose patients with dementia at the IAA in the Memory Clinic at Groote Schuur Hospital.

Bristol Activities of Daily Living Scale (BADLS)

The Bristol Activities of Daily Living Scale (BADLS) (Appendix B) is frequently used to perform an initial assessment of daily living abilities in individuals with dementia (Bucks et al., 1996). This measure typically consists of a total of 20 items, with a five-point Likert scale response format ranging from 0 (able to perform the task) to 3 (unable to perform the task), included in this five-point response is also a score of 0 for the task not being applicable (Bucks et al., 1996). In terms of scoring the items, a maximum score of 60 is given to the individual, with higher scores indicating a greater lack of ability in daily living activities (Bucks et al., 1996)

Although the original BADLS is a 20-item scale, this study made use of a modified version, consisting of 17 items, where basic and instrumental activities of daily living were assessed. The total score of an individual assessed according to this modified version therefore ranged between 0 and 51, with scores closer to 51 indicating a greater lack of ability. In addition, this measure was based on informant responses, as impaired patients may not have been able to comment on their own abilities.

The original BADLS has been shown to have good test-retest reliability ($r = 0.95$, $p < 0.001$). In addition, 14 out of the 20 items had good/very good Kappa scores, ranging from 0.61 to 1.0 (Bucks et al., 1996). In addition, the BADLS showed good scale validity, when compared to the Mini Mental State Examination (MMSE) ($r = -0.55$) and observed task performance, part of the Observational Scale ($r = 0.65$), indicating that the BADLS is a reliable and valid measure (Bucks et al., 1996).

Deterioration Cognitive Observee Scale (DECO).

The Deterioration Cognitive Observee Scale (DECO) (Appendix C) consists of 19 items that are aimed at extracting information from an informant (or caregiver of the patient) on the patients current cognitive functioning ability, compared to one year prior (Ritchie & Fuhrer, 1996). The measure covers aspects of behavioural changes, specifically memory, activity levels, visuospatial abilities and the acquisition of new techniques and abilities (Ritchie & Fuhrer, 1996). The items of the measure are scored either 2, 1 or 0, with a total possible score of 38, where lower scores indicate little to no change in the patient, and higher scores indicate a significant amount of change in the patient's cognitive abilities (Ritchie & Fuhrer, 1996).

This instrument has indicated both good test-retest reliability ($r = 0.92$, $p < 0.0001$) and interrater reliability ($k = 0.87$, $p < 0.001$) (Ritchie & Fuhrer, 1996). In addition, kappa scores for each of the items ranged between 0.9 and 1.0, besides item 15, which had a kappa score of

0.8 (Ritchie & Fuhrer, 1996). Moreover, the measure is considered to have high face validity, owing to the fact that the instrument was formed after thoroughly investigating the findings from interview information synthesized from 147 patients with dementia (Ritchie & Fuhrer, 1996). This measure is therefore considered to be both reliable and valid.

Cornell Scale for Depression in Dementia (CSDD)

The Cornell Scale for Depression (CSDD) (Appendix D) was used to obtain information from patients who presented in the Memory Clinic to assess levels of depression. This instrument comprises 19 items/questions to assess information from either patients themselves or caregivers, relating to a series of observed behaviour's, physical indications and emotions of the patient (Alexopoulos et al., 1988). Furthermore, this measure is assesses five domains of depressive symptoms related to mood-related signs, behavioural disturbances, physical signs, cyclic functions and ideational disturbance (Alexopoulos et al., 1988). Responses are based on a four-point Likert scale, including the following response options; Unable to Evaluate – U, Absent – 0, Mild or intermittent – 1 and Severe – S (Alexopoulos et al., 1988) to give a maximum possible score of 38. Scores greater than 18 indicate "definite major depression", scores greater than 10 but less than 18 indicate probable major depression and scores lower than 6 indicate "absence of depressive symptoms" (Alexopoulos et al., 1988). The scale is administered by a clinician, and is not used as a diagnostic measure, but rather an instrument to screen patients for depression (Alexopoulos et al., 1988).

This CSDD has been used on a wide range of patients and has shown high reliability and validity. In the case of dementia, the scale demonstrated both high internal consistency (coefficient $\alpha = 0.84$) and interrater reliability (kw = 0.67) (Alexopoulos et al., 1988). The scale also showed high internal consistency (KR-20 = 0.98) as well as high interrater reliability ($\kappa = 0.74$ (Alexopoulos et al., 1988).

Procedure

In this study we used archival data that was collected in an ongoing larger study that took place at the memory clinic at the IAA in the department of Psychiatry at the University of Cape Town. The data for this study was collected from the 23rd of September 2021 to the 12th of November 2021. Patients who present at the memory clinic are often referrals from other hospitals or clinics who most often have a diagnosis of subjective memory loss or dementia. Patients are usually required to be accompanied by their significant others, who we can obtain collateral information from.

The first stage of the process involved a medical officer within the psychiatric department conducting an initial clerking of the patient. The patient's medical history, along with their demographic and biographical information was obtained. Further to this, the patient would have then been asked about their level of premorbid functioning and if they had any other complaints or concerns. The second and third stages of this process occurred simultaneously, where the patient would have been examined both physically and neuropsychiatrically, whilst their partner/family member would have been given an array of assessment measures to complete in a different room. The measures would have included the AES, BADLS, DECO and the CSDD (Alexopoulos et al., 1988; Bucks et al., 1996; Marin et al., 1991; Ritchie & Fuhrer, 1996).

The third stage also included neurocognitive assessment of the patient, in which measures tested for orientation (Mini Mental State Exam), executive function (cognitive switching) and attention (Digit Span test). The final stage consisted of a team of various health care professionals, such as neurologists, neuropsychologists and psychiatrists, who took part in a conference to explore alternative diagnoses and to analyse brain scans, to essentially formulate a diagnostic consensus. In addition to this, the patient's prognosis and intervention plan would have been discussed by the team. A clinician would have then given

feedback to the patient and their partner or family member on the outcome of the completed assessments. All data obtained from a patient is stored in a patient's file at the IAA, as well as in the format of an electronic copy within an online database.

The procedure for coding this patient information involved selecting patient files using a simple random sampling technique at the IAA Memory Clinic in Groote Schuur Hospital. Each patient file was first examined to ensure it included the AES, BADLS, DECO and CSDD scales, as well as a Mini Mental State Examination scores. Patient folder numbers were recorded to avoid any duplication of information. The data for each of the scores and the totals of each of the scales was then coded into Microsoft Excel 2019 Version 16.0.6742.2048.

Ethical Considerations

This main study obtained ethical approval from the Faculty of Health Sciences Human Research Ethics Committee at the University of Cape Town (UCT). Since this study was nested within a larger study, wherein data collection had already taken place, we made use of the ethical approval documentation for the larger study. Ethical approval for the main study was granted on the 04th of April 2007 by the Faculty of Health Sciences Human Research Ethics Committee at the University of Cape Town (Appendix E).

Informed Consent. During the data collection period that took place between the period 2012 and 2021 in the larger study, participants were verbally informed that their information and patient files could be used for research. Each of the participants provided consent prior to any tests or scales being administered.

It was clearly stated to all participants that participation in the larger study was voluntary, and that they therefore had the choice not to participate in the study, or if they did want to participate, that they could withdraw themselves from the study at any point.

Confidentiality and Anonymity. Furthermore, all participants were informed that information obtained from their assessments would be kept confidential and anonymous, ensuring that this information would only be available to those working on the study. This was upheld by making use of only patient folder numbers in both the data collection and analysis processes, rather than their names. In addition to this, this study implemented data protection procedures, such as the use of password-protected files. To ensure utmost confidentiality, questionnaires were kept under lock and key and the data coding process was conducted in a protected office. Furthermore, in this research paper, no names or patient numbers were published to ensure confidentiality and anonymity.

Risks and Benefits. There were no risks in participating in this study. On the other hand, the primary benefit for participants in this study was that they were offered the opportunity of a thorough assessment of their case by health care professionals, potentially leading to a more accurate diagnosis.

Results

Data Analysis

The raw data from the hard copy patient files was entered into Microsoft Excel 2019 Version 16.0.6742.2048 at Groote Schuur Hospital Memory Clinic. Duplicate patient files were deleted in Microsoft Excel, and missing scores were imputed with the value 0 to avoid skewing the data. The data was then analysed using R version 3.6.2 to provide descriptive and inferential statistics with a significance level of $p < 0.05$.

Factor structure of the Basic Activities of Daily Living Scale (BADL)

A component analysis of the 17 items on the Basic Activities of Daily Living Scale (BADLS) was conducted to establish its factor structure. The Kaiser-Meyer-Olkin measure of sample adequacy, as well as Barlett's test of sphericity, were used to examine the factorability of the BADL scale items. The result of Bartlett's sphericity test was significant (χ 2 (90) =

340.77, $p < .001$), showing that the BADL scale may be used. Moreover, the Kaiser-Meyer-Olkin adequacy test (KMO =. 83) demonstrated a high level of adequacy. Then, to identify and compute scores for the underlying factors, we used principal component analysis. According to the Kaiser Criterion, the factor solution should have had 3 components because the initial eigenvalues were 6.57, 2.10 and 1.43 respectively. However, a closer analysis of the number of components to include in the factor using the Horn's Parallel Analysis (See Appendix F) revealed that a two component factor structure was better suited for the items in the BADL scale than a three component factor structure. Thereafter, we applied a varimax rotation on the structure. The two components were fairly robust, explaining 28% and 22% of the variation in the BADL scale, respectively, and when combined, they accounted 50% of the variance in the scale. Component 1 contained eight elements and a Cronbach's alpha of.82. Items in component 1 consisted of basic activities such as bathing and we labelled them as the basic activities subscale of the BADL scale. Component 2 consisted of 9 items with a Cronbach's alpha of .87. Additionally, items in component 2 included questions which asked participants how well they could conduct their household finances thus this component was labelled the instrumental activities subscale of the BADL scale.

Apathy and Instrumental Activities of Daily Living (IADL)

We had hypothesized that apathy scores on the AES would be positively associated with a decline in the ability to complete IADL's. We calculated Pearson's correlation coefficient and the result showed a moderate positive association ($r = 0.52$, 95% CI = 0.35 - 0.65) between apathy and instrumental ADL's (see table 2), demonstrating that a rise in the incapacity to perform instrumental daily activities is linked to apathetic symptoms.

Apathy and Cognitive Deterioration

We had also hypothesized that apathy scores would have a positive significant association with cognitive deterioration scores on the DECO. The presence of a relationship between cognitive decline and apathy was determined using a scatterplot. The results of the scatterplot indicated that although there was a positive linear relationship between apathy and cognitive deterioration, the relationship was weak (see Appendix G). Following that, we used a Pearson's coefficient to see how strong the relationship between apathy symptoms and cognitive decline was. As shown in Table 2, there was a weak positive association between the AES and DECO scores ($r = 0.35$; 95% CI = 0.15–0.52), but it was statistically significant (p.001), demonstrating that a rise in cognitive degradation might be connected with apathetic symptoms.

Apathy and Depression

Because apathy symptoms and depression symptoms frequently overlap, we investigated the correlation between the two in our research. It was hypothesized that apathy symptoms and depressive symptoms would have a positive significant association. We utilized a scatterplot to see if there was a relationship between apathy and depressive symptoms. The results of the scatterplot revealed that there was no discernible pattern or linear association between apathy scores on the AES and depression scores on the CSSD (see Appendix G).

To validate or contradict the scatterplot's results, the Pearson's correlation coefficient was obtained. Interestingly, the relationship between apathy (AES total scores) and depressive symptoms (CSDD total scores) revealed a moderate positive correlation ($r = 0.41$; 95% CI = 0.22–0.57) (see Table 2), as well as statistical significance ($p < .001$), indicating that an increase in depressive symptoms was associated with an increase in apathy symptoms.

Table 2

Correlation Matrix of the AES, DECO, CSDD, IADL's and BADL's

Variable	1	2	3	4	5
1. AES					
2. DECO	.35** [.15, .52]				
3. CSDD	.41** [.22, .57]	.29** [.09, .47]			
4. Basic BADL	.26* [.05, .44]	.11 [-.10, .31]	.13 [-.08, .33]	.83** [.76, .89]	
5. IADL	.52** [.35, .65]	.48** [.30, .63]	.22* [.01, .40]	.94** [.92, .96]	.61** [.46, .73]

The Predictors of Apathy

Although there was no hypothesis as to which variables predicted apathy, a secondary analysis comparing how strongly depression, cognitive decline, and instrumental activities of daily living predicted the existence of apathy symptoms was valuable to our study. In order to determine which factors best predicted the occurrence of apathetic symptoms, a hierarchical multiple regression model was utilized. IADLs, DECO, and CSSD were the first and second variables in the model because they had a positive significant relationship with apathy symptoms.

The overall results depicted in table 4 show that there was a collective significant effect between instrumental daily activities (IADL), depression (CSD), cognitive decline (DECO) and apathy (AES), ($F(16.31) = 11.38$, $p < .001$, $R2 = .36$) (see table 3). Individual predictors were further examined and it was found that IADL ($t = 4.31$, $p < .001$) and CSDD

(t = 3.35, p < .001) were significant predictors of apathy. Although, DECO (t = .55, p = . 56) was not a significant predictor of apathy removing it from the model did not strengthen the model or increase the adjusted r-squared value so we kept it in the model.

Post hoc tests of Model 1 that made use of Q-Q plots, variance inflation factor (VIF) and a scatterplot of residuals vs predicted values revealed that the model did not violate any assumption of linearity, homoscedasticity, multicollinearity nor did it have any significant outliers.

Table 3

Regression results using apathy evaluation scale (AES) as the criterion.

Predictor	*b*	*b* 95% CI [LL, UL]	*beta*	*beta* 95% CI [LL,UL]	*r*	*Fit*
(Intercept)	28.21**	[23.38,33.04]				
IADL	11.85**	[6.39, 17.31]	0.43	[0.23,0.62]	.52**	
CSDD	0.68**	[0.28, 1.08]	0.30	[0.12, 0.48]	.41**	
DECO	0.07	[-0.19, 0.33]	0.06	[-0.14, 0.25]	.35**	
						R^2 = .363**
						95% CI[.19,.48]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. sr^2 represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. * indicates $p < .05$. ** indicates $p < .01$.

Predictor Variables of Depression

We hypothesized that depression scores on the CSSD would not be significantly associated with a decline in cognition on the DECO and a loss in the ability to perform IADLs. We generated a multiple regression model using depression as the outcome variable to examine this. The presence of apathy symptoms (AES) and a loss in the capacity

to carry out IADL's were the greatest predictors of depressive symptoms suggesting that a decline in cognition was not substantially linked with depressive symptoms.

As shown in table 4, the overall results of this model showed a significant effect between IADL (instrumental activities), BADL (basic activities), and AES (apathy) (F (5.81) = 5.78, p = .001, R2 = 0.13). However, further investigations of the predictor variables revealed that apathy (AES) (t = 3.55, p < .001) was the only predictor that was significant. Thus, indicating that depression was not significantly associated with a decline in IADL's (t = -0.12, p = .91).

Table 4

Regression results using depression (CSDD) as the criterion.

Predictor	*b*	*b* 95% CI [LL, UL]	*beta*	*beta* 95% CI [LL,UL*]*	*r*	*Fit*
(Intercept)	1.30	[-2.57, 5.18]				
IADL	-0.21	[-3.67, 3.26]	-0.02	[-0.30, 0.26]	.22*	
AES	0.18**	[0.08, 0.28]	0.41	[0.18, 0.64]	.41**	
Basic BADLS	0.46	[-2.91, 3.83]	0.03	[-0.21, 0.28]	.13	
						R^2 = .169**
						95% CI[.03,.29]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. sr^2 represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. * indicates $p < .05$. ** indicates $p < .01$.

Discussion

In this study, we aimed to investigate the relationship between apathy and functional and cognitive decline, as well as explore whether apathy was associated with depressive

symptoms in a sample of 90 memory clinic outpatients with reported or subjective cognitive decline. Although studies have previously explored the topic of apathy in relation to brain pathologies, very few studies have explored the association between apathy and cognitive and functional decline. This comes as a surprise, since faster rates of functional and cognitive decline may present issues relating to early admission into care facilities. As a result, potential contributing factors to this state, such as apathy, and its relationship to cognitive and functional decline should be explored.

Apathy and Functional Decline

We had hypothesized that there would be a significant positive association between apathy and functional decline, particularly in instrumental activities of daily living (IADLS) and we found a positive significant association between apathy and IADL's (Zahodne & Tremont, 2012). Moreover, as a secondary analysis, we also found that a decline in the ability to perform IADL's was a predictor of apathy symptoms. The finding that the ability to undertake instrumental activities of daily life has deteriorated in patients with apathy is consistent with the findings of other investigations (Green et al., 2021; Lechowski et al., 2009; Zhu et al., 2019). These findings could be attributed to the fact that instrumental tasks, such as efficient communication with people or participation in home duties, need a certain amount of motivation, goal-oriented behaviour, or interest, which individuals with apathy symptoms appear to lack (Cipriani et al., 2014).

On the other hand, we found no significant association between apathy and basic activities of daily living. Therefore, a decline in the ability to perform basic activities of daily living was not a predictor of the presence of apathy symptoms. The finding that apathy is more closely linked to instrumental tasks than basic activities is consistent with what other studies have found in their studies (Clarke et al., 2010; Schmidtke et al., 2008; Zahodne & Tremont, 2012). According to Mlinac and Feng (2016), fundamental actions such as eating and

drinking water are primitive needs that must be met for survival, hence patients with apathy may eat food and drink water for survival reasons even if they are not interested in the meal.

Apathy and Cognitive Decline

Furthermore, we hypothesized that there would also be a significant positive association between apathy and cognitive decline on the DECO (Clarke et al., 2010). In our study, we found no significant association between apathy symptoms and cognitive decline on the DECO. In this area, there is a lot of contradictory data about the association between apathy and cognitive decline. Palmer et al. (2011), for example, discovered that individuals with extreme apathy exhibited significant cognitive decline. Tierney et al. (2018), on the other hand found that individuals with significant apathy did not experience cognitive decline. One explanation for the difference in this area is because researchers measure cognition differently. The DECO scale, for example, was used in our study to assess cognitive deterioration, whereas other studies may employ assessments such as the Montreal Cognitive Assessment (MoCA), making it nearly impossible to compare the studies on apathy and cognitive decline. Furthermore, apathy is defined by a loss of interest and goal-directed behaviour rather than an incapacity or struggle to start or complete activities due to cognitive deterioration (Mortby et al., 2012). Moreover, the majority of apathy research is conducted on people who are already experiencing cognitive decline or mild cognitive impairment (MCI) as a result of a neurodegenerative disease such as Alzheimer's Disease or advanced age (Santangelo et al., 2014; Verlinden et al., 2014). As a result, apathy is frequently related with cognitive impairment, leading to the conclusion that apathy is linked to an increase in cognitive decline (Clarke et al., 2010).

Apathy and Depressive Symptoms

And lastly, we hypothesized that there would be a significant positive association between apathy and depressive symptoms, but that depression would not be significantly associated

with a deterioration in IADLS and cognition. We found a positive significant association between depressive symptoms and apathy. Because overlapping symptoms like anhedonia are prevalent in both major depression and apathy, this finding is not altogether unexpected (Groeneweg-Koolhoven et al., 2014; Sozeri-Varma et al., 2018). For example, questions such as lack of reactivity or loss of interest can be classified as apathetic symptoms on the Cornell Scale for Depression in Dementia, which was used to screen for depressive symptoms in our study. As a result, several researchers have identified a substantial link between depressive symptoms and apathy, comparable to ours (Chase, 2011; Mortby et al., 2012; Starkstein & Leentjens, 2008). Moreover, findings such as ours, on the other hand, are a major concern because they continue to perpetuate the underdiagnosis or misdiagnosis of apathy (Chase, 2011). This substantial link between depressive symptoms and apathy may then justify further investigation into whether apathy is associated with a clinical diagnosis of depression, and not only depressive symptoms.

Additionally, we found that an increase in depressive symptoms was not significantly associated with a decline in cognition and IADL's. This finding contradicts with that of Stogmann et al. (2015) who found that patients with depressive symptoms reported more difficulties in the ability to carry out activities of daily living. However, our finding cannot be compared to that of Stogmann et al. (2015) because we distinguished between the basic activities and instrumental activities. Moreover, Stogmann et al. (2015) did not distinguish between apathy, and depressive symptoms often overlap therefore the functional decline could have been a result of apathy symptoms.

Mortby et al. (2012) recommend that clinical dysphoric symptoms be used to distinguish depression from apathy. However, because distinguishing depression from apathy based on dysphoric symptoms might be challenging, we propose that apathy be distinguished from depression based on the presence of additional comorbidities. Depression, for example, was

not found to be associated with functional or cognitive decline in our study. Patients with apathy in our study, on the other hand, reported a decline in instrumental activities of daily life (functional decline). As a result, a patient with symptoms that are comparable to depression and apathy should be examined for functional decline to distinguish between the two.

Limitations and Future Directions

Our study presented a few limitations, which may have limited the extent to which our results could be generalised. The limitation of generalisability was two-fold in the sense that our sample size was smaller (n = 90) than what we had initially anticipated. This came as a result of access and time constraints. If this were not the case, we could have potentially coded more participants, and as a result had a large enough sample size, for our results to be generalised. The second possible limitation to generalisability was that some of the coded data dated back to 2013, therefore posing the issue of data not being relevant in a present setting, and ultimately limiting whether our results could be generalised. Another limitation to our study was only exploring an association between apathy and depressive symptoms, and not a clinical diagnosis of depression. However, this provides an area for further exploration in the future. Another limitation to our study was that we did not do a factor analysis on the DECO scale, which could have provided more insight into whether ADL items on the DECO scale associate differently to apathy than memory related items, this however leaves room for further research.

Finally, according to Schmidtke et al. (2008), patients in a memory outpatient clinic frequently have functional memory impairment, a condition in which memory loss and depressive symptoms are attributed to psychosocial burden or stress. Because we did not isolate or test for functional memory disorder in our outpatient memory clinic sample, future studies should ensure that participants do not have functional memory disorder in order to see

the true effects of apathy on cognitive and functional decline without the presence of functional memory disorder (Schmidtke et al., 2008).

Conclusion

Apathy can be a symptom of other conditions (such as depression or central nervous system disorders) or it can be a primary syndrome (Marin, 1991). Moreover, apathy has been linked to a poor prognosis, a high caregiver load, and a poor quality of life (Evensen et al., 2012). However, few research articles have looked at the link between cognitive decline and apathy, as well as the link between functional decline and apathy. The association between apathy and functional decline, as well as apathy and cognitive decline was investigated in this study. Apathy and basic activities of daily life, as well as apathy and cognitive deterioration, were shown to have no significant associations**.** On the other hand, apathy was found to be associated with depression and instrumental activities of daily living. This study adds to the little body of knowledge about apathy and its link to cognitive and functional decline. Furthermore, these findings highlight the importance of distinguishing between apathy and depression, otherwise apathy will continue to go misdiagnosed or undiagnosed. Future research is needed to draw a clear distinction between apathy and depression so that the impacts of apathy, such as functional or cognitive decline, can be explored excluding depression.

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References

Alexopoulos, G., Abrams, R., Young, R., & Shamoian, C. (1988). Use of the Cornell Scale in Nondemented Patients. *Journal Of The American Geriatrics Society*, *36*(3), 230-236. https://doi.org/10.1111/j.1532-5415.1988.tb01806.x

Bucks, R. S., Ashworth, D. L., Wilcock, G. K., & Siegfried, K. (1996). Assessment of Activities of Daily Living in dementia: Development of the Bristol Activities of Daily Living. *Age and Ageing, 25*(2), 113-120.

Carcaillon, L., Berrutp, G., Sellalm, F., Dartigues, J., Gillette, S., Pere, J., & Bourdeix, I. (2011). Diagnosis of Alzheimer's disease patients with rapid cognitive decline in clinical practice: Interest of the Deco questionnaire. *The Journal Of Nutrition, Health & Aging, 15*(5), 361-366. https://doi.org/10.1007/s12603-011-0047-z

Chase, T. (2011). Apathy in Neuropsychiatric Disease: Diagnosis, Pathophysiology, and Treatment. *Neurotoxicity Research, 19*(2), 266-278. https://doi.org/10.1007/s12640-010-9196-9

Cipriani, G., Lucetti, C., Danti, S., & Nuti, A. (2014). *Apathy and Dementia. Nosology, Assessment and Management. Journal Of Nervous & Mental Disease*, *202*(10), 718-724. https://doi.org/10.1097/nmd.0000000000000190

Clarke, D. E., Ko, J. Y., Kuhl, E. A., Van Reekum, R., Salvador, R., & Marin, R. S. (2011). Are the available apathy measures reliable and valid? A review of the psychometric evidence. *Journal of Psychosomatic Research, 70*(1), 73-97

Clarke, D., Ko, J., Lyketsos, C., Rebok, G., & Eaton, W. (2010). Apathy and cognitive and functional decline in community-dwelling older adults: results from the Baltimore

ECA longitudinal study. *International Psychogeriatrics*, *22*(5), 819-829. https://doi.org/10.1017/s1041610209991402

Delgado, M., Beer, J., Fellows, L., Huettel, S., Platt, M., Quirk, G., & Schiller, D. (2016). Viewpoints: Dialogues on the functional role of the ventromedial prefrontal cortex. *Nature Neuroscience*, *19*(12), 1545-1552. https://doi.org/10.1038/nn.4438

Evensen, J., Røssberg, J., Barder, H., Haahr, U., Hegelstad, W., & Joa, I. (2012). *Flat affect and social functioning: A 10year follow-up study of first episode psychosis patients*.

Gignac, G. E., & Szodorai, E. T. (2016). Effect size guidelines for individual differences researchers. *Personality and Individual Differences*, *102*, 74–78. https://doi.org/10.1016/j.paid.2016.06.069

Green, S. L., Gignac, G. E., Watson, P. A., Brosnan, N., Becerra, R., Pestell, C., & Weinborn, M. (2021). Apathy and Depression as Predictors of Activities of Daily Living Following Stroke and Traumatic Brain Injuries in Adults: A Meta-Analysis. *Neuropsychology Review*. Published. https://doi.org/10.1007/s11065-021-09501-8

Groeneweg-Koolhoven, I., de Waal, M., van der Weele, G., Gussekloo, J., & van der Mast, R. (2014). Quality of Life in Community-Dwelling Older Persons with Apathy. *The American Journal Of Geriatric Psychiatry*, *22*(2), 186-194. https://doi.org/10.1016/j.jagp.2012.10.024

Landes, AM., Sperry, SD., Strauss, ME., Geldmacher, DS. (2001). *Apathy in Alzheimer's disease. J Am Geriatr Soc*. 49:1700–1707.

Lechowski, L., Benoit, M., Chassagne, P., Vedel, I., Tortrat, D., Teillet, L., & Vellas, B. (2009). Persistent apathy in Alzheimer's disease as an independent factor of rapid functional decline: the REAL longitudinal cohort study. *International Journal of Geriatric Psychiatry*, *24*(4), 341–346. https://doi.org/10.1002/gps.2125

Leroi, I., Perera, N., Harbishettar, V., & Robert, P. (2014). Apathy and Emotional Blunting in Parkinson's Disease. *Brain Disorders & Therapy*, *03*(05), 1-8. https://doi.org/10.4172/2168-975x.1000141

Marin, RS. (1991). *Differential diagnosis and classification of apathy*. *Am J Psychiatry 147(1),* 22–30

Marin, R. S., & Biedrzycki, S., & Firinciogullari, S. (1991). Reliability and validity of the Apathy Evaluation Scale, *Psychiatry Research, 38,* 143-162.

Miller, D., Robert, P., Ereshefsky, L., Adler, L., Bateman, D., & Cummings, J. (2021). Diagnostic criteria for apathy in neurocognitive disorders. *Alzheimer's & Dementia*. https://doi.org/10.1002/alz.12358

Mlinac, M. E., & Feng, M. C. (2016). Assessment of Activities of Daily Living, Self-Care, and Independence. *Archives of Clinical Neuropsychology*, *31*(6), 506–516. https://doi.org/10.1093/arclin/acw049

Mortby, M., Maercker, A., & Forstmeier, S. (2012). Apathy: a separate syndrome from depression in dementia? A critical review. *Aging Clinical And Experimental Research*, *24*(4), 305 -316. https://doi.org/10.3275/8105.

Njomboro, P., Humphreys, G. W., & Deb, S. (2014). Exploring social cognition in patients with apathy following acquired brain damage. *BMC Neurology*, *14*(1). https://doi.org/10.1186/1471-2377-14-18

Palmer, K., Lupo, F., Perri, R., Salamone, G., Fadda, L., & Caltagirone, C. (2011). Predicting Disease Progression in Alzheimer's Disease: The Role of Neuropsychiatric Syndromes on Functional and Cognitive Decline. *Journal Of Alzheimer's Disease*, *24*(1), 35-45. https://doi.org/10.3233/jad-2010-101836

Ritchie, K., & Fuhrer, R. (1996). The validation of an informant screening test for irreversible cognitive decline in the elderly: performance characteristics within a general population sample. *International Journal Of Geriatric Psychiatry*, *11*(2), 149-156. https://doi.org/10.1002/(sici)1099-1166(199602)11:2<149::aid-gps298>3.0.co;2-5

Santangelo, G., Vitale, C., Trojano, L., Picillo, M., Moccia, M., & Pisano, G. (2014). Relationship between apathy and cognitive dysfunctions inde novountreated Parkinson's disease: a prospective longitudinal study. *European Journal Of Neurology*, *22*(2), 253-260. https://doi.org/10.1111/ene.12467

Schmidtke, K., Pohlmann, S., & Metternich, B. (2008). The Syndrome of Functional Memory Disorder: Definition, Etiology, and Natural Course. *The American Journal of Geriatric Psychiatry*, *16*(12), 981–988. https://doi.org/10.1097/jgp.0b013e318187ddf9

Stogmann, E., Moser, D., Klug, S., Gleiss, A., Auff, E., Dal-Bianco, P., Pusswald, G., & Lehrner, J. (2015). Activities of Daily Living and Depressive Symptoms in Patients with Subjective Cognitive Decline, Mild Cognitive Impairment, and Alzheimer's Disease. *Journal of Alzheimer's Disease*, *49*(4), 1043–1050. https://doi.org/10.3233/jad-150785

Sozeri-Varma, G., Bingol, C., Topak, O., Enli, Y., & Ozdel, O. (2018). Relationship of apathy in geriatric depression with depressive symptom severity and cognitive functions. *Archives Of Neuropsychiatry*. https://doi.org/10.29399/npa.22931

Starkstein, S., & Leentjens, A. (2008). The nosological position of apathy in clinical practice. *Journal Of Neurology, Neurosurgery & Psychiatry*, *79*(10), 1088-1092. https://doi.org/10.1136/jnnp.2007.136895

Tierney, S. M., Woods, S. P., Weinborn, M., & Bucks, R. S. (2018). Real-world implications of apathy among older adults: Independent associations with activities of daily living and quality of life. *Journal of Clinical and Experimental Neuropsychology*, *40*(9), 895–903. https://doi.org/10.1080/13803395.2018.1444736

Verlinden, V., van der Geest, J., Hofman, A., & Ikram, M. (2014). Cognition and gait show a distinct pattern of association in the general population. *Alzheimer's & Dementia*, *10*(3), 328-335. https://doi.org/10.1016/j.jalz.2013.03.009

Zahodne, L. B., & Tremont, G. (2012). Unique effects of apathy and depression signs on cognition and function in amnestic mild cognitive impairment. *International Journal of Geriatric Psychiatry*, *28*(1), 50–56. https://doi.org/10.1002/gps.3789

Zhu, C. W., Grossman, H. T., & Sano, M. (2019). Why Do They Just Sit? Apathy as a Core Symptom of Alzheimer Disease. *The American Journal of Geriatric Psychiatry*, *27*(4), 395–405. https://doi.org/10.1016/j.jagp.2018.12.013

Appendix A

Apathy Evaluation Scale Informant (AES-I)

Apathy Evaluation Scale (Informant)

Name: _____ Date: ___/___/___

Informant's Name: _____ Relationship: _____

For each statement, circle the answer that best describes the subject's thoughts, feelings, and activity in the past 4 weeks.

1. S/he is interested in things.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

2. S/he gets things done during the day.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

3. Getting things started on his/her own is important to him/her.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

4. S/he is interested in having new experiences.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

5. S/he is interested in learning new things.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

6. S/he puts little effort into anything.

NOT AL ALL	SLIGHTLY	SOMEWHAT	A LOT
(1)	(2)	(3)	(4)

7. S/he approaches life with intensity.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

8. Seeing a job through to the end is important to him/her.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

9. S/he spends time doing things that interest him/her.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

10. Someone has to tell him/her what to do each day.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(1)	(2)	(3)	(4)

11. S/he is less concerned about her/his problems than s/he should be.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(1)	(2)	(3)	(4)

12. S/he has friends.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

13. Getting together with friends is important to him/her.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

14. When something good happens, s/he gets excited.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

15. S/he has an accurate understanding of her/his problems.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

16. Getting things done during the day is important to her/him.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

17. S/he has initiative.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

18. S/he has motivation.

NOT AT ALL	SLIGHTLY	SOMEWHAT	A LOT
(4)	(3)	(2)	(1)

The Apathy Evaluation Scale was developed by Robert S. Marin, M.D. Development and validation studies are described in RS Marin, RC Biedrzycki, S Firinciogullari; "Reliability and Validity of the Apathy Evaluation Scale, "*Psychiatry Research*, 38:143-162, 1991.

Total score ☐

Appendix B

Bristol Activities of Daily Living Scale (BADLS) (modified)

N1 **Bristol Activities of Daily Living Scale (modified)**

Instruction: Circle the response that best describes the patient's level of ability to perform that activity. Only one box should be marked for each activity. Where in doubt, choose the level of ability which represents the patient's average performance over the past two weeks.

1. **Food**

a Selects and prepares food	0
b Able to prepare food only if ingredients are set out	1
c Able to prepare food only if shown step by step	2
d Unable to prepare food	3
e Not applicable	0

2. **Eating**

a Eats as previously	0
b Eats appropriately if food is made manageable and/or uses a spoon	1
c Needs someone to help guide food to mouth	2
d Needs to be fed	3
e Not applicable	0

3. **Drink**

a Able to make tea/coffee as previously	0
b Able to make tea/coffee only if ingredients are set out	1
c Able to make tea/coffee only if shown step by step	2
d Unable to make tea/coffee	3
e Not applicable	0

4. **Dressing**

a Dresses as previously	0
b Puts clothes on incorrectly or inappropriately	1
c Unable to dress self but moves limbs to assist	2
d Has to be dressed	3
e Not applicable	0

5. **Hygiene**

a Washes self as previously	0
b Able to wash self if given soap, towel and water	1
c Able to wash self but needs help	2
d Has to be washed	3
e Not applicable	0

6. **Teeth**

a Cleans teeth as previously	0
b Cleans teeth only if given water and toothpaste or gargle	1
c Able to clean teeth but needs help	2
d Unable to clean teeth	3
e Not applicable	0

7. **Toilet**

a Uses toilet as previously	0
b Able to use toilet (or bucket) if helped	1
c Incontinent of urine	2
d Incontinent of urine and faeces	3
e Not applicable	0

8. **Transfers**

a Able to get in/out of a chair as previously	0
b Able to get in a chair but needs help to get out	1
c Needs help getting in/out of a chair	2
d Has to be lifted in/out a chair	3
e Not applicable	0

9. **Mobility**

a Walks independently	0
b Walks with assistance, i.e. furniture, arm for support	1
c Uses aid to walk, i.e. cane, frame	2
d Unable to walk	3
e Not applicable	0

10. **Orientation – Time**

a Fully orientated to time/day/date, etc.	0
b Unaware of time/day/date but seems unconcerned	1
c Repeatedly asks the time/day/date	2
d Mixes up night and day	3
e Not applicable	0

11. **Orientation – Space**

a Fully orientated to surroundings	0
b Orientated to familiar surroundings only	1
c Gets lost in home, needs reminding where toilet is	2
d Does not recognise own home	3
e Not applicable	0

12. **Communication**

a Able to hold appropriate conversation	0
b Understands others and tries to respond verbally with gestures	1
c Can make self understood but has difficulty understanding others	2
d Does not respond to or communicate with others	3
e Not applicable	0

13. **Telephone**

a Uses telephone appropriately	0
b Uses telephone with help	1
c Answers telephone but does not make calls	2
d Unable/unwilling to use telephone	3
e Not applicable	0

14. **Housework/gardening**

a	Able to do housework/gardening to previous standard	0
b	Able to do housework/gardening but not to previous standard	1
c	Limited participation in housework/gardening	2
d	Unwilling/unable to participate in previous housework/gardening activities	3
e	Not applicable	0

15. **Shopping**

a	Shops to previous standard	0
b	Only able to shop for 1 or 2 items without a list	1
c	Unable to shop alone, but participates when accompanied	2
d	Unable to participate in shopping even when accompanied	3
e	Not applicable	0

16. **Finances**

a	Manages own finances as previously	0
b	Recognises money values and can sign name	1
c	Does not recognise money values but can sign name	2
d	Unable to sign name or recognise money values	3
e	Not applicable	0

17. **Transport**

a	Able to drive, cycle or use public transport independently	0
b	Unable to drive but uses public transport, bike, etc.	1
c	Unable to use public transport alone	2
d	Unable or unwilling to use public transport even when accompanied	3
e	Not applicable	0

Score: Add encircled numbers for 17 activity domains

Maximum Score: 51 [ ]

Total "not applicable" activities [ ]

Appendix C

Deteriotation Cognitive Observee (DECO)

N4 **Deterioration Cognitive Observee (DECO)**

Instruction: Say to the relative: *We would like you to tell us how your relative was a year ago. The following questions ask about a number of everyday situations. We would like you to tell us whether in these situations he/she is doing about the same, not as well, or much worse than a year ago.*

Tick the appropriate box for each item.

	Better or about the same	Not as well	Much worse
1. Does he/she remember as well as before which day of the week and which month it is?			
2. When he/she goes out of the house, does he/she know her way as well as before?			
3. Have there been changes in his/her ability to remember his/her own address or telephone number			
4. In the house, does he/she remember as well as before where things are usually kept?			
5. And when an object isn't in its usual place, is he/she capable of finding it again?			
6. In comparison with a year ago, how well is he/she able to use household appliances (washing machine, etc....)?			
7. Has his/her ability to dress or undress changed at all?			
8. How well does he/she manage his/her money, for example, doing the shopping?			
9. Apart from difficulties due to physical problems, has there been a reduction in his/her activity level?			
10. How well can he/she follow a story on television, in a book or told by someone?			
11. And writing letters for business or to friends; does he/she do this as well as a year ago?			
12. How well does he/she recall a conversation you had with him/her a few days ago? Has this changed over the past year?			
13. And if you remind him/her of this conversation, does he/she still have difficulty remembering it in comparison to a year ago?			
14. Does he/she forget what he/she wanted to say in the middle of a conversation? Has this changed over the past year?			
15. In a conversation, does he/she sometimes have difficulty finding the right word?			
16. In comparison with a year ago, how well does he/she recognize the faces of people he/she knows well?			
17. And how well does he/she remember the names of these people?			
18. In comparison with a year ago, how well does he/she remember other details concerning people he/she knows well; where they live, what they do?			
19. Over the past year, have there been changes in his/her ability to remember what has happened recently?			

M 4.4 Not done ☐ Specify .....

Appendix D

Cornell Scale for Depression in Dementia (CSDD)

N2 **Cornell Scale for Depression**

Instruction: Tick the appropriate box for each item.

	Unable to evaluate (U)	Absent (0)	Mild or intermittent (1)	Severe (2)
A. Mood-related signs				
1 Anxiety (anxious expression, ruminations, worrying)	☐	☐	☐	☐
2 Sadness (sad expression, sad voice, tearfulness)	☐	☐	☐	☐
3 Lack of reactivity to pleasant events	☐	☐	☐	☐
4 Irritability (easily annoyed, short-tempered)	☐	☐	☐	☐
B. Behavioural disturbances				
5 Agitation (restlessness, hand-wringing, hair pulling)	☐	☐	☐	☐
6 Retardation (slow movements / speech / reaction)	☐	☐	☐	☐
7 Multiple physical complaints (*score 0 if GI symptoms only*)	☐	☐	☐	☐
8 Loss of interest (less involved in usual activities; *score only if change occurred acutely, i.e. in less than one month*)	☐	☐	☐	☐
C. Physical signs				
9 Appetite loss (eating less than usual)	☐	☐	☐	☐
10 Weight loss (*score 2 if greater than 2 kilos in one month*)	☐	☐	☐	☐
11 Lack of energy (fatigues easily, unable to sustain activities; *score only if change occurred acutely, i.e. in less than one month*)	☐	☐	☐	☐

	Unable to evaluate (U)	Absent (0)	Mild or intermittent (1)	Severe (2)
D. Cyclic functions				
12 Diurnal variation of mood (symptoms worse in the morning)	☐	☐	☐	☐
13 Difficulty falling asleep (later than usual for this individual)	☐	☐	☐	☐
14 Multiple awakenings during sleep	☐	☐	☐	☐
15 Early morning awakening (earlier than usual for this individual)	☐	☐	☐	☐
E. Ideational disturbance				
16 Suicide (feels life is not worth living, has suicidal wishes, or makes suicide attempts)	☐	☐	☐	☐
17 Poor self-esteem (self-blame, self deprecation, feelings of failure)	☐	☐	☐	☐
18 Pessimism (anticipation of the worst)	☐	☐	☐	☐
19 Mood-congruent delusions (delusions of poverty, illness or loss)	☐	☐	☐	☐

☐

Score: Add the number received for each item.

Score < 6: Absence of depressive symptoms

Score >10: Probable major depression

Score >18: Definite major depression

Maximum Score: 38 ☐

Total unable to evaluate ☐

Appendix E

Letter from UCT Ethics Committee Expressing Approval

UNIVERSITY OF CAPE TOWN

Health Sciences Faculty
Research Ethics Committee
Room E52-24 Groote Schuur Hospital Old Main Building
Observatory 7925
Telephone [021] 406 6338 • Facsimile [021] 406 6411
e-mail: preaward@curie.uct.ac.za

04 April 2007

REC REF: 152/2007

Dr S Kalula
Geriatric Medicine

Dear Dr Kalula

PROJECT TITLE: APPLICATION FOR BLANKET ETHICAL APPROVAL FOR MEMORY CLINIC DATA.

Thank you for your letter to the Research Ethics Committee dated 23rd March 2007.

I have pleasure in informing you that the Ethics Committee has **formally approved** the above mentioned study.
Please inform the Committee of each study being performed.

This serves to confirm that the University of Cape Town Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP) and Declaration of Helsinki guidelines.

The Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the REC. REF in all your correspondence.

Yours sincerely

PROF M BLOCKMAN
CHAIRPERSON, HSF HUMAN ETHICS

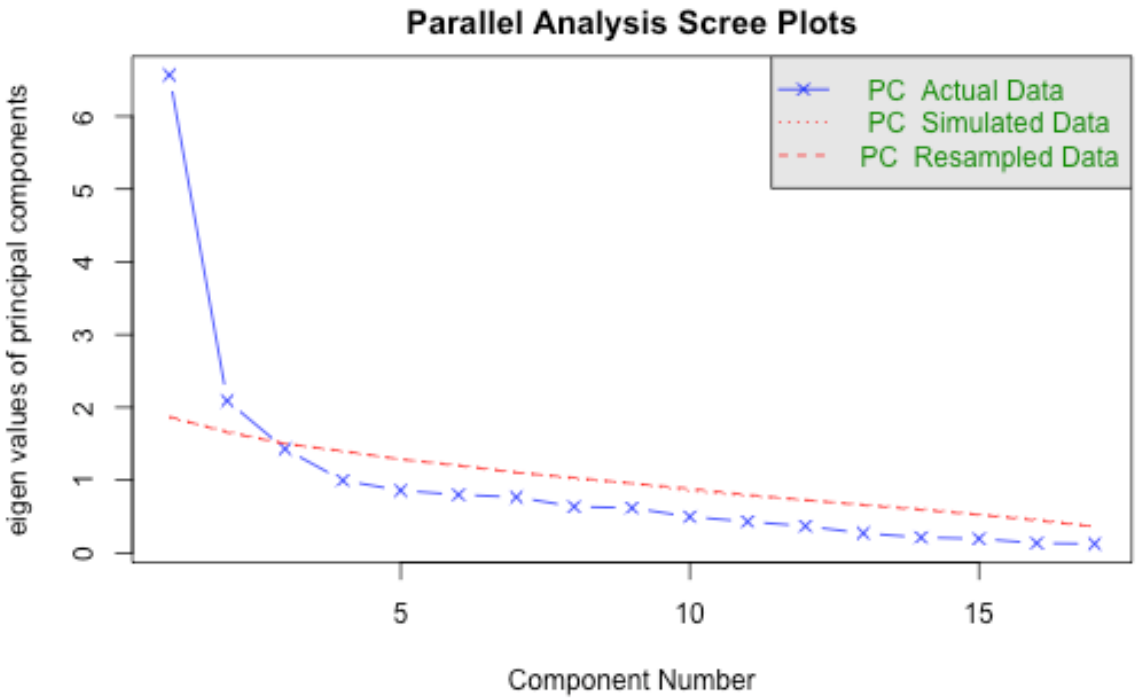
pp

lemjedi

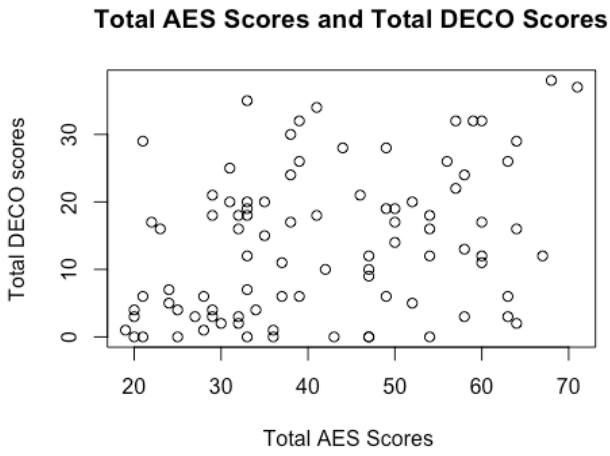
Appendix F

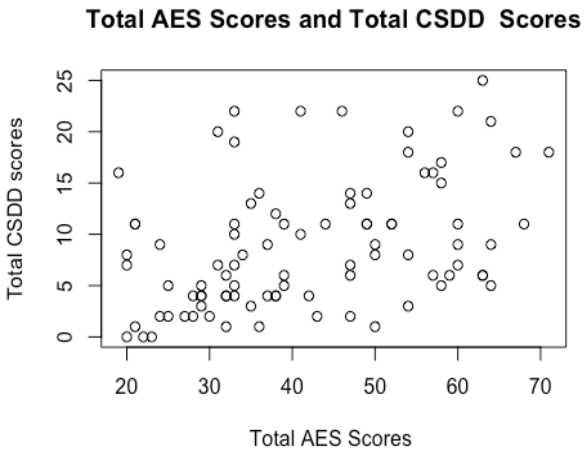
Figure 1

Horns Parallel Analysis Result



Appendix G


Total AES Scores and Total DECO Scores
Total DECO scores
0
10
20
30
20
30
40
50
60
70
Total AES Scores


Total AES Scores and Total CSDD Scores
Total CSDD scores
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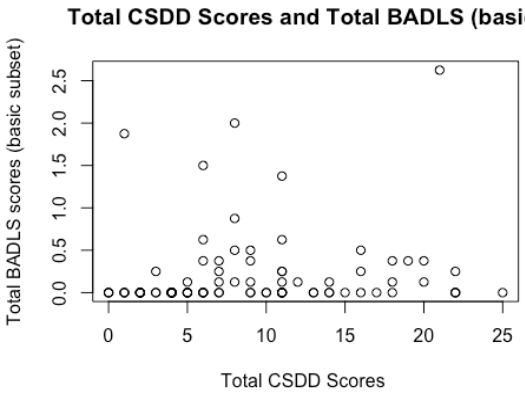
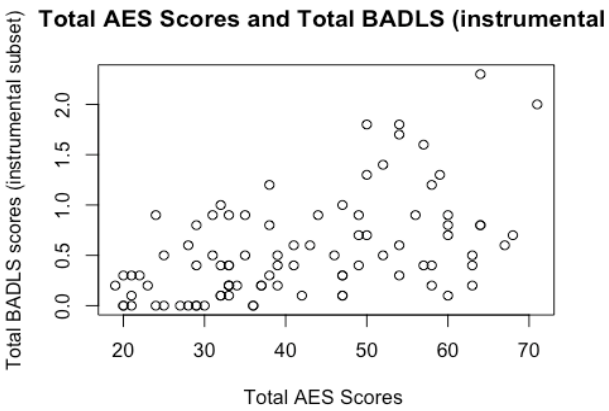
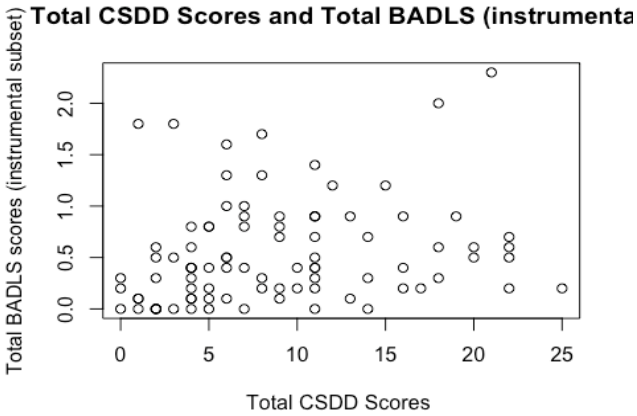
5
10
15
20
25
20
30
40
50
60
70
Total AES Scores


Total CSDD Scores and Total BADLS (basic)
Total BADLS scores (basic subset)
0.0
0.5
1.0
1.5
2.0
2.5
0
5
10
15
20
25
Total CSDD Scores


Total AES Scores and Total BADLS (instrumental
Total BADLS scores (instrumental subset)
0.0
0.5
1.0
1.5
2.0
20
30
40
50
60
70
Total AES Scores


Total CSDD Scores and Total BADLS (instrumenta
Total BADLS scores (instrumental subset)
0.0
0.5
1.0
1.5
2.0
0
5
10
15
20
25
Total CSDD Scores