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Acceptance and Commitment Therapy with Older Adults and Psychosocial Adjustment to Mild Cognitive Impairment

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Doctorate in Clinical Psychology

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DEDICATION

I dedicate this thesis to my Mum and her mastery in keeping me company during those long journeys on the M8.

ACKNOWLEDGEMENTS

I am very grateful to the participants who gave up their time to take part in this research. Thank you for being willing to share your experiences with me.

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Word count: 17,894 *(excluding abstracts, references and appendices)*

OVERVIEW TO THESIS PORTFOLIO

This thesis was completed in part fulfilment of the Doctorate in Clinical Psychology. It is divided into two chapters: chapter one is a systematic review of the literature investigating Acceptance and Commitment Therapy with older adults; and chapter two is an empirical study investigating psychosocial adjustment to mild cognitive impairment.

Both chapters are presented in journal article format.

THESIS PORTFOLIO ABSTRACT

Purpose: The systematic review summarised the research investigating Acceptance and Commitment Therapy (ACT) with older adults. The empirical study explored psychosocial adjustment patterns to a diagnosis of mild cognitive impairment, a condition characterised by memory or thinking problems.

Method: The review included 14 studies identified through database searches using predefined eligibility criteria. The empirical study employed a cross-sectional design. Thirty-five participants completed a short cognitive assessment and a series of questionnaires measuring perceptions of MCI, cognitive fusion (i.e. how caught up someone is with their thoughts), anxiety, depression and quality of life.

Results: The review found initial evidence to suggest that ACT is an acceptable and effective intervention for reducing distress in older adults. The empirical study found that threatening perceptions of MCI were more strongly related to psychosocial adjustment outcomes than objective level of cognitive impairment. The study also found evidence to suggest that cognitive fusion is associated with adjustment outcomes in an MCI population.

Conclusions: The systematic review highlights the limited, but promising evidence-base for the application of ACT with older adults. The review emphasises the need for further research with improved methodological rigor. Findings from the empirical study need to be replicated with a larger sample, however the results indicate that psychological interventions such like ACT could have utility for MCI patients with adjustment difficulties.

LAY SUMMARY

This project has two parts.

Part one is a review of research studies. The studies aimed to find out whether Acceptance and Commitment Therapy (ACT) could help older people reduce feelings of distress (e.g. anxiety or low mood) or improve physical ability. Most of the studies found that ACT could help lower distress in older people. Some of the studies found that ACT helped to improve the physical ability of older people with long-term pain. The review uncovered only a small amount of research focusing on ACT for older people. The studies did show that ACT could be used with older people living in the community and care home settings. More research is needed to work out how helpful ACT is compared to other types of therapy for older people.

Part two is a research study. It focuses on how people adjust to a diagnosis of mild cognitive impairment (MCI) (i.e. thinking or memory problems). The people who took part in the study had been diagnosed with MCI in the past three to nine months. The study found that people's beliefs about MCI influenced their quality of life and their mood. The severity of people's memory or thinking problems was found to have no influence on feelings or quality of life. The study also looked at a process linked to ACT called cognitive fusion, which is about how caught up people can get with their thoughts. The study found that cognitive fusion was related to distress levels in people adjusting to MCI. Further research is needed with more people taking part to confirm the study findings.

Chapter 1: Systematic review

Acceptance and Commitment Therapy with older adults: a systematic review of psychological and physical health outcomes

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Abstract

Background: Acceptance and Commitment Therapy (ACT) has established an evidence-base as an effective therapeutic intervention, with favourable outcomes across a range of psychological and physical health domains. There is growing interest in the application of ACT for older adults, however a broad review of the literature is lacking. The current review aims to collate the research investigating ACT with older people, appraise the methodological quality and report on the effectiveness of ACT in areas of emotional distress, psychological flexibility and physical functioning.

Method: A systematic review of the literature was conducted. Multiple databases including EMBASE, PsycINFO and MEDLINE® were searched. Reference lists of relevant papers were hand-searched and study authors were contacted for unpublished works. Eligible articles were subject to methodological quality appraisal and a narrative synthesis of the results was compiled.

Results: Fourteen studies were included in the review. Studies varied in their application of ACT (individual and group-based) across older adults with chronic pain, depression and anxiety, both in community and care home settings. Study quality was mixed and overall risk of bias was increased by virtue of poor study design and small sample sizes. Preliminary evidence suggests that ACT is an effective intervention for reducing distress in older adults, however the evidence for improving psychological flexibility and physical functioning is less conclusive.

Conclusions: The evidence-base for ACT with older adults is not yet well-established, however the reviewed studies provide valuable information regarding the clinical application of ACT across a range of problems in older adults. Preliminary evidence indicates that ACT is effective for reducing distress in older adults, however further randomised controlled trials (RCTs)

are required employing larger samples, active comparison groups and longitudinal designs.

Keywords: Acceptance and Commitment Therapy; distress; older adults; psychological flexibility; physical functioning; systematic review

Highlights

- Evidence suggests that ACT is effective for alleviating distress in older adults.
- Evidence is less conclusive for physical functioning or psychological flexibility.
- ACT demonstrates acceptability amongst older adults with chronic pain, depression and anxiety.
- Further good quality research is warranted to support the evidence-based delivery of ACT with older adults.

Abstract word count: 278

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Introduction

The UK has an ageing population and by 2046, a projected one quarter of people living in Britain will be aged 65 or over (Office for National Statistics, July 2017). By 2050, the number of 60 year olds living worldwide is projected to double (World Health Organisation, 2015). Adapting to this demographic shift requires fundamental societal change in how we perceive the ageing process and what it means to be 'old'. A common misperception is that poor mental wellbeing is an inevitable part of ageing (Law, Laidlaw & Peck, 2010), however research indicates otherwise. Evidence supports that old age is associated with increased emotional stability, resilience and improved interpersonal functioning (Scheibe & Carstensen, 2010; Charles & Carstensen, 2014).

The health and social challenges associated with ageing (e.g. chronic illness, bereavements, loneliness, frailty and cognitive impairment) can compromise the emotional wellbeing and quality of life of some older adults (Cole & Dendukuri, 2003; Luanaigh & Lawler, 2008). Prevalence of mental health problems in old age is difficult to determine due to large heterogeneity across the age range, however best estimates suggest that around 20% of community-dwelling older adults, and up to 40% of care home residents experience clinical depression (Djernes, 2006; Volkert, Schulz, Härter, Wlodarczyk, & Andreas, 2013). An estimated 10% to 17% of older people experience clinical levels of anxiety (Canuto *et al.,* 2018; Kessler *et al.,* 2005), with much higher rates amongst individuals with co-morbid physical health problems and cognitive impairment (Gould, O'Hara, Goldstein & Beaudreau, 2016). Although numbers have fallen, suicide rates remain high amongst older adults when compared to other age groups (Conwell, Duberstein & Caine, 2002). Research has extensively demonstrated the negative consequences associated with late-life anxiety and depression including increased admissions to acute hospital care, poorer outcomes for recovery and rehabilitation from physical health problems (Coventry & Gellatly, 2008), higher

likelihood of nursing home placement (Gibbons *et al*., 2002), increased suicide rates (Conwell, Duberstein & Caine, 2002; Turvey *et al.,* 2002) and accelerated cognitive decline (Cherbuin, Kim & Anstey, 2015; Mourao, Mansur, Malloy-Diniz, Castro-Costa & Diniz, 2016).

Older adults and mental health care provision

An ageing population presents a particular challenge to mental health services, which have predominantly been developed to meet the needs of working-age adults (Anderson, 2011). Specialist knowledge and skills are required to meet the often chronic and complex needs of older people, due to their experience of mental health problems over a longer life course, in addition to physical comorbidities and cognitive decline. Age discrimination, both direct and indirect, exists in mental health care provision and has been widely documented (see *'All Things Being Equal'*; Mental Health Foundation, 2009; *'Age Discrimination in Mental Health Services: Making Equality a Reality'*; Royal College of Psychiatrists, 2009), with clear assertions that people aged 65 and over are not receiving the same level or quality of care as their working-age counterparts. Ageist attitudes, age-restrictive services and a lack of specialist knowledge amongst clinicians is said to contribute to the under-recognition and treatment of psychiatric problems in later life (Beecham *et al*., 2008). The Royal College of Psychiatrists (2009) reported that an estimated 85% of people aged 65 or over with depression in the UK receive no National Health Service (NHS) treatment at all.

Older people are far more likely to be offered pharmacological rather than psychological interventions (Gum, Iser & Petkus, 2010). This is in spite of recommendations discouraging over-prescription of psychotropic medications in older people, amid concerns regarding polypharmacy and safety (Brooks & Hoblyn, 2007; Markota, Rummans, Bostwick & Lapid, 2016). Evidence suggests that psychological approaches are accepted and preferred by older adults (Gum *et al.,* 2006), whilst also demonstrating effectiveness (Chaplin,

Farquharson, Clapp & Crawford, 2015) and offering a suitable alternative or adjunct to drug treatments. Nevertheless, there are currently fewer evidence-based, psychotherapeutic treatment options recommended in national guidelines (e.g. The Scottish Government, 2005) for older-age compared to working-age adults. As response to treatment is not necessarily determined by age, the evidence-base pertaining to working-age adults could be applicable to the older-age population. Nevertheless, age specific augmentations are recommended and utilised in clinical practice to optimise psychotherapy outcomes for older people (Laidlaw & Kishita, 2015). It is therefore important to achieve equity in terms of evidence-based treatment options that match the specific needs of older people as a large, heterogeneous group, where complexity, co-morbidities, and cohort differences exist, but are not inevitable.

Cognitive Behavioural Therapy

Cognitive Behavioural Therapy (CBT) is the psychological treatment of choice for a range of emotional problems in older-age adults (The Scottish Government, 2015). Meta-analytic findings support that CBT is significantly more effective than treatment-as-usual or waiting list control conditions in treatment of late-life anxiety and depression, with comparable effect sizes to other active treatments, including pharmacological approaches (e.g. anti-depressants) and other psychotherapies (e.g. interpersonal therapy and problem solving therapy) (Cuijpers, Andersson, Donker & van Straten, 2011; Gould, Coulson & Howard 2012[a]; 2012[b]). A number of studies have also demonstrated the effectiveness of CBT for older adults with early dementia (Paukert *et al.,* 2010; Scholey & Woods, 2003), Parkinson's disease (Dobkin *et al.,* 2011) and post-stroke depression (Broomfield *et al.,* 2011). Despite positive outcomes, CBT does not outperform other psychotherapeutic approaches and with regard to treatment of anxiety, may be less effective with older compared to younger-age adults (Gould, Coulson & Howard, 2012[b]; Kishita & Laidlaw, 2017). CBT may also be sub-optimal for older chronic pain populations. A meta-analysis of 12 outcome studies investigating CBT for

chronic pain in older adults found significant improvements in self-reported pain experience, with a medium pooled effect (*z*=0.47, 95% CI 0.34 to 0.60), however found limited effects on depression symptoms, physical functioning or medication use (Lunde & Nordhus, 2009). This meta-analysis may have been limited by few randomised control trials (RCTs), however it could highlight the limited reach of CBT in addressing physical and emotional health outcomes simultaneously during a single intervention. Maximizing the therapeutic benefits of psychological treatments beyond one domain or disorder seems optimal for older people who are more likely to present with multi-morbidities (Barnett *et al.,* 2012). Given the acknowledged limitations of CBT, it is important to explore the applicability of other psychotherapeutic approaches with this population group.

Acceptance and Commitment Therapy

An alternative to traditional CBT is Acceptance and Commitment Therapy (ACT; Hayes, Strosahl & Wilson, 1999). ACT is a 'third wave' therapeutic approach emerging from research investigating the influence of language on behaviour. It is rooted in the philosophy of functional contextualism and is influenced, in part, by the ideological concepts of Relational Frame Theory (RFT: Hayes, Barnes-Holmes & Roche, 2001). ACT differs from CBT as it focuses on the function rather than the content of inner experiences (e.g. thoughts, memories, feelings). Whilst CBT aims to modify or eliminate distress, ACT utilises acceptance and mindfulness-based techniques to help individuals experience distress, rather than avoiding or fighting against it. It encourages individuals to take committed action to living a meaningful life that is in accordance with their values, in spite of personal challenges that are considered to be an inevitable part of life. Rather than targeting a specific symptom or problem, ACT more broadly aims to increase 'psychological flexibility', which is:

"The ability to contact the present moment more fully as a conscious human being, and to change or persist in behaviour, when doing so serves valued ends" (Hayes *et al*., 2006, p7).

ACT has a growing evidence-base of over 170 RCTs across a range of mental and physical health conditions (Association for Contextual Behavioural Science; ACBS, https://contextualscience.org/state_of_the_act_evidence, last accessed February 2018). Meta-analyses of RCTs have reported moderate effect sizes for ACT on primary outcome measures at post-treatment and follow-up (Ruiz, 2012). In addition, meta-analyses report favourable outcomes for ACT when compared to control conditions (A-Tjak *et al.,* 2015; Hacker, Stone & Macbeth, 2016) and comparable effect sizes when compared to traditional cognitive behavioural approaches. ACT has strong empirical support in chronic pain populations (Hughes*,* Clark, Colclough, Dale, & McMillan, 2017; Veehof, Trompetter, Bohlmeijer & Schreurs, 2016) and modest support in treatment of psychosis (Bach & Hayes, 2002; Bach, Hayes & Gallop, 2012; Gaudiano & Herbert, 2006), mixed anxiety (Bluett, Homan, Morrison, Levin & Twohig, 2014), obsessive-compulsive disorder (Bluett *et al.,* 2014) and depression (Twohig & Levin, 2017). Mediation analyses support that processes within the 'psychological flexibility' model are mechanisms of change in producing positive outcomes in ACT interventions (Ruiz, 2012).

Acceptance and Commitment Therapy with older adults

Published literature has provided a strong conceptual rationale for the application of ACT with older adults across community and care home settings (Petkus & Wetherell, 2013; Gillanders & Laidlaw, 2014). Firstly, the transdiagnostic nature of ACT means that few adaptations are required for particular problems or diagnoses. Approximately 66% of people aged 65 and over experience two or more long term conditions at any one time (e.g. chronic pain, sensory impairment, psychological problems or cognitive decline) (Barnett *et al*., 2012), and as a consequence are more likely to have symptoms which cut across diagnostic categories. ACT can therefore offer greater

flexibility in breadth of application compared to traditional psychotherapies (e.g. CBT), which tend to be symptom or disorder-focused.

Petkus and Wetherell (2013) suggest that acceptance and mindfulness techniques could have greater utility over traditional cognitive control strategies for late-life anxiety. The negative beliefs or worries older adults may hold regarding their physical health, cognitive functioning or developmental losses, although unhelpful, could be realistic. In this context, cognitive modification techniques that directly challenge the validity of thought content would be inappropriate. In contrast, ACT-based techniques would encourage older adults to 'step back' from negative cognitive content and realign focus on living in accordance with personally held values, in spite of health or social challenges. Ferssizidis *et al.* (2010) found significant associations between connection to core values and improved emotional wellbeing and quality of life in an older adult sample. Moreover, a systematic review of 15 mindfulness-based intervention (MBI) studies found evidence of both acceptability and feasibility of techniques with older adults (Geiger *et al.,* 2016). However, conclusions regarding the efficacy of MBIs were limited due to the small number of RCTs, variability in mindfulness protocols and poor methodological rigor across the studies (Geiger *et al.,* 2016).

The ACT model, in particular the focus on value-directed living, parallels with the well established Selective Optimisation and Compensation (SOC) Model of Successful Ageing (Baltes & Baltes, 1990). The SOC model endorses that older adults should select and optimise their strengths and intact capabilities, in spite of declines in functioning and/or personal losses (Baltes & Baltes, 1990). The model encourages individuals to continue to engage with valued pursuits, which are achievable and realistic, much like ACT. Interestingly, training in the SOC approach has been combined with ACT to treat chronic pain in elderly care home residents and has demonstrated both applicability and acceptability (Alonso-Fernández, López-López, Losada, González & Wetherell, 2016).

Empirical research has demonstrated associations between the core processes of the ACT 'psychological inflexibility' model and psychiatric problems in old age. Experiential avoidance has been associated with increased suicidality in late-life depression (Cukrowicz, Ekblad, Cheavens, Rosenthal & Lynch, 2008), and more generally increased anxiety and reduced mindfulness in older people (Mahoney, Segal & Coolidge, 2015). Thought suppression, a form of experiential avoidance, has been associated with increased psychopathology and somatic symptoms in homebound older people with chronic illness (Petkus, Gum & Wetherell, 2012) and poorer treatment outcomes for late-life depression (Rosenthal, Cheavens, Compton, Thorp & Lynch, 2005). In addition, Butler and Ciarrochi (2007) found greater psychological acceptance in older people to be associated with increased quality of life.

Rationale and aims of the current review

Published literature has clearly outlined the importance of developing treatment options to meet the varied psychological needs of older people. In addition, a strong theoretical rationale has been provided to support the clinical application of ACT with older populations. Previous reviews have included studies investigating ACT with older adults (Kishita, Takei & Stewart, 2017; Twohig & Levin, 2017), however a systematic review exclusively examining the outcomes of ACT with this population is lacking.

The current review aims to provide a broad overview of the literature investigating the application of ACT with older adults experiencing elevated levels of emotional distress and/or physical health problems. The methodological quality of the literature will be appraised and the current evidence-base for ACT will be evaluated. The systematic review will address whether ACT is an acceptable and effective intervention for: 1) reducing

emotional distress; 2) improving physical functioning; and 3) increasing psychological flexibility, in adults aged 60 years and over.

Methods

The review was conducted in accordance with PRISMA guidance (Moher *et al.,* 2015) and specific recommendations set out by Shenkin, Harrison, Wilkinson, Dodds & Ioannidis (2017) for systematic reviews of gerontological research. The protocol for the review was pre-registered with PROSPERO (ID: CRD42017062413) to increase transparency and reduce risk of bias.

Inclusion/ exclusion criteria

Studies were included if they: (a) described an ACT intervention with adults aged 60 years or over[1]; (b) included at least one measure of emotional distress (e.g. depression), physical functioning (e.g. pain severity) or psychological flexibility (e.g. Acceptance and Action Questionnaire (AAQ); Bond *et al.,* 2011); and (c) employed a quantitative methodology. Studies were excluded if they: (a) employed an ACT intervention that did not seek to improve psychological flexibility through at least two of the core processes (e.g. cognitive defusion or enhancing value-directed behaviour); or (b) employed an intervention that included only one component of ACT (e.g. mindfulness).

The systematic literature review broadly included all quantitative study designs. Single-n case studies and case series, with pre and post outcome data, were included based on recommendations set out by Shenkin *et al.* (2017) to increase clinical applicability. The review did not exclude studies

[1] *An age cut off of 60 years was selected based on the United Nations definition of an older adult (United Nations, 2015).*

based on comparison groups, follow-up period, sample size or publication status. No date or language restrictions were applied to the search.

Search strategy

The following electronic databases were searched between July 2017 and October 2017. EMBASE, PsycINFO, OVID MEDLINE® and Allied and Complementary Medicine (AMED) via the OVID gateway. CINAHL Plus, ERIC and AgeLine via EBSCO host. Applied Social Sciences Index and Abstracts (ASSIA), Social Services Abstracts, Sociological Abstracts and ProQuest Dissertations, and Theses Global via ProQuest. The 'Science' and 'Social Sciences and Humanities' collections of the Conference Proceedings Citation Index via Web of Science and SCOPUS.

'Grey literature' was searched via OpenGrey, Google Scholar and the British Library Electronic Theses Online System (EThOS). The reference lists of relevant papers and reviews identified via the search were also hand searched for additional studies. Research papers listed on the Association of Contextual Behaviour Science (ACBS) website were also searched. The first authors of included studies were contacted, where possible, for any unpublished works.

Search terms

Search terms were developed in consultation with an expert librarian, in addition to, the third and fourth authors (DG & AG) who have specialist knowledge of ACT and gerontology. Search terms included English, Spanish and French terms, due to the known interest in ACT within countries with these native languages.

The following terms were used:

"Acceptance and Commitment Therapy" **OR** "Third wave" **OR** "3rd wave" **OR** **"**Acceptance-based" **OR "**Acceptance based" **OR "**Contextual cognitive behavio*" **OR** "Terapia de aceptación y compromiso" OR “Traitement d'acceptation et d'engagement" **AND** "Old* adult*" **OR** "Old* people" **OR** "Elder*" **OR** "Late* life" **OR** "Old-age" **OR "**Old age" **OR "**Aged" **OR** "Over 60*" **OR** "Over 65*" **OR** "Geriatric*" **OR** "Gero*" **OR** "Adulto mayor" OR “Adulte âgé"

Data extraction and management

A data extraction tool was developed to extract key demographic and study information. The first author (KR) extracted data regarding study design, setting, participants, intervention, comparators, follow-up period, outcome measures and key findings. The second and fourth author repeated data extraction for the studies published in French (HW) and Spanish (AG) (n=2) to ensure accuracy. Any disagreements were resolved through discussion until full agreement was reached.

Where studies did not report effect sizes, the first author (KR) calculated the effect sizes from the intervention scores, if available within the publication. The first author of an included study (Wetherell *et al.,* 2016) was contacted for additional information in order to calculate effect sizes, however they were unable to meet this request.

Quality appraisal

Existing quality criteria were deemed insufficient to fully address the objectives set out by this review. A new quality assessment tool was developed *a priori* from several well-regarded checklists for assessment of intervention studies, including: Scottish Intercollegiate Guidelines Network (SIGN) Methodology Checklist for Systematic Reviews and Meta-analyses (SIGN, n.d.) and the

Downs and Black (1998) Quality Checklist for Health Care Intervention Studies.

The final checklist (Appendix B) contained thirteen items, each with a quality rating of either ‘good’, ‘fair’, ‘poor’ or ‘unsatisfactory/ unclear/ not applicable’. The thirteen items were operationalised, as far as possible, to improve clarity and reduce bias. To provide an indication of overall quality, each study was given an overall descriptive rating of ‘high’, acceptable’ or ‘low’ based on study performance across the thirteen items. The studies had to achieve 75% or more ‘good’ category ratings to achieve ‘high’ overall quality and 50% or more ‘good’ category ratings to achieve ‘acceptable’ overall quality. Studies with fewer than 50% of ‘good’ category ratings were awarded ‘low’ overall quality. The overall quality ratings were descriptive rather than numerical, in accordance with best practice guidelines (Higgins & Green, 2011).

All studies (excluding case studies) (n=8) were subject to quality assessment by the first author (KR). To improve accuracy and validity, all studies were then blindly re-rated by a second doctoral-level researcher. Inter-rater agreement was high [K=.82 (95% CI, .72-.92, p<0.05)] (Altman, 1991). Discrepancies were resolved through discussion and final ratings were agreed upon.

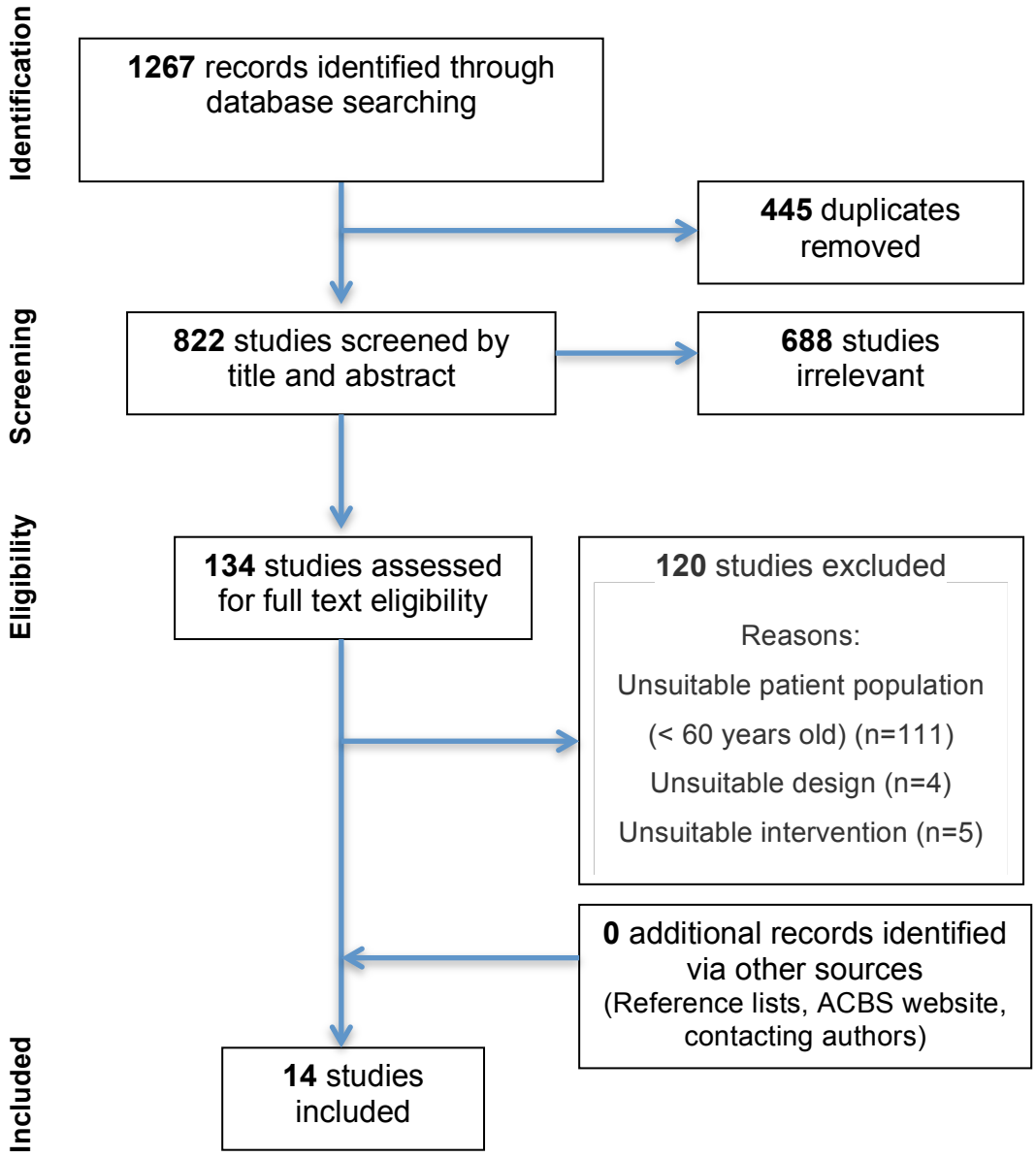
Data synthesis

A narrative synthesis of the main findings from each of the identified studies was conducted. Meta-analysis was deemed inappropriate due to the heterogeneity of the included studies in terms of study design, population, clinical setting, intervention format and primary outcome measures.

Results

A total of 1267 studies were identified from the initial database search. Once duplicates were removed (445), the title and abstract of 822 studies were reviewed for inclusion in the review. Of this, 134 publications were retrieved in full and reviewed for eligibility. No additional studies were identified via other sources (e.g. reference lists, ACBS website or following contact, where possible, with lead authors). Therefore, a total of 14 studies were eligible for inclusion in the current review (Figure A1).

Figure A1: Flow chart of screening process for systematic review.



Description of included studies

A descriptive overview of the included studies is presented in Table A1. Of the fourteen included papers, there were four RCTs (Alonso- Fernández *et al.,* 2016; Davison, Eppingstall, Runci & O'Connor, 2017; Wetherell *et al.,* 2011[a]; 2016), one non-randomised controlled trial (Alonso, López, Losada & González, 2013), three repeated measures studies (Karlin *et al.,* 2013; McCracken & Jones, 2012; Scott, Daly, Yu & McCracken, 2017), one case-series (Ruiz Sánchez, Cangas Díaz & Barbero Rubio, 2014) and five single-n case studies (Coniasse-Brioude*,* 2016; Jourdain & Dulin, 2009; Lunde & Nordhus, 2009; Petkus & Wetherell, 2013; Roberts & Sedley, 2016). The case studies did not employ experimental research designs, however they all included pre, post and follow-up, or session-by-session scores on primary outcome measures. Of the studies utilising statistical analyses (n=8), all used the appropriate analysis for the study design. In terms of comparators, two studies employed a waiting-list control (Alonso *et al.,* 2013; Davison *et al.,* 2017) and three employed active control conditions including a 'minimal support group' (Alonso-Fernández *et al.,* 2016), individual CBT (Wetherell *et al.,* 2011[a]) and group CBT (Wetherell *et al.,* 2016). Eight studies assessed outcomes at follow-up (Davison *et al.,* 2017; Lunde & Nordhus, 2009; McCracken & Jones, 2012; Roberts & Sedley 2016, Ruiz Sánchez *et al.,* 2014; Scott *et al.,* 2017; Wetherell *et al.,* 2011[a]; 2016). The average length of follow-up period ranged from 1.5 to 12 months.

Studies investigated application of ACT for a range of problems in older adults including chronic pain (Alonso *et al.,* 2013; Alonso-Fernández *et al.,* 2016; McCracken & Jones, 2012; Scott *et al.,* 2017; Wetherell *et al.,* 2016), depression (Karlin *et al.,* 2013; Ruiz Sánchez *et al.,* 2014), anxiety (generalised anxiety, fear of falling and health anxiety) (Coniasse-Brioude, 2016; Jourdain & Dulin, 2009; Wetherell *et al.,* 2011[a]) and mixed depression and anxiety (Davison *et al.,* 2017; Petkus & Wetherell, 2013; Roberts & Sedley, 2016). Ten of the studies investigated community-dwelling older adults and four investigated older people residing in care homes. All studies were

carried out in clinical, rather than university settings. The weighted mean age across the studies (excluding data from Karlin *et al.* (2013) which was not reported) was 76.6 years (range 64-87). The mean percentage of females across the studies was 57.5% (range 0% - 100%).

The ACT-based interventions varied in terms of delivery. Five studies employed group-based ACT (Alonso *et al.,* 2013; Alonso-Fernández *et al.,* 2016; McCracken & Jones, 2012; Scott *et al.,* 2017; Wetherell *et al.,* 2016) and eight studies utlised individual ACT (Coniasse-Brioude*,* 2016; Davison *et al.,* 2017; Jourdain & Dulin, 2009; Karlin *et al.,* 2013; Lunde & Nordhus, 2009; Roberts & Sedley, 2016; Ruiz Sánchez *et al.,* 2014; Petkus & Wetherell, 2011; Wetherell *et al.,* 2011[a]).

Table A1: Characteristics of included studies

Study (Year) / Country	**Design**	**% female**	**Participants / Mean age (SD)**	**Intervention arm(s) (Baseline n/ post n/ follow-up n)**	**ACT duration (total hours)**	**Follow-up period (Months)**	**Outcome measure(s)**
Randomised controlled trials							
Alonso-Fernández *et al.* (2016) Spain	RCT	78.1	Care home residents with chronic pain 83 years *(SD=6.82)*	Group ACT (53/27/-) Minimal support group (48/26/-)	9 weeks (18)	-	**Distress** GDS-30 PASS-20 **Physical functioning** BPI (severity) BPI (interference)
Davison *et al.* (2017) Australia	RCT	88	Care home residents with depression and anxiety 85.3 years *(SD=9.2)*	Individual ACT (22/20/15) Waiting list (19/15/-)	6 weeks (12)	3	**Distress** CSDD GAI-20 GDS-15
Wetherell *et al.* (2011[a]) USA	RCT	47.5	Community-dwelling with generalised anxiety 70.8 years *(SD=6.5)*	Individual ACT (11/7/7) Individual CBT (9/7/5)	12 weeks (12)	6	**Distress** HAMA PSWQ BDI-II SF-36 (mental)
Wetherell *et al.* (2016/ 2011[b]) USA	RCT	48	Community-dwelling with chronic pain 73.1 years *(SD=7.8)*	Group ACT (9/9/9) Group CBT (12/12/12)	8 weeks (12)	6	**Distress** BDI-II **Physical functioning** BPI (interference)
Controlled studies							
Alonso *et al.* (2013) Spain	Controlled study	80	Care home residents with chronic pain 87 years *(SD=2.44)*	Group ACT (7/6/-) Waiting list (7/7/-)	5 weeks (20)	-	**Distress** GDS-10 **Physical Functioning** BPI (interference) **Psychological flexibility** AAQ

Study (Year) / Country	Design	% female	Participants / Mean age (SD)	Intervention arm(s) (Baseline n/ post n/ follow-up n)	ACT duration (total hours)	Follow-up period (Months)	Outcome measure(s)
Repeated measures studies							
Karlin *et al.* (2013) USA	Repeated measures	5.3	Community-dwelling veterans with depression NR (all participants >65)	Individual ACT (76/59/-)	12 – 16 weeks (12 –16)	-	**Distress** BDI-II
McCracken & Jones (2012) UK	Repeated measures	62.5	Community-dwelling with chronic pain 64.3 years *(SD=4.7)*	Group ACT (40/40/22)	3-4 weeks (97.5-130)	3	**Distress** BCMDI PASS-20 **Physical functioning** SIP (physical) SIP (psychosocial) **Psychological flexibility** AAQ-II
Scott *et al.* (2017) UK	Repeated measures	61.7	Community-dwelling with chronic pain 69.3 years *(SD=4.2)*	Group ACT (64/60/30)	2-4 weeks (65-130)	9	**Distress** PHQ-9 SF-36 (mental) **Physical functioning** SF-36 (physical) **Psychological flexibility** AAQ-II
Case studies/ series							
Coniasse-Brioude (2016) France	Case study	100	Community dwelling with fear of falling 86 years	Individual ACT (1/1/-)	24 weeks (7.5)	-	**Distress** BAI BDI-II
Jourdain & Dulin (2009) New Zealand	Case study	0	Community-dwelling veteran with health anxiety 68 years	Individual ACT (1/1/-)	8 weeks (7)	-	**Distress** DASS HAQ PANAS

Study (Year) / Country	Design	% female	Participants / Mean age (SD)	Intervention arm(s) (Baseline n/ post n/ follow-up n)	ACT duration (total hours)	Follow-up period (Months)	Outcome measure(s)
Case studies/ series							
Lunde & Nordhus (2009) Norway	Case study	100	Community-dwelling with chronic pain 70 years	Individual ACT with CBT components (1/1/1)	8 weeks (12)	6	**Distress** BDI-II **Physical functioning** SF-MPQ **Psychological flexibility** CPAQ
Roberts & Sedley (2016) New Zealand	Case study	100	Community-dwelling with depression and generalised anxiety disorder 89 years	Individual ACT (1/1/1)	8 weeks (6)	1.5	**Distress** GDS-30 HAMA
Ruiz Sánchez *et al.* (2014) Spain	Case series	33.3	Care home residents with depression 65, 80, 83 years	Individual ACT (3/3/3)	6 weeks (4-9)	5 & 12	**Distress** GDS-30 HAM-D
Petkus & Wetherell (2013) USA	Case study	0	Community-dwelling with depression and anxiety 69 years	Individual ACT (1/1/-)	12 weeks (12)	-	**Distress** BDI

Note:
BAI; Beck Anxiety Inventory**, BCMDI**; British Columbia Major Depression Inventory, **BDI-II**; Beck Depression Inventory – 2nd Edition, **BPI**; Brief Pain Inventory, **CPAQ**; Chronic Pain Acceptance Questionnaire, **CSDD**; Cornell Scale for Depression in Dementia, **DASS;** Depression Anxiety Stress Scales, **GAI**; Geriatric Anxiety Inventory, **GDS;** Geriatric Depression Scale, **HADS**; Hospital Anxiety and Depression Scale, **HAMA**; Hamilton Anxiety Rating Scale, **HAM-D**; Hamilton Depression Scale, **HAQ**; Health Anxiety Questionnaire, **PANAS**; Positive and Negative Affect Schedule, **PASS**; Pain Anxiety Symptoms Scale, **PSWQ**; Penn State Worry Questionnaire, **PHQ-9**; Patient Health Questionnaire, **SF-36**; Short Form Self-Report Health Survey, **SF-MPQ**; Short Form McGill Pain Questionnaire, **SIP**; Sickness Impact Profile.

Quality appraisal

Methodological quality ratings for the studies (excluding case studies/ case series) are presented in Table A2. Wetherell and colleagues' (2016) study was the strongest methodologically and received a 'high' overall quality rating. Five studies were rated as having 'acceptable' overall quality (Alonso-Fernández *et al.,* 2016; Davison *et al.,* 2017; Karlin *et al.,* 2013; Scott *et al.,* 2017; Wetherell *et al.,* 2011[a]) and two studies were rated as having 'low' overall quality (Alonso *et al.,* 2013; McCracken & Jones, 2012). Performance across methodological domains was varied and will now be discussed.

Study design and sample representativeness

Four studies employed an RCT design and all achieved an overall 'high' or 'acceptable' quality rating (Alonso-Fernández *et al.,* 2016; Davison *et al.,* 2017; Wetherell *et al.,* 2011[a]; 2016). One study employed a non-randomised control trial and received the lowest overall quality rating across the studies (Alonso *et al.,* 2013). The remainder of the studies were repeated measures designs and received a mixture of 'low' (McCracken & Jones, 2012), 'adequate' (Scott *et al.,* 2017, and 'high' (Karlin *et al.,* 2013) ratings.

All eight of the appraised studies utilised convenience-sampling methods, however appropriate eligibility criteria were employed across five of the studies to ensure adequate sample representativeness (Alonso *et al.,* 2013; Alonso-Fernández *et al.,* 2016; Davison *et al.,* 2017; Karlin *et al*., 2013; Wetherell *et al.,* 2013). Two studies explicitly excluded individuals with any degree of cognitive impairment (Alonso *et al.,* 2013; Scott *et al.,* 2017), which limits generalisability to a clinical older adult population. One of the studies did not clearly report their inclusion and exclusion criteria (McCracken & Jones, 2012) and therefore it was difficult to assess whether the sample was representative.

Interventions and fidelity

All of the studies included a sufficiently detailed intervention protocol within the published text or provided a reference for the protocol, if published elsewhere. This was an area of methodological strength, with all studies achieving the highest quality ratings. Adherence to protocol was monitored via fidelity checks in several studies, including use of audio/ video recordings (Karlin *et al.,* 2013; Wetherell *et al.,* 2011[a]; 2016) and clinical supervision with an experienced ACT practitioner (Davison *et al.,* 2016; McCracken & Jones, 2012). Three studies did not report or were unclear regarding adherence to therapy protocol (Alonso *et al.,* 2013; Alonso-Fernández *et al.,* 2016; Scott *et al.,* 2017). Therapist training was adequate in six studies (Alonso *et al.,* 2013; Alonso-Fernández *et al.,* 2016; Davison *et al.,* 2016; Karlin *et al.,* 2012; Wetherell *et al.,* 2011[a]; 2016) and not clearly reported in two (McCracken & Jones, 2012; Scott *et al.,* 2017). There was variation between the studies in terms of the professionals delivering ACT including doctoral and masters level psychologists, occupational therapists and nurses.

Five studies compared ACT to an active or waiting list control condition (Alonso *et al.,* 2013; Alonso-Fernández *et al.,* 2016; Davison *et al.,* 2017; Wetherell *et al.,* 2011[a]; 2016). The active control conditions (group CBT and a minimal support group) were adequately matched in terms of length and intensity, allowing for equal comparison. Allocation to groups across the two waiting list control studies was inadequate (poor or no randomisation and investigators not blinded to allocation), however random allocation was employed in the studies with an active control.

Outcome measures

All studies included at least one outcome measure to assess psychological distress, physical functioning or psychological flexibility following ACT. All of the studies utilised self-report outcome measures shown to have good

psychometric properties with an older adult population, except for one study (McCracken & Jones, 2012), which employed the British Columbia Major Depression Inventory (BCMDI; Iverson & Remick, 2004). To our knowledge, the BCMDI has not been validated with an older adult population. Furthermore, the measure is arguably less applicable for retired older people, as it includes an item to evaluate the impact of depression symptoms on school or work.

Sample size and power

Sample sizes were small across the included studies. There were seven single-n case studies and a case series with a sample size of 3. The remainder of the studies, which underwent quality assessment, recruited sample sizes ranging from 14 to 101, with a total sample size across the studies of 385. Post-hoc power calculations were conducted and four of the studies were inadequately powered to detect medium or large effects, with a power level of 0.80 and a significance level of <0.05 (Alonso *et al.,* 2013; Alonso-Fernández *et al.,* 2016; Davison *et al.,* 2017; Wetherell *et al.,* 2011).

Attrition and acceptability

Attrition rates provide some indication of acceptability of ACT with older adults. Several studies reported attrition rates clearly, alongside reasons for treatment incompletion. Attrition was varied across the included studies from pre to post treatment, ranging from low (=<20%) (Davison *et al.,* 2017; Karlin *et al.,* 2013; McCracken & Jones, 2012, Scott *et al.,* 2017, Wetherell *et al.,* 2016), moderate (=<40%) (Alonso *et al.,* 2013; Wetherell *et al.,* 2011[a]) and high (>40%) (Alonso-Fernández *et al.,* 2016). The average attrition rate across the eight experimental studies was 17% at post treatment (range 0% to 49%) and 34% (range 0% to 54%) at follow-up (n=5). Attrition was slightly higher in care home settings (20%) than in community settings (13%), but relatively equal between individual ACT (18%) and group-based ACT interventions (17%). Reasons for treatment drop-out were clearly reported by five studies (Alonso *et al.,* 2013,

Alonso-Fernández *et al.,* 2016; Davison *et al.,* 2017; Karlin *et al.,* 2013; Wetherell *et al.,* 2011[a]) and included health problems, speech and communication issues, questionnaire completion burden, time constraints, death and symptom relief.

Table A2: Methodological quality ratings of included studies (excluding case studies/case series)

	Design	Recruitment	Power	Allocation	Equal groups	Measures	Follow-up	Protocol	Fidelity	Analyses	Attrition 1	Attrition 2	Missing data	Overall quality
Alonso *et al.* (2013)	Fair	Fair	Poor	Fair	Poor	Good	N/A	Good	Poor	Fair	Fair	N/A	Unclear	Low
Alonso-Fernández *et al.* (2016)	Good	Fair	Poor	Good	Fair	Good	N/A	Good	Poor	Good	Poor	N/A	Unclear	Acceptable
Davison *et al.* (2017)	Good	Fair	Poor	Fair	Poor	Good	Poor	Good	Fair	Good	Fair	Fair	Good	Acceptable
Karlin *et al.* (2013)	Poor	Fair	Good	N/A	N/A	Good	N/A	Good	Good	Good	Good	N/A	Good	Acceptable
McCracken & Jones (2012)	Poor	Un-clear	Fair	N/A	N/A	Fair	Poor	Good	Fair	Good	Good	Poor	Unclear	Low
Scott *et al.* (2017)	Poor	Poor	Good	N/A	N/A	Good	Fair	Good	Unclear	Good	Good	Poor	Fair	Acceptable
Wetherell *et al.* (2011[a])	Good	Fair	Unsatis factory	Good	Poor	Good	Fair	Good	Good	Poor	Fair	Fair	Unclear	Acceptable
Wetherell *et al.* (2016/ 2011[b])	Good	Poor	Un-clear*	Good	Fair	Good	Fair	Good	Good	Fair	Good	Good	Good	High

*Unable to retrieve data per age group to determine power for pre-post analysis for older adult group.
Note: See Appendix B for full quality assessment criteria.

Emerging evidence for ACT with older adults

The included studies employed ACT-based interventions with older adults to foster change in emotional distress, physical functioning and psychological flexibility. The current evidence-base for ACT when applied to each of these outcomes will now be discussed. A summary of the key findings and effect sizes are presented in Table A3 and A4.

Emotional distress

All 14 studies (including case studies/ case series) measured whether ACT had an impact on distress in older adults. Unfortunately, effect size data was unavailable for the methodologically strongest paper (Wetherell *et al.,* 2016) and accordingly will not be reported. Six of the studies found a significant reduction in measures of distress following ACT intervention, with within-group effect sizes ranging from small to large (d=0.32-0.97) at post-treatment, and from medium to large (d=0.40-1.30) across the three studies which included a follow-up period (Davison *et al.,* 2017; McCracken & Jones, 2012; Scott *et al.,* 2017). Only one study (Alonso *et al.,* 2013) observed no effect of ACT on any measure of distress, however it should be noted that the study was greatly underpowered (n=10) and received the lowest overall methodological quality rating.

Two RCTs with 'acceptable' overall quality ratings, reported between group effect sizes for distress outcome measures. Alonso-Fernández *et al.* (2016) compared an ACT group with an active control condition ('minimal support group') for care home residents with chronic pain and found significantly greater improvements on the Pain Anxiety Symptoms Scale (PASS; McCracken, Zayfert & Gross, 1992) following the ACT group (d=.45, p<0.05). This study found no significant between group effects on the Geriatric Depression Scale (GDS-30; Yesavage *et al*., 1982), however reduction in depression could have been a secondary treatment outcome in this study,

which was primarily focused on increasing pain acceptance and functional autonomy (Alonso-Fernández *et al.,* 2016).

Davison *et al.* (2017) compared individual ACT with a waiting list control condition for care home residents with anxiety and depression, and found significant between group differences on the Geriatric Depression Scale (GDS-15; Yesavage & Sheikh, 1986) (d=.66, p<0.05) and the Cornell Scale for Depression in Dementia (CSDD; Alexopoulos, Abrams, Young & Shamoian, 1988) (d=.59, p<0.05), both with medium effect sizes. The study found no significant between group differences in Geriatric Anxiety Inventory (GAI; Pachana *et al*., 2007) scores (Davison *et al*. 2017).

All six case studies found clinically significant improvements on distress measures following individual ACT-based interventions for older adults with anxiety, depression or chronic pain, except for one study (Lunde & Nordhus, 2009), which describes an intervention with a 70 year old, community-dwelling male with chronic pain. Although a small reduction on the Beck Depression Inventory (BDI-II; Beck, Steer & Brown, 1996) was noted (8 at pre-treatment to 6 at post-treatment and follow-up), his pre-treatment score was sub-clinical, thus ruling out clinically significant reductions (Lunde & Nordhus, 2009).

Psychological flexibility

Three studies investigated changes in psychological flexibility, as measured by the AAQ-II (Bond *et al.,* 2011). Two studies found no significant change in AAQ-II score following group-based ACT interventions for chronic pain (Alonso *et al.,* 2013; McCracken & Jones, 2012), however these studies both received the lowest ratings for methodological quality. In contrast, Scott *et al.* (2017) did find a significant improvement on the AAQ-II following their ACT group for community-dwelling older adults with chronic pain (d=.35, p<0.01). The intervention protocols were similar for both McCracken & Jones (2012) and Scott *et al.* (2017) studies, however the latter study was carried out in a

secondary rather than tertiary care setting, meaning the overall sample had fewer chronic pain symptoms. Furthermore, Scott *et al.* (2017) study recruited a larger sample (n=65) and had better methodological quality.

Four case studies included psychological flexibility measures including the AAQ-II and the Chronic Pain Acceptance Questionnaire (CPAQ; McCracken, Vowles & Eccleston, 2004). Three studies found improvements in AAQ-II scores following individual ACT for a range of difficulties, including health anxiety in an older veteran (Jourdain & Dulin, 2009), mixed anxiety and depression in an older community-dwelling male (Roberts & Sedley, 2016) and depression in two nursing home residents (Ruiz Sanchez *et al.* 2014). Lunde and Nordhus (2009) found improvements in pain willingness and activity engagement on CPAQ (from 65 to 77) in an older community-dwelling male with chronic pain.

Physical functioning

Five studies investigated ACT groups for chronic pain in older adults and included a measure of subjective physical functioning. Two studies (McCracken & Jones, 2012; Scott *et al.* 2017) of low and acceptable quality, found significant improvements in community-dwelling older adults' scores on the Sickness Impact Profile (SIP; Bergner, Bobbitt, Carter & Gilson, 1981) subscales (*d*=.40-.67) and the Short Form Self-Report Health Survey (SF-36 physical; Ware Jr & Sherbourne, 1992) (*d*=.50-.61), at post-treatment and follow-up. The methodologically strongest study by Wetherell *et al.* (2016) compared treatment responses to an ACT group and a CBT group for older adults (65+) with chronic pain. Treatment response was defined by a ≥30% decrease on the Brief Pain Inventory (BPI; Cleeland & Ryan, 1994) (as recommended by Farrar, Portenoy, Berlin, Kinman & Strom, 2000), and the study found a 38% greater treatment response for the ACT group compared to the CBT group at post-treatment, which increased to 42% at follow-up. Alonso-Fernández *et al.* (2016) found significantly greater improvements on the BPI 'walking ability' subscale for the ACT group when compared to a 'minimal

support group' for care home residents with chronic pain (*d*=.56, *p*<0.05). Alonso *et al.* (2013) also utilised the BPI, but found no significant within or between-group effects following an ACT group intervention, however the study was greatly underpowered (n=10) and received a 'low' overall methodological quality rating.

Lunde & Nordhus' (2009) case study detailed application of a hybrid ACT intervention with some add-on CBT components for a community-dwelling 70 year old male with chronic pain and found a clinically significant reduction in pain quality on the Short-Form McGill Pain Questionnaire (SF-MPQ; Melzack, 1987) at post-treatment and six month follow-up. However no significant reduction was found on the 'pain intensity' subscale.

Table A3: Summary of treatment effects on distress, physical functioning and psychological flexibility

Study (Year)	Measures-specific, pre-post change following intervention	Effect size (Pre-post within subjects' change)	Effect size (Pre-post between subjects' change)	Effect size Pre-follow-up change
Controlled studies				
Alonso *et al.* (2013)	**Distress** No significant change in GDS-10 from pre to post in either group and no significant between group difference. **Psychological flexibility** No significant change in AAQ-II from pre to post in either group and no significant between group difference. **Physical functioning** No significant change in BPI interference subscales from pre to post in either group and no significant between group difference.	*d*=-.69 *d*=-1.28	*d*=-.75 *d*=-1.39	N/A
Alonso-Fernández *et al.* (2016)	**Distress** Significant reduction in GDS-30 from pre to post in ACT group . No significant difference between ACT group and 'minimal support group'. Significant reduction in PASS from pre to post in ACT group. Significant between group difference **Physical functioning** No significant change in BPI severity or BPI interference scales pre to post in either group, except for the 'mood' subscale which had a significant reduction in the ACT group. Significant between group difference in 'walking ability' subscale of BPI interference.	*d*=-.32* *d*=-.46** (Mood) d=.-.44 *	*d*=-.28 *d*=-.45* (Walking ability) *d*=-.56*	N/A
Davison *et al.* (2017)	**Distress** Significant reduction in GDS-15 from pre to post in ACT group. Significant between group difference. Significant reduction in GDS-15 from pre to follow-up in ACT group Significant reduction in CSDD from pre to post in ACT group. Significant between group difference. Significant reduction in CSDD from pre to follow up in the ACT group. No significant change in GAI from pre to post, between groups or at follow up.	*d*=-.55* *d*=-.62* *d*=-.27	*d*=-.66* *d*=-.59* *d*=-.04	*d*=-.85* *d*=-1.30* *d*=-.57

Study (Year)	Measures-specific, pre-post change following intervention	Effect size (Pre-post within subjects' change)	Effect size (Pre-post between subjects' change)	Effect size Pre-follow-up change
Controlled studies				
Wetherell *et al.* (2011[a])	**Distress** No significant change in HAMA from pre to post in ACT group. Significant reduction in PSWQ from pre to post in ACT group. Significant reduction in BDI-II from pre to post in ACT group No significant change in SF-36 (mental) from pre to post in ACT group	η^2=.51 η^2=.54* η^2=.65* η^2=.41	Not reported	Not reported
Wetherell *et al.* (2016/2011[b])	**Physical functioning** Significantly more responders (≥30% reduction on BPI) in the ACT group compared to the CBT group at post-treatment (CBT=17%/ ACT=57%) and follow-up (CBT=25%/ ACT=67%). Study found that as age in years increased, the odds of response (responder ≥30% reduction on BPI) to CBT decreased (OR=0.97), but increased for ACT (OR=1.04). (Participants aged 18-89 years).	Not reported	Not reported	Not reported
Repeated measures studies				
Karlin *et al.* (2013)	**Distress** Significant reduction in BDI-II from pre to post intervention.	*d*=0.95***	N/A	N/A
McCracken & Jones (2012)	**Distress** Significant reduction in BCMDI from pre to post intervention and pre to follow-up. Significant reduction in PASS-20 from pre to post intervention and pre to follow-up. **Physical functioning** Significant reduction in SIP (Physical) from pre to post intervention and pre to follow-up. Significant reduction in SIP (Psychosocial) from pre to post intervention and pre to follow-up. **Psychological flexibility** No significant change in AAQ-II from pre to post intervention but significant increase in AAQ-II from pre to follow-up	*d*=.53** *d*=.39* *d*=.67*** *d*=.50*** *d*=.25	N/A	*d*=.62** *d*=.43*** *d*=.40** *d*=.56** *d*=0.38*

Study (Year)	Measures-specific, pre-post change following intervention	Effect size (Pre-post within subjects' change)	Effect size (Pre-post between subjects' change)	Effect size Pre-follow-up change
Repeated measures studies				
Scott *et al.* (2017)	**Distress** Significant reduction in PHQ-9 from pre to post intervention and pre to follow-up. Significant reduction in SF-36 (mental) from pre to post intervention, but effects not significant from pre to follow-up. **Physical functioning** Significant increase in SF-36 (physical) from pre to post intervention and pre to follow-up. **Psychological flexibility** Significant increase in AAQ-II from pre to post intervention, but effects not significant from pre to follow-up.	*d*=.64*** *d*=.97*** *d*=.61*** *d*=.35**	N/A	*d*=.40* *d*=.32 *d*=.50* *d*=.29

Note:
BAI; Beck Anxiety Inventory, **BCMDI**; British Columbia Major Depression Inventory, **BDI-II**; Beck Depression Inventory – 2nd Edition, **BPI**; Brief Pain Inventory, **CSDD**; Cornell Scale for Depression in Dementia, **GAI**; Geriatric Anxiety Inventory, **GDS**; Geriatric Depression Scale, **HAM-D**; Hamilton Depression Scale, **PASS**; Pain Anxiety Symptoms Scale, **PHQ-9**; Patient Health Questionnaire, **SF-36**; Short Form Self-Report Health Survey, **SIP**; Sickness Impact Profile.

*=p<0.05, **=p<0.01, ***=p<0.001

Cohen (1988) suggests the following 'rule of thumb' for interpretation: d=0.20 small effect/ d=0.50 medium effect/ d=0.80 large effect

Effect sizes were calculated at *https://www.psychometrica.de (last accessed on 21st April 2018).*

Table A4: Summary of treatment effects on distress, physical functioning and psychological flexibility (case studies/ case series)

Study (Year)	Population	Intervention	Outcomes for distress, physical functioning and psychological flexibility
Coniasse-Brioude (2016)	Community dwelling 86 year old female with fear of falling	10 sessions of individual ACT	**Distress** Clinically significant reduction in anxiety (BAI) from 'moderate-severe' range to 'normal-minimal' range. Reduction in depression score (BDI) at post-treatment, however pre-treatment score indicated minimal/ no symptoms of depression.
Jourdain & Dulin (2009)	Community dwelling 68 year old male veteran with health anxiety	7 weekly sessions of individual ACT plus 1 review session	**Distress** Clinically significant improvement in health anxiety (HAQ) from 53 'clinical' to 23 'sub-clinical' at post-treatment and 25 'sub-clinical' at 6 week follow-up. Reduction in DASS-21 subscales from 'moderate to extremely severe' to non-clinical levels at post-treatment and 6 week follow-up Clinically significant improvement in 'negative affect' (PANAS) from 47 'extremely high' to within the 'average range' (10) at post treatment and 6 week follow-up. No significant improvement in positive affect. P**sychological flexibility** Reduction in psychological inflexibility and experiential avoidance: AAQ-II score reduced from 55 to 13 at post-treatment and 30 at 6 week follow-up.
Lunde & Nordhus (2009)	Community dwelling 70 year old with chronic pain	8 weekly sessions of combined CBT and ACT	**Distress** Reduction in depression score (BDI) from 8 'minimal/ no symptoms' at pre-treatment to 6 at post-treatment and 6 month follow-up. **Physical functioning** Clinically significant improvement in pain quality (SF-MPQ) from 26 'moderate to severe' at pre-treatment to 16 at post treatment and 10 at 6 month follow-up, but no change in pain intensity. **Psychological flexibility** Improvements in pain willingness and activity engagement on CPAQ from 65 to 77, indicative of greater acceptance of pain.

Study (Country)	Population	Intervention	Outcomes for distress, physical functioning and psychological flexibility
Petkus & Wetherell (2013)	Community dwelling 69 year old with depression and anxiety	12 sessions of individual ACT	**Distress** Clinically significant reduction in depression on BDI from 31 'severe' to 18 'mild'.
Roberts & Sedley (2016)	Community dwelling 89 year old with depression and generalised anxiety	8 weekly sessions of individual ACT	**Distress** Clinically significant reduction in depression and anxiety scores: GDS-30 reduced from 16 'mild' to 7 'normal'; HADS-depression reduced from 12 'moderate' to 2 'normal'; and HADS-anxiety reduced from 8 'mild' to 1 'normal'. **Psychological flexibility** Reduction in psychological inflexibility and experiential avoidance: AAQ-II score reduced from 19 to 10.
Ruiz Sánchez *et al.* (2014)	Care home residents. 1x 65 year old male, 1x 80 year old female and 1x 83 year old female with depression	6 weekly sessions of individual ACT	**Distress** Clinically significant reduction in depression score (HAM-D) in 3/3 from pre-treatment to post-treatment and pre-treatment to 12 month follow-up. Clinically significant reduction in depression score (GDS – Spanish version) in 1/3. **Psychological flexibility** Improvement in psychological flexibility (AAQ-II) in 2/3 and decrease in psychological flexibility in 1/3.

Note:
BAI; Beck Anxiety Inventory, **BDI-II**; Beck Depression Inventory – 2nd Edition**, CPAQ**; Chronic Pain Acceptance Questionnaire**, DASS**; Depression, Anxiety, Stress Scales, **GDS**; Geriatric Depression Scale, **HADS**; Hospital Anxiety and Depression Scale, **HAM-D**; Hamilton Depression Scale, **HAQ**; Health Anxiety Questionnaire, **PANAS**; Positive and Negative Affect Schedule, **SF-MPQ**; Short Form McGill Pain Questionnaire.

Discussion

Summary of findings: the utility of ACT with older adults

The current review has synthesized the research investigating ACT with older adults and has found the application of ACT to be wide-ranging across problem areas (chronic pain, depression and varied sub-types of anxiety), populations (care home residents, community-dwellers, veterans) and outcomes (psychological distress, physical functioning and psychological flexibility). The broad scope of applications suggests workability of the ACT model for clinical use with this population group. Although the research is in its relative infancy, the published literature reflects a growing interest amongst clinicians and researchers in ACT, and how it can be utilised with older people across clinical settings. The review highlights the preliminary nature of the research in this area, with studies trialing diverse protocols across pilot and exploratory studies. Accordingly, it is difficult to reliably provide conclusions on the effectiveness or comparability of ACT to other active treatments in this population. Encouragingly, all but one reviewed study (Alonso *et al.,* 2008) found significant improvements in outcome measures of distress following ACT intervention, with moderate to large effect sizes. In addition, five case studies found clinically significant improvements in distress measures following ACT. Significant improvements were also found across some measures of physical functioning in older chronic pain populations, however only six studies including a case study, measured this outcome. Findings were even less conclusive for psychological flexibility, with two out of three studies finding no significant improvements on the AAQ-II post intervention.

Overall, it is difficult to draw firm conclusions regarding effectiveness, based on any of the three outcome areas (psychological distress, physical functioning and psychological flexibility) due to the paucity of studies, their heterogeneity, the varied methodological quality and the lack of RCTs. It is impossible to extrapolate reliably, given the study designs, whether findings are attributable to the varied ACT-based interventions or merely a consequence of placebo or regression to the mean. Furthermore, as many of the studies were

underpowered, they may have been susceptible to type II error, thus potentially not detecting effects even if they were present. This seems particularly likely in the case of Alonso and colleagues' (2013) study, which detected very large, but non-significant effects.

The majority of studies included within the review had low attrition rates, suggesting that ACT is an acceptable intervention for older adults. Nevertheless, there was considerable variability in the range of attrition rates, with one study (Alonso-Fernández *et al.,* 2016) reporting an attrition rate of almost 50%. The study investigated a 9-week, group-based ACT intervention for care home residents with chronic pain. The main reason for drop out was *'loss of interest in the study',* in addition to medical illness, problems understanding the between-session exercises and systemic issues involving other residents and staff. To increase engagement, ACT interventions delivered in care homes may need to be shorter in duration, or delivered on an individual basis to allow for specific adaptations based on residents' individual physical or cognitive abilities. Indeed, Davison *et al.* (2017) achieved superior participant retention (≤20%) with a shorter ACT protocol (over 7 weeks), delivered on an individual basis within a care home setting. Further research is warranted to determine the optimal delivery method and effectiveness of ACT in care home settings.

Limitations of reviewed studies

Overall, the main limitations of the reviewed studies included low statistical power, poor study design, a lack of matched, active control groups, insufficient follow-up periods and poor monitoring of treatment fidelity.

Some studies were also restricted in their ability to demonstrate clinically significant change following ACT due to floor effects on outcome measures. Baseline levels of distress were low prior to the intervention in these studies, thus leaving limited scope for improvement.

Implications for future research

Further research should incorporate the positive aspects of the reviewed studies in terms of intervention protocol reporting, inclusion of clinically representative samples and utilisation of outcome measures with good psychometric properties for older adults. Inclusion of objective measures of behavioural activity (e.g. pedometers) would enhance the chronic pain literature by reducing potential bias incurred via self-report measures. Other areas for improvement are evidently regarding study design, where utilisation of RCTs, with matched active controls and longer-term follow-up is necessary. Furthermore, it will be essential for studies to employ larger sample sizes as the research area grows, in order to provide more robust data regarding clinical effectiveness. This will assist in providing a more stringent evidence-base for practitioners who are already applying ACT clinically in older adult settings (e.g. Coniasse-Brioude*,* 2016; Jourdain & Dulin, 2009; Lunde & Nordhus, 2009; Petkus & Wetherell, 2013; Roberts & Sedley, 2016; Ruiz Sánchez *et al.,* 2014). An estimated 46.8 million people are living with dementia worldwide and prevalence is continuing to rise (Prince *et al*., 2015). Future research could be extended to explore utilisation of ACT for people with mild cognitive impairment or early dementia.

Future ACT case study research should focus on reporting atypical or complex older adult presentations. This would be invaluable for clinicians to assess the feasibility of ACT for older patients with psychological problems that go beyond the scope of the current evidence-base. Future case studies could also be enhanced by implementation of single case experimental design methods (Backman & Harris, 1999; Smith, 2012; Manolov & Moeyaert, 2017). By employing statistical techniques, albeit single-case, the studies would garner much richer data regarding the statistical significance of change in outcome measures across the course of an intervention.

Strengths and limitations of the current review

The current review has several limitations, which should be acknowledged. A meta-analysis could not be completed due to the limited number of RCTs per outcome area and heterogeneity between the reviewed studies in terms of design, population group and clinical setting. The current review synthesizes study data based upon three outcome areas (emotional distress, physical functioning and psychological flexibility). This approach was chosen due to the transdiagnostic nature of ACT; however grouping results based on mode of intervention delivery, clinical setting or diagnostic group, arguably may have been clearer. A third limitation relates to study quality assessment and the use of descriptive 'overall quality ratings' based upon percentage cut-off scores. This method of categorisation could be viewed as arbitrary and may over-simplify readers' interpretation of study quality. Accordingly, readers are encouraged to remain cognizant of specific ratings awarded for each of the thirteen quality domains. Finally, the current review was limited by the inability to report effect sizes for the methodologically strongest paper (Wetherell *et al*., 2016). The lead author was contacted for this data, however this request was not met.

Several strengths of the current review should also be highlighted. To the best of our knowledge, this is the first systematic review of solely ACT interventions for older adults. The review was broad-based and included English, French and Spanish papers, in addition to published case studies, which provide a useful descriptive account of the applicability of ACT for older adults within clinical settings. In addition, the quality appraisal process was conducted rigorously due to the inclusion of a second quality rater. A high level of inter-rater reliability was achieved.

Clinical implications

Although more research is required, initial evidence suggests that ACT is effective for reducing distress in older adults. The review did not uncover sufficient evidence to assess the viability of ACT as a suitable alternative to other therapeutic approaches, for example CBT, which has a more established evidence-base for late-life depression and anxiety (Gould, Coulson & Howard, 2012[a]; 2012[b]). Only two of the included studies compared ACT with a CBT control condition (Wetherell *et al.,* 2011[a], 2016) and both studies did not report the between-group effect sizes. Further research comparing the effectiveness of ACT and CBT with older adults will be required to establish the optimality of the different therapeutic approaches to support evidence-based clinical practice.

The current review highlights that ACT is not yet well established within care home settings. Further research is necessary to determine the true utility of ACT within this context, however initial findings are encouraging.

Conclusion

To the best of our knowledge, this is the first systematic review to investigate the effectiveness of ACT interventions for older adults in areas of emotional distress, physical functioning and psychological flexibility. Conclusions are restricted due to study heterogeneity, mixed methodological quality and the limited number of RCTs. The evidence-base for ACT with older adults is in its relative infancy, however the review uncovered promising initial findings. Broadly, the review suggests that ACT-based interventions are acceptable and effective for reducing distress in older adults in community and care home settings. Findings are less conclusive for physical functioning and psychological flexibility outcomes. This is likely to reflect the limited number of published studies assessing these outcomes. Further research is warranted, particularly with larger samples and improved methodological rigor.

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Chapter 2: Empirical project

Psychosocial adjustment to mild cognitive impairment: the role of illness perceptions, cognitive fusion and cognitive impairment

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Abstract

Objective: This study analyses the relative contribution of cognitive impairment, illness perceptions and cognitive fusion in influencing distress and quality of life (QoL) in older adults with mild cognitive impairment (MCI).

Method: A cross-sectional study was conducted with 35 community-dwelling older adults with MCI. All participants completed the Montreal Cognitive Assessment (MoCA) and six questionnaires measuring illness perceptions, cognitive fusion, depression, anxiety and QoL. Relationships between the variables were analysed using correlation, regression and conditional process analyses.

Results: Regression analyses indicated that illness perceptions were a stronger predictor of depression and QoL, than objective cognitive impairment. Illness perceptions did not directly predict anxiety symptoms, however cognitive fusion significantly mediated this relationship. Cognitive fusion also significantly mediated the relationship between illness perceptions and depression. Illness perceptions had a direct effect on QoL, however there was no indirect effect via cognitive fusion.

Conclusion: Illness perceptions were more strongly associated with depression and QoL in people with MCI, than severity of cognitive impairment. Greater fusion with threatening illness perceptions was significantly related to increased anxiety and depression. Psychological treatments such as Acceptance and Commitment Therapy (ACT), which target cognitive fusion, could warrant further investigation in this population.

Key words: Acceptance and Commitment Therapy; anxiety; cognitive fusion; depression; mild cognitive impairment; older adults; quality of life

Running title: Psychosocial adjustment to mild cognitive impairment

Highlights:

- Illness perceptions were found to be a stronger predictor of depression and QoL in people with MCI than objective cognitive impairment.
- Cognitive fusion significantly mediated the relationship between illness perceptions and anxiety in people with MCI.
- Cognitive fusion significantly mediated the relationship between illness perceptions and depression in people with MCI.
- Psychological interventions that directly target negative illness perceptions and cognitive fusion may reduce distress and improve QoL in people adjusting to MCI.

Abstract word count: 194

Introduction

Mild cognitive impairment (MCI) is a diagnostic classification, adopted by health professionals and researchers, to describe the intermediary state between normal cognition and early dementia (Petersen, 2004). The diagnostic term emerged in the late eighties (Reisberg *et al.,* 1988) and has become more widely utilised since the publication of Petersen and colleagues formal definition (Petersen *et al.,* 1999). Although the definition has evolved over the past decade, it is generally accepted that MCI is characterised by: (a) self or informant reported cognitive complaints; (b) objective evidence of cognitive impairment; (c) intact functional abilities; and (d) no dementia (Petersen *et al.,* 2014). Data from population studies, adopting Peterson's expanded definition of MCI, indicate that approximately 18% of older adults have MCI, with incidence rates of 47.9 (range: 21.5-71.3) per 1000 person-years (Peterson *et al.,* 2014).

People diagnosed with MCI are at increased risk of developing dementia, particularly Alzheimer's disease. Research evidence from a large meta-analysis of 41 studies suggests that annual progression rates are around 5% to 10% (Mitchell & Shiri-Feshki, 2009), however many people diagnosed with MCI experience no further cognitive decline and an estimated 16% revert back to 'normal' cognitive functioning (Koepsell & Monsell, 2012; Sachdev *et al.,* 2013). It should be noted that conversion rates vary widely between studies due to differences in study sampling procedures (e.g. memory clinics or community based studies) and variation in the operationalisation and implementation of diagnostic criteria across settings.

Limited research has focused on individual experiences of receiving an MCI diagnosis. Adjusting to MCI may be challenging, particularly given the uncertain clinical trajectory surrounding progression to dementia. Some researchers argue that an MCI diagnosis merely causes undue distress for individuals and their carers, about what may be part of a 'normal' ageing

process (Beard & Neary, 2013; Fang *et al.,* 2017; Whitehouse, 2007). This is particularly salient, given the absence of any evidence-based interventions for people diagnosed (Fang *et al.,* 2017; Karakaya, Fußer, Schroder & Pantel, 2013). Patients diagnosed with MCI are challenged with managing the practical, social and emotional consequences of living with cognitive impairment, in a context of having limited information regarding the cause or prognostic course of their difficulties.

Emergence of the MCI diagnosis has facilitated a surge of research activity regarding biomarkers for dementia and pharmacological treatments (Fitzpatrick-Lewis, Warren, Ali, Sherifali & Raina, 2015; Karakaya *et al.,* 2013), however comparatively there has been limited research investigating the psychological or social implications, such as how people adjust to the diagnosis. Addressing this research gap is important, particularly given meta-analytic findings, which suggest that anxiety and depression symptoms significantly increase risk of progression from MCI to dementia by around 18% and 25% respectively (Mourao, Mansur, Malloy-Diniz, Castro-Costa & Diniz, 2016; Li & Li, 2018). Research has also demonstrated significantly higher levels of anxiety and depression in MCI patients when compared to cognitively healthy, age-matched controls (Ismail *et al*., 2017; Mirza *et al.,* 2016).

Adjustment and the common sense model (CSM)

Variations in how people adjust psychologically to MCI could be influenced by individual beliefs or perceptions about the diagnosis. The Common Sense Model (CSM) of Self-Regulation (Leventhal, Meyer & Nerenz, 1980; Leventhal, Nerenz & Steele, 1984) offers a theoretical framework to explain diversity in individual responses to ill health and proposes that 'illness perceptions' can have a direct effect on coping behaviour and emotional wellbeing. Illness perceptions are cognitions that form in response to a health threat and include beliefs about how long the illness will last, what the consequences will be, how controllable the symptoms are via self-management or formal treatment and

what the possible causes are. The CSM has an extensive evidence-base across a range of health conditions including multiple sclerosis (Dennison, Moss-Morris & Chalder, 2009), cancer (Gillanders, Sinclair, MacLean & Jardine, 2015), diabetes (Hudson, Bundy, Coventry & Dickens, 2014) and cardiovascular conditions (Foxwell, Morley & Frizelle, 2013). Broadly, evidence supports that more negative or threat-focused appraisals of health are associated with maladaptive coping responses (e.g. avoidance or rumination), poorer physical health outcomes, increased emotional distress and reduced quality of life (QoL) (Dempster, Howell & McCorry, 2015; Hagger & Orbell, 2003; Hagger, Koch, Chatzisarantis & Orbell, 2017; O'Donovan, Painter, Lowe, Robinson & Broadbent, 2016). Furthermore, studies in populations with rheumatoid arthritis, chronic pain and multiple sclerosis have found that illness perceptions have greater predictive value than objective disability level in determining adjustment outcomes (Groarke, Curtis, Coughlan & Gsel, 2004; Severeijins, Vlaeyen, van den Hout & Weber, 2001; Spain, Tubridy, Kilpatrick, Adams & Holmes, 2007).

Individual perceptions of MCI have been studied outwith the framework of the CSM in several qualitative studies, which have identified a possible tension between worry and relief when diagnosed with MCI (Dean & Wilcock, 2012; Gomersall *et al.,* 2015; 2017; Meilak, Partridge, Willis & Dhesi, 2016). Commonly identified themes across qualitative studies include: uncertainty about the future; ambiguity about the MCI diagnosis; fears of progression to dementia; and relief following memory assessment that the outcome is MCI and not Alzheimer's disease (Beard & Neary, 2013; Dean & Wilcock, 2012; Frank *et al.,* 2006; Gomersall *et al.,* 2015; 2017; Meilak *et al*., 2016). This research has been extended by a small number of quantitative studies, which have directly explored the influence of illness perceptions on coping and emotional responses in an MCI population. Lin and Heidrich (2012) explored the relationship between illness perceptions and coping behaviour in 63 older adults with MCI and found significant associations between perceptions of MCI, self-reported symptoms and coping. Lin, Gleason and Heidrich (2012)

found no significant association between illness perceptions and distress in 30 MCI patients, when utilising the same measure of illness perception, the Illness Perception Questionnaire – Mild Cognitive impairment (IPQ-MCI) (Lin *et al*., 2012), however this study was greatly limited by their recruitment of a small homogeneous sample of predominantly well-educated males who had been diagnosed with MCI on average two years prior to taking part in the study. Thus, potentially not capturing the adjustment period following diagnosis.

In contrast, Stevenson, Gillanders, Ferreira and Gilroy (2014) found perceptions regarding the consequences and emotional impact of MCI (as measured by the IPQ-MCI) to be associated with depression and anxiety symptoms in their sample of 19 older adults with the condition. However no association was found between perceptions of MCI and QoL in their sample (Stevenson *et al.,* 2014). Stevenson and colleagues (2014) do provide some partial evidence to support the CSM with an MCI population, however only tentative conclusions could be drawn from this study, as a result of the small sample size.

Currently, the evidence-base for the applicability of the CSM to adjustment processes in people with MCI is equivocal. This could be attributed to the limited number of studies with relatively small samples sizes, or it could be the case that the CSM does not provide a robust enough framework to conceptualise the psychological processes involved in adjustment to this condition.

Acceptance and Commitment Therapy: the role of cognitive fusion

Acceptance and Commitment Therapy (ACT; Hayes, Strosahl & Wilson, 1999; 2012) offers an alternative perspective regarding the processes involved in adjustment to a health condition. While the CSM places emphasis on the content of an individual's beliefs or perceptions about their health, the ACT model would propose that how one relates to internal experiences (e.g.

symptoms and their appraisal), independent of content or form, is more salient. Six inter-related processes comprise the ACT model of psychological flexibility. It is conceptualised as the present-moment, non-judgmental acceptance of unwanted internal experiences, that may otherwise by ruminated over or suppressed, to allow for flexible and committed behaviour, consistent with personal values (Hayes, Strosahl & Wilson, 2012). Adjusting to MCI may therefore be influenced by different processes, which are central to ACT, but are not considered within the CSM. The current study is interested in the ACT process of cognitive fusion, and the inverse cognitive defusion, which has conceptual overlap with meta-cognitive awareness (Teasdale *et al.,* 2002) and decentering (Safran & Segal, 1990) in mindfulness literature and practice. Cognitive fusion describes the process of becoming excessively caught up or entangled with internal experiences (e.g. thoughts, bodily symptoms), to the extent that it can control or overly regulate behaviour (Gillanders *et al.,* 2014). Studies indicate that cognitive fusion is a significant predictor of psychological distress and QoL in a range of health conditions including multiple sclerosis (Ferenbach, Gillanders & Harper, 2011), chronic pain (McCracken & Vowes, 2014) and cancer (Gillanders *et al.,* 2015). To date, there have been no studies investigating the role of cognitive fusion in adjustment to MCI.

Study aims and hypotheses

The current study aims to investigate the relative influence of illness perceptions and cognitive impairment on levels of distress and QoL in people diagnosed with MCI within the past three to nine months. The study also examines whether cognitive fusion has a mediating role in relationships between predictor (illness perceptions and cognitive impairment) and outcome variables (anxiety, depression and QoL).

The study aims to provide information for health care professionals regarding the factors involved in patient adjustment to MCI. This could assist with development of assessment and early intervention procedures for patients with increased distress or reduced life satisfaction following diagnosis.

It was hypothesized that:

(1) Increased perceptions of MCI as threatening and greater cognitive impairment will be significantly associated with increased distress (anxiety and depression) and reduced QoL.

(2) Illness perceptions will significantly predict, and account for greater variance in psychosocial variables (depression, anxiety and QoL) than level of cognitive impairment.

(3) Cognitive fusion will significantly mediate the relationship between threat appraisals and psychosocial variables (depression, anxiety and QoL).

(4) Cognitive fusion will significantly mediate the relationship between cognitive impairment and psychosocial variables (depression anxiety and QoL).

Methods

Design

The study was cross-sectional and adopted a questionnaire design to explore the possible inter-relationships between the following variables: perceptions of MCI, cognitive impairment, cognitive fusion, anxiety, depression and QoL. A group of older adults registered with the Patient and Public Advisory Service (ACCORD: http://accord.scot/public-access-patient-and-public-involvement/patient-and-public-advisory-service, last accessed on 26th April 2018) were involved in the design of the study.

Ethics

Ethical approval was granted from the South of Scotland Research Ethics Committee (reference: 16/SS/0215), NHS Lothian and NHS Lanarkshire

Research and Development (R&D) (reference: 2016/0320 and L17015) and The University of Edinburgh, School of Health in Social Science. Ethical approval documentation is included in Appendix D.

Statistical power and sample size

Power calculations were carried out *a-priori* to determine the minimum sample size required for correlation, regression and conditional process analyses (Hayes, 2013).

G*power (version 3.1) (Faul, Erdfelder, Buchner & Lang, 2009) was used to calculate sample size estimates for correlation analysis to detect medium and large effect sizes, with a power of 0.80 and an alpha of <0.05. Estimates were n=67 to detect medium effects and n=23 to detect large effects.

To estimate sample size for multiple regression analysis, Green (1991) proposes the formula '50+8*m*' (where *m* equates to the number of predictors). As the study employs two predictor variables (threat appraisal and cognitive impairment), the formula suggests a sample of at least n=66 to establish the overall fit of the regression model, with a power of 0.80 and an alpha of <0.05. In order to compare the two predictor variables, Green (1991) proposes the formula '104+*m*', which suggests a sample size of at least n=106, with a power of 0.80 and an alpha of 0.05.

For conditional process analysis (Hayes, 2013), Fritz and MacKinnon (2007) provide 'rule of thumb' sample size estimates for simple mediation analyses, utilising a bootstrapping approach. Fritz and MacKinnon (2007) recommend that sample size should be based on the magnitude of the expected effects for the *'a'* and *'b'*, indirect pathway in the mediation model. As previous research has found medium to large effects (Ferenbach *et al.,* 2011; Gillanders *et al.,* 2015; Graham, Gouick, Ferreira & Gillanders, 2016; Scott, Daly, Yu & McCracken, 2017; Solé *et al.,* 2015; Scott *et al.,* 2017; Stevenson *et al*., 2014)

with comparable populations, Fritz and Mackinnon (2007) suggest a sample size of 54 to detect medium effects and 34 to detect large effects.

In order to be adequately powered for the most conservative analyses, the study needed to recruit a sample of 106 participants.

Participants

Participants were eligible to take part if they had received a diagnosis of MCI according to ICD-10 criteria (World Health Organisation, 1992) in the last three to nine months, were aged sixty years or over, were fluent in English and were deemed to have capacity to consent to taking part. Participants were excluded if they resided in a care home, had a significant physical or mental health problems (e.g. Parkinson's disease or schizophrenia), significant sensory impairment, a history of pre-morbid cognitive difficulties, stroke or brain injury, and past or present substance misuse. Participants were not eligible to take part if their score on the Montreal Cognitive Assessment (MoCA; Nasreddine *et al*., 2005) fell below the threshold for MCI (<18), suggestive of greater cognitive impairment (Freitas, Simões, Alves & Santana, 2013).

Measures

Participants completed the following measures:

(1) Demographic questionnaire (see Appendix E)

A short self-report questionnaire asking participants to provide the following demographic data: age; gender; marital status; educational attainment (years); length of time since diagnosis; onset of cognitive difficulties (months); previous or current occupation; and age at retirement, if applicable.

(2) Montreal Cognitive Assessment (MoCA; Nasreddine *et al*., 2005)

The MoCA is a cognitive screening tool assessing several domains of cognition including: memory; language skills; visuospatial abilities; and executive functioning. Validation studies suggest that the MoCA has high test-retest reliability, good internal consistency (Cronbach's α = 0.83) and adequate levels of sensitivity (90%) and specificity (87%) for detecting MCI (Nasreddine *et al.,* 2005). The maximum MoCA score is 30 and scores between 26 and 18 are clinically indicative of MCI (Nasreddine *et al.,* 2005).

(3) Geriatric Depression Scale – 5 (Hoyl *et al*., 1999)

The GDS-5 is a five item, self-report measure of depression intended for use with older adults (aged 60+). It has demonstrated greater sensitivity (.97) and specificity (.85) than the longer fifteen-item version (GDS-15; Yesavage & Sheikh, 1986) and has been successfully administered to MCI patients in previous studies (Lin, Gleason & Heidrich, 2012; Stevenson *et al.,* 2014). A score greater than 2 out of 5 is indicative of clinical levels of depression (Hoyl *et al.,* 1999).

(4) Geriatric Anxiety Inventory – Short Form (GAI-SF; Byrne & Pachana, 2011)

The GAI-SF is a five item, self report measure of anxiety intended for use with older adults (aged 60+). The measure is adapted from the original twenty-item GAI (Pachana *et al.,* 2007). The GAI-SF has been shown to have adequate sensitivity (.75) and internal consistency (Cronbach's α=0.71), and good specificity (.87) in a community-dwelling older adult sample (Byrne & Pachana, 2011; Johnco, Knight, Tadic & Wuthrich, 2015). The GAI-SF has been administered successfully with an MCI population (Stevenson *et al.,* 2014) and a sample of memory clinic attendees (Byrne, Pachana, Arnold, Chalk & Appadurai, 2008). A score greater than 3 out of 5 is indicative of clinical levels of anxiety (Byrne & Pachana, 2011).

(5) Illness Perception Questionnaires – Mild Cognitive Impairment (IPQ-MCI; Lin *et al*., 2012)

The IPQ-MCI is measure of illness perceptions intended for use with an MCI population. It is based on the Illness Perception Questionnaire-Revised (IPQ-R; Moss-Morris *et al.,* 2002), which is a broad-based measure of illness perceptions that can be utilised across a range of health conditions. The IPQ-MCI has nine subscales: identity; cause; consequences; chronic timeline; cyclic; personal control; treatment control; coherence; and emotional representation. The cause subscale was omitted in this study to reduce respondent burden and because the qualitative interpretation did not fit with the planned analyses. Broadbent (2006) proposes that an overall 'illness threat' score can be computed for the brief version of the IPQ by adding the identity, chronic timeline, consequence and emotional representation subscale scores with the reverse scores for the personal control, treatment control and coherence scales. Higher scores are considered to be indicative of a more threatening perception of illness. The IPQ-MCI has been validated with an MCI population and demonstrates adequate internal consistency (Cronbach's *α* ranging from .62 to .86) (Lin *et al.,* 2012; Lin & Heidrich, 2012).

(6) Cognitive Fusion Questionnaire (CFQ; Gillanders *et al*., 2014)

The CFQ is a seven item, self-report questionnaire measuring cognitive fusion. Research has shown the scale is reliable (Cronbach α =.88-.93) and has good concurrent validity, as demonstrated by its correlation with other established measures of ACT constructs (e.g. Acceptance and Action Questionnaire; AAQ-II; Bond *et al.,* 2011 and Valued Living Questionnaire; VLQ, Wilson, Sandoz, Kitchens & Roberts, 2010). The CFQ has not been validated with an MCI population, however research has demonstrated cognitive fusion, as measured by the CFQ, to be a good predictor of anxiety, depression and QoL in people with other health conditions including multiple sclerosis (Gillanders *et al.,* 2014; Valvano *et al.,* 2016) and cancer (Gillanders *et al.,* 2015). The CFQ has also

demonstrated adequate internal consistency in an older adult population with chronic pain (Cronbach's *α*=.74) (Scott *et al.,* 2017)

(7) Quality of Life in Alzheimer's Disease (QoL-AD; Logsdon, Gibbons, McCurry & Teri, 2002)

The QoL-AD is a 13 item, self-report measure designed specifically to assess QoL in people with Alzheimer's disease. The QoL-AD asks respondents to rate on a four point Likert scale from 'poor' to 'excellent', their subjective QoL across broad domains such as financial situation, physical health and family. Although the measure was developed for individuals with Alzheimer's disease, rather than MCI, it was selected for use in the current study as it incorporates a memory item and has a simple format deemed potentially less challenging for individuals with compromised cognition. In addition, the QoL-AD has demonstrated good concurrent validity and internal reliability (Cronbach's α=.90) when administered to individuals with MCI (Tatsumi, Yamamoto, Nakaaki, Hadano & Narumoto, 2011).

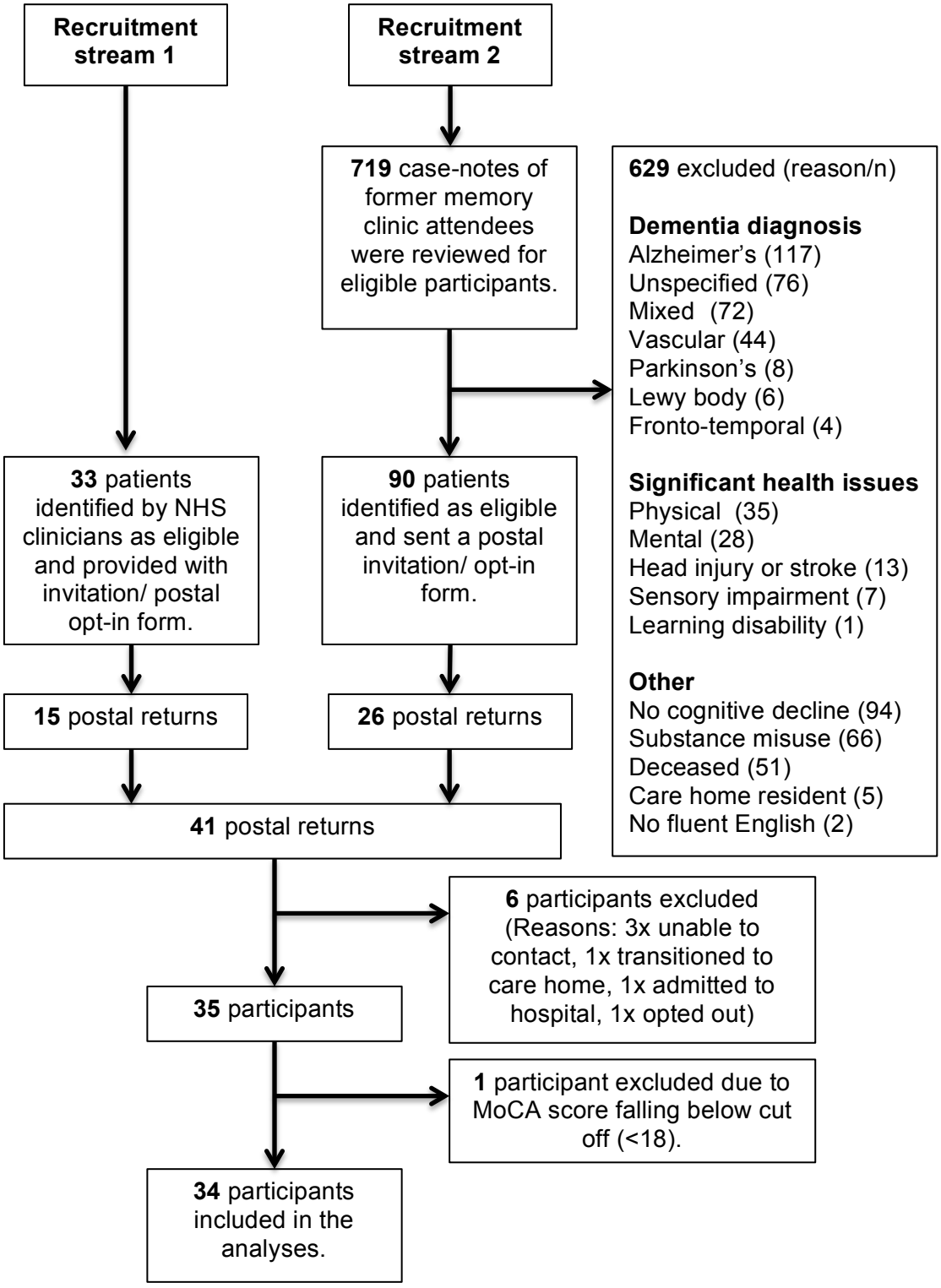
Recruitment

Thirty-five participants were recruited from six National Health Service (NHS) Memory Clinics and a Specialist Old Age Psychology Service between March 2017 and February 2018. Participants were either identified directly by a National Health Service (NHS) clinician (Consultant Psychiatrist or Clinical Psychologist) involved in the assessment of their memory difficulties, or indirectly identified following a case-note review of former memory clinic attendee notes, which was carried out by the first author (KR). Figure B1 illustrates the two recruitment streams. All participants were sent a participant information sheet (Appendix F) in the post and were required to return an opt-in slip in a stamped addressed envelope if they were interested in taking part. NHS clinicians identified 33 eligible patients and 15 returned opt-in slips, equating to a 45% return rate. Ninety patients were identified as eligible

following case-note review and 26 returned opt-in slips, equating to a lower return rate of 29%. The overall return rate was 34%.

Postal returns were received for 41 participants. Five were excluded for the following reasons: significant physical health problem (n=1); no longer fulfilling the eligibility criteria (n=1); and administrative issues (n=3). Another participant decided they no longer wished to take part. Thirty-five participants took part in the study, however data for one participant was excluded as they received a below threshold score on the MoCA for MCI (<18) (Nasreddine *et al.,* 2005). Henceforth, the data for 34 participants is reported.

Figure B1: Process of recruitment



Procedure

Participants met with the first author (KR), a doctoral student in Clinical Psychology, to complete a cognitive assessment (MoCA), a series of six outcome measures and a short demographic questionnaire. All participants were asked to provide their informed consent prior to commencement of the study. All participants were administered the assessment measures in the same order (MoCA, GDS-5, GAI-SF, IPQ-MCI, CFQ and QoL-AD). Participants completed the study during a single appointment lasting approximately one hour at a hospital, health centre location or in their own homes. Home visits were made available to participants who had health issues compromising their ability to travel.

Data analysis

Preliminary analyses were carried out to screen the data and to ensure that statistical assumptions were met for correlation and regression analyses. Conditional process analysis does not require assumption testing, due to the robust nature of the bootstrapping method (Fritz and MacKinnon, 2007).

All variables met the assumption of normality, except for GAI-SF, GDS-5 and IPQ-MCI subscales, chronic timeline and treatment control. Transformations (square root and logarithmic) were conducted and resulted in a marked improvement in normality (see Appendix G). There were no violations of linearity, homoscedasticity or multi-collinearity. Presence of outliers was assessed visually using histograms and statistically using the Mahalanobi's distance statistic. No significant outliers were identified. Little's missing completely at random (MCAR) test was employed to detect missing data. Results indicated that data was not missing at random. Non-random missing data was identified for the 'marriage' item on the QoL-AD measure, due to a proportion of participants being single or widowed (n=10). In this circumstance, a total adjusted QoL-AD score was calculated, omitting the 'marriage' item.

A simultaneous 'forced entry' method of regression was selected to analyse the relative contribution of the independent predictor variables (threat appraisals and cognitive impairment) on anxiety, depression and QoL outcome variables. A simultaneous regression was selected, over and above stepwise methods due to concerns highlighted by Field (2013), which suggest that stepwise methods can be sub-optimal for theoretically derived models. Furthermore, stepwise methods are constrained in their ability to manage random variation in the data, often resulting in models that are not generalisable to other samples (Field, 2013, p. 213). Hierarchical regression was also deemed unsuitable to address the study aim of comparing the unique explanatory power of the predictors on the outcome variables. Hierarchical regression would require the predictors to be entered one at a time, based upon evidence from prior research and theory, which is less conclusive for this population.

The bootstrapping method of simple mediation analysis (Hayes, 2013) was selected for conditional process analyses, as opposed to The Sobel Test (Sobel, 1982) or the Baron and Kenny (1986) approach, as it is considered to be a robust method of analysis in circumstances where sample size is small and data is non-parametric (Fritz and MacKinnon, 2007; MacKinnon *et al.,* 2002).

All statistical analyses were conducted using IBM Statistical Package for Social Science (SPSS) version 24. The PROCESS macro for SPSS developed by Hayes (2013) was used to conduct simple mediation analyses (model 4) using 5000 bootstrap resamples.

Results

Sample characteristics

Descriptive statistics were computed for all study variables and are presented in Table B1 and B2. Of the 34 participants included in the study, 47% were female and 53% were male. The mean age of participants was 76.4 years (range 62-90). Eighty-two percent of the sample was retired and the mean age at retirement (n=27) was 62.7 years (range 45-77). The majority of the sample were married (67.6%), with smaller numbers widowed (20.6%), single (8.8%) or divorced (2.9%). The average number of years in education across the sample was 14.3 years (*SD*=3.7).

Time since onset of cognitive problems was varied across the sample: 11.8% reported onset within the last year; 38.3% within the last one to three years, 32.3% within the last three to five years; and 17.6% reported onset of problems more than five years ago. The mean MoCA score was 21.9, which is in line with normative data from a comparable population (Nasreddine *et al.,* 2005). All participants were diagnosed with MCI in the past three to nine months (*M*=5.3, *SD*=2.2).

Distress and quality of life

Participants scored, on average, slightly higher for anxiety (*M*=1.8, range 0-5) than depression (*M*=1.1, range 0-5). Across the sample, 21% were experiencing clinical levels of anxiety and 12% were experiencing clinical levels of depression. Participant scores on the CFQ (*M*=18.8) suggest that the overall sample was relatively defused from thought content, however there was variability across the sample with scores ranging from 7 to 40, with higher scores indicating greater fusion. The mean QoL score (39 out of 52) indicates that overall, the sample perceived their QoL to be ‘good’ or ‘excellent’,

however individual scores ranged more widely from 24 to 50, indicative of greater variability in life satisfaction across the sample.

Table B1: Descriptive statistics for the study sample

Characteristic	**Mean (*SD*)**
Age	76.4 (7.8)
Education (years)	14.3 (3.7)
MoCA score	21.9 (3.1)
Months since MCI diagnosis	5.3 (2.1)
Age at retirement (n=28)	62.7 (6.5)
	N (%)
Female	16 (47)
Retired	28 (82)
Marital status	
Married	23 (67.6)
Divorced	1 (2.9)
Single	3 (8.8)
Widowed	7 (20.6)
Onset of cognitive problems (years)	
<1	4 (11.8)
1 - 3	13 (38.8)
3 - 5	11 (32.3)
5+	6 (17.6)

Note: MoCA: Montreal Cognitive Assessment (Nasreddine *et al.,* 2005)
SD= standard deviation

Table B2: Descriptive statistics for independent, mediator and outcome variables with comparative normative data

	Current sample (n=34)				**Comparative data**	
	Max possible score	Min	Max	Mean (*SD*)	N	Mean (*SD*)
Independent						
MoCA	30	18	29	21.9 (3.1)	94	22 (6.1)[a]
IPQ-MCI*						
Identity	27	1.0	18	7.0 (4.3)	63	7.0 (4.3)[b]
Chronic timeline	5	2.2	5.0	4.2 (0.8)	63	3.8 (0.7)[b]
Consequences	5	1.7	4.6	3.1 (0.7)	63	3.2 (0.7)[b]
Personal control	5	1.0	4.2	3.1 (0.8)	63	2.6 (0.7)[b]
Treatment control	5	1.2	3.8	3.0 (0.5)	63	2.7 (0.6)[b]
Coherence	5	1.0	4.6	2.9 (1.0)	63	2.8 (0.9)[b]
Cyclic	5	1.0	4.3	2.4 (0.9)	63	2.8 (0.7)[b]
Emotional represenations	5	1.0	4.4	2.5 (0.9)	63	2.8 (0.7)[b]
Mediator						
CFQ	49	7	40	18.8 (9.8)	191	19.9 (9.6)[c]
Outcome						
GDS-5	5	0	5	1.1 (1.2)	30	1.6 (1.4)[d]
GAI-SF	5	0	5	1.8 (1.6)	22	1.1 (2.3)[e]
QoL-AD	52	24	50	39.3 (6.4)	50	32.1(6.9)[f]

Note: SD= standard deviation. *IPQ-MCI scores are adjusted mean scores (sum of scale items divided by number of items). [a]From Nasreddine *et al.* (2005) MCI sample; [b]From Lin *et al.* (2012) MCI sample. [c]From Graham *et al.* (2016) adults with long-term conditions sample. [d]From Lin *et al.* (2011) MCI sample. [e]From Byrne & Pachana (2011) older adult sample. [f]From Bárrios *et al.* (2013) MCI sample.

Cognitive appraisals of mild cognitive impairment (MCI)

The mean number of subjective symptoms reported across the sample was 12, and an average of 7 were attributed to MCI. Participants were more likely to endorse cognitive (e.g. memory and language deficits) rather than somatic symptoms (e.g. cardiovascular or sensory issues). Higher mean scores on the chronic timeline (*M*=4.2, *SD*=0.8) and consequences (*M*=3.1, *SD*=0.7) subscales, indicate more strongly held beliefs in the sample that MCI is a chronic condition with greater negative consequences. Lower mean scores on the cyclic subscale (*M*=2.4, *SD*=0.9), suggests that overall the sample did not perceived their symptoms to be cyclical in nature. Around 51% of the sample reported increased distress associated with MCI.

In terms of controllability, higher mean scores suggest the overall sample had more positive beliefs about treatments for MCI (*M*=3.0, *SD*=0.5) and perceived themselves to have greater personal control (*M*=3.1, *SD*=0.8) over managing their symptoms. On average, participant understanding of MCI was varied with scores ranging from 1 (limited understanding) to 4.9 (high understanding) out of 5.

Correlation analyses

Pearson's correlations were conducted to explore the relationships between predictor (illness perceptions and cognitive impairment), mediator (cognitive fusion) and outcome variables (depression, anxiety and QoL). Correlation co-efficients for study variables are provided in Table B3. The results show a range of moderate correlations, in expected directions between objective cognitive impairment and the following three variables: chronic timeline (*r*=-.38, *p*<0.05); personal control (*r*=.39, *p*<0.05); and emotional representations (*r*=-.35, p<0.05). Contrary to hypothesis (1), there was no significant relationship found between objective cognitive impairment and depression, anxiety or QoL.

In line with hypothesis (1), moderate to strong correlations, in expected directions were found between several types of illness perceptions and psychosocial variables. Increased depression was significantly associated with a higher number of self-reported MCI symptoms (r=.41, p<0.05) and increased perceptions of MCI as a cyclic condition (r=.48, p<0.01). Increased anxiety was significantly associated with more negative emotional representations of MCI (r=.52, p<0.01). Reduced QoL was significantly associated with a higher number of self-reported MCI symptoms (r=-.50, p<0.01) and increased negative appraisals regarding the consequences (r=.53, p<0.01) and cyclic nature of MCI (r=-.37, p<0.05). Greater fusion with cognitions was significantly associated with increased depression (r=.36, p<0.05) and anxiety (r=.67, p<0.01), and reduced QoL (r=-.48, p<0.01), in addition to a higher number of self-reported MCI symptoms (r=.41, p<0.05), more negative emotional representations of MCI (r=.56, p<0.01) and negative appraisals regarding the consequences (r=.59, p<0.01) and cyclic nature of MCI (r=.35, p<0.05).

Table B3: Correlation matrix between independent, mediator and outcome variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. MoCA	1	-.10	.24	-.15	.20	.14	-.38*	.09	.39*	-.25	.07	.24	.35*
2. GDS-5		1	.35	-.51**	.36*	.41*	-.23	.32	-.26	.10	.48**	-.18	.13
3. GAI-SF			1	-.32	.67**	.20	-.18	.33	.29	-.38	.21	.03	.52**
4. QoL-AD				1	-.48**	-.50**	.31	-.53**	.29	.03	-.37*	.30	-.11
5. CFQ					1	.41*	-.29	.59**	.12	-.16	.35*	-.17	.56**
6. Identity						1	-.27	.69**	.18	-.18	.50**	-.32	.26
7. Chronic timeline							1	-.46**	-.03	-.17	-.26	.10	-.27
8. Consequences								1	.13	-.04	.39*	-.32	.44**
9. Personal control									1	-.41*	-.03	.15	.29
10. Treatment control										1	-.24	-.14	-.24
11. Cyclic											1	-.35*	.28
12. Coherence												1	-.25
13. Emotional representations													1

Note: * = Correlation is significant at the 0.05 level (2-tailed)
** = Correlation is significant at the 0.01 level (2-tailed)

Multivariate analyses: multiple regression

Simultaneous 'forced entry' linear regression was conducted to test the relative contribution of cognitive impairment and illness perceptions in predicting anxiety, depression and QoL. As suggested by Broadbent (2006), seven IPQ-MCI subscales were combined to derive an overall 'threat appraisal' variable, with higher scores denoting more negative appraisals of MCI as threatening. The overall threat appraisal variable was entered into the regression model as one, as opposed to seven predictors, in an attempt to conserve power. The composite variable comprised 67 items and the Cronbach's alpha indicated adequate internal consistency (.86) in the current sample. The variable was normally distributed and had a sample mean of 25.9 (*SD*=5.66, range=16-42). Results of the regression analyses are summarised in Table B4.

Table B4: Linear regression for prediction of depression, anxiety and quality of life.

	GAI-SF: Anxiety			**GDS-5: Depression**			**QoL-AD: Quality of life**		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Cognitive impairment	.03	.03	.21	-.09	.02	-.15	-.19	.31	-.09
Threat appraisal	.02	.02	.21	.03	.01	.48*	-.65	.17	-.58**
R^2	.09			.24			.35		
Adj. R^2	.04			.19			.31		
F	1.6			4.9			8.3		
P-value	*p=.22*			*p=.01***			*p=.001****		

Note:

* =significant at <0.05 level; **=significant at <0.01 level; ***=significant at <0.001 level

GAI-SF: Geriatric Anxiety Inventory – Short Form; **GDS-5:** Geriatric Depression Scale – five item; **QoL-AD:** Quality of Life in Alzheimer's Disease.

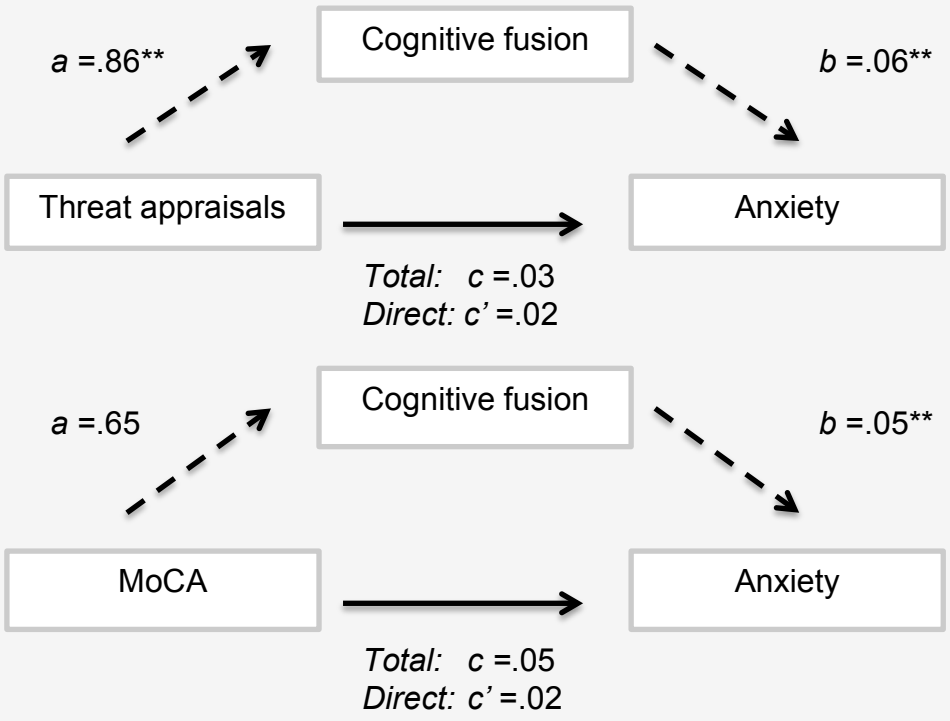
Prediction of anxiety, depression and quality of life

The two predictors accounted for 24% of the variance in depression symptoms (Adj R^2=.19) and the equation was significant ($F_{(2,31)}$=4.9,p<0.01). In line with hypothesis (2), degree of cognitive impairment did not significantly predict depression, however threat appraisals did with a moderate to large effect (β=.48, p<0.05). The two predictors accounted for 35% of the variance in QoL (Adj R^2=.31,p<0.01) and the equation was significant ($F_{(2,31)}$=8.3, p<0.001). In line with hypothesis (2), degree of cognitive impairment did not significantly predict QoL, however threat appraisals did with a large effect (β=-.58, p<0.01). The two predictors accounted for 9% of the variance in anxiety symptoms (Adj R^2=.04) and the equation was non-significant ($F_{(2,31)}$=1.6, p>0.05). Contrary to hypothesis (2), there was no significant individual effect of either predictor variable on anxiety.

Conditional process analyses

Linear regression analysis provided information regarding the relative strength of the two predictors on the three psychosocial outcome variables. In order to test more complex relationships between the variables, conditional process analysis was selected (Hayes, 2013). This method allows for detection of any indirect effects between the predictor and outcome variables, via a mediating variable. A theoretically informed simple mediation model was hypothesized *a-priori*, which proposed that threat appraisals would influence psychosocial variables (depression, anxiety and QoL) directly, and also indirectly via cognitive fusion. Secondly, it was hypothesized that degree of cognitive impairment would influence psychosocial variables (depression, anxiety and QoL) directly, and also indirectly via cognitive fusion. These theoretically derived models are illustrated in Figures B2-B4.

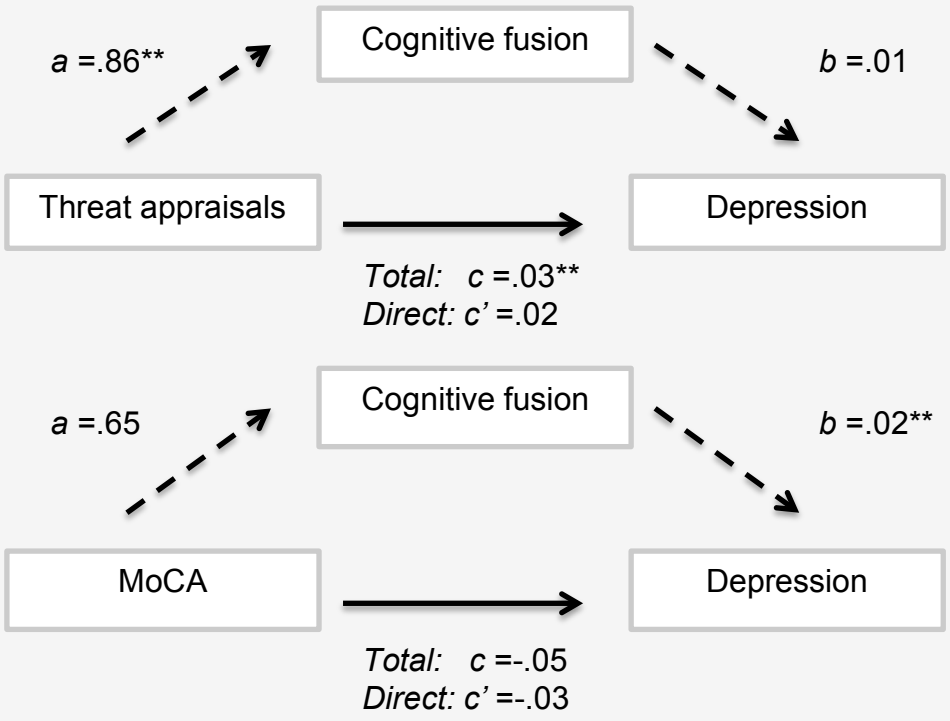
Figure B2: Conditional process analysis – anxiety models



	BCI	
Path – anxiety	**LL**	**UL**
Total effect (Threat appraisals to anxiety)	-.02	.08
Direct effect (Threat appraisals to anxiety)	-.07	.02
Total indirect effect (Threat appraisals to cognitive fusion to anxiety)	.02	.09
Total model	*R^2=.46, p<.0001, f^2=13.41*	
Total effect (MoCA to anxiety)	-.04	.14
Direct effect (MoCA to anxiety)	-.06	.09
Total Indirect effect (MoCA to cognitive fusion to anxiety)	-.03	.06
Total model	*R^2=.46, p<.0001, f^2=13.08*	

Note: *Numbers on the path indicate unstandardised β coefficients.*
BCI: bootstrapped confidence interval; LL: Lower limit; UL: Upper limit
=significant at <0.05 level; **=significant at <0.01 level; *=significant at <0.001 level*

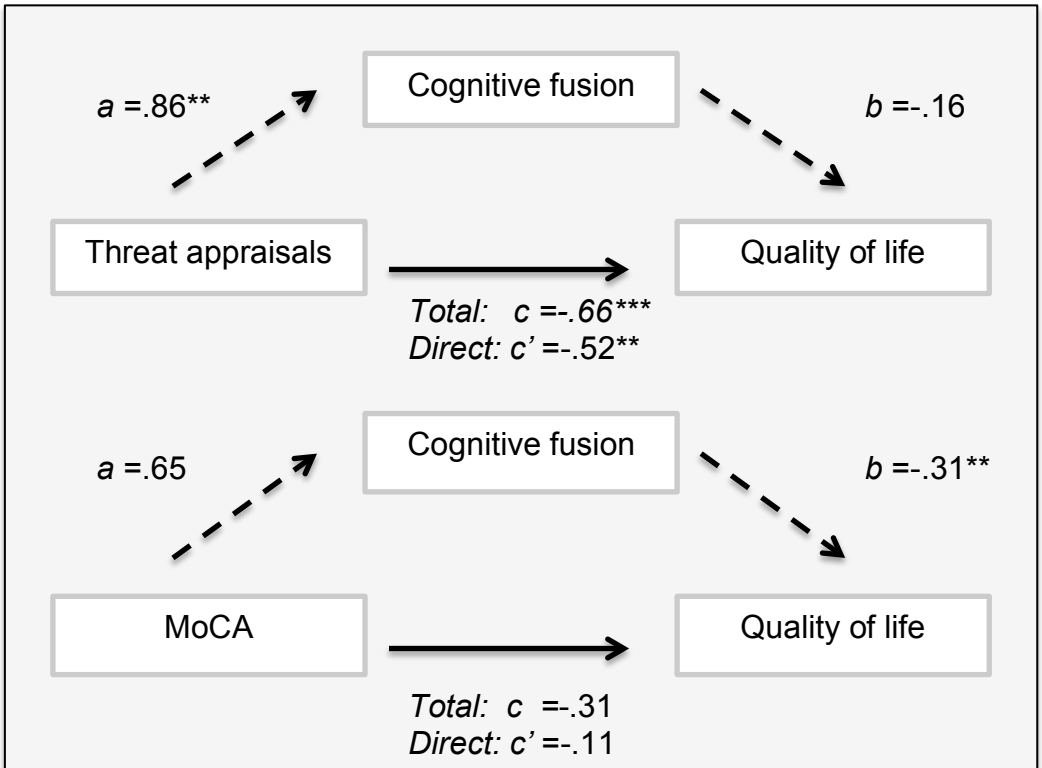
Figure B3: Conditional process analysis – depression models



	BCI	
Path – depression	**LL**	**UL**
Total effect (Threat appraisals to depression)	.01	.05
Direct effect (Threat appraisals to depression)	-.003	.05
Total indirect effect (Threat appraisals to cognitive fusion to depression)	.01	.03
Total model	R^2=.25, p<.01, f^2=6.64	
Total effect (MoCA to depression)	-.06	.03
Direct effect (MoCA to depression)	-.07	.01
Total Indirect effect (MoCA to cognitive fusion to depression)	-.01	.05
Total model	R^2=.27, p<.01, f^2=5.75	

Note: *Numbers on the path indicate unstandardised β coefficients.*
BCI: bootstrapped confidence interval; LL: Lower limit; UL: Upper limit
=significant at <0.05 level; **=significant at <0.01 level; *=significant at <0.001 level*

Figure B4: Conditional process analysis – quality of life models



	BCI	
Path – quality of life (QoL)	**LL**	**UL**
Total effect (Threat appraisals to QoL)	-.99	-.33
Direct effect (Threat appraisals to QoL)	-.90	-.15
Total indirect effect (Threat appraisals to cognitive fusion to QoL)	-.32	.06
Total model	*R^2=.39, p<.001, f^2=9.80*	
Total effect (MoCA to QoL)	-1.1	.45
Direct effect (MoCA to QoL)	-.80	.59
Total Indirect effect (MoCA to cognitive fusion to QoL)	-.64	.15
Total model	*R^2=.23, p<.05, f^2=4.61*	

Note: *Numbers on the path indicate unstandardised β coefficients.*
BCI: bootstrapped confidence interval; LL: Lower limit; UL: Upper limit
=significant at <0.05 level; **=significant at <0.01 level; *=significant at <0.001 level*

Figure B2 outlines the two overall models predicting anxiety. The overall threat appraisals model explained 46% of the variance in anxiety. Threat appraisals did not have a significant direct effect on anxiety, however they did have a significant indirect effect when mediated by cognitive fusion (β=.05, bootstrapped confidence interval (BCI)= .02, .09). As hypothesized, greater fusion with negative threat appraisals is associated with increased anxiety. The overall cognitive impairment model explained 46% of the variance in anxiety. Cognitive impairment did not have a direct effect on anxiety and was not indirectly mediated by cognitive fusion (β=.02, BCI=-.02, .06).

Figure B3 outlines the two overall models predicting depression. The overall threat appraisals model explained 25% of the variance in depression. Threat appraisals did not have a significant direct effect on depression, however they did have a significant indirect effect when mediated by cognitive fusion (β=.01, BCI=.01, .03). As hypothesized, greater fusion with threat appraisals is associated with increased depression. The overall cognitive impairment model explained 27% of the variance in depression. Cognitive impairment did not have a significant direct effect on depression and was not indirectly mediated by cognitive fusion (β=.014, BCI=-.008, .044).

Figure B4 outlines the two overall models predicting QoL. The overall threat appraisals model explained 39% of the variance in QoL. Threat appraisals had a significant direct effect on QoL (β=-.52, BCI=-.900, -.149), but no significant indirect effect on QoL via cognitive fusion. The overall cognitive impairment model explained 23% of the variance in QoL. Cognitive impairment did not have a significant direct effect on QoL and was not indirectly mediated by cognitive fusion (β=-.20, BCI=-.651, .127).

Discussion

The purpose of the current study was to investigate the inter-relationships between cognitive impairment, illness perceptions, cognitive fusion, distress and QoL amongst individuals diagnosed with MCI in the past three to nine months. The study extended findings from previous research (Lin & Heidrich, 2012; Stevenson *et al.,* 2014), by providing additional support for Leventhal's CSM in psychosocial adjustment patterns to MCI. Furthermore, the study provides evidence to suggest that cognitive fusion, a construct central to ACT, may contribute to adjustment processes in this population.

Illness perceptions and adjustment to MCI

In line with Leventhal's CSM, results show significant associations, in expected directions, between several types of illness perceptions and psychosocial adjustment outcomes. A higher number of self-reported MCI symptoms was associated with increased distress and lower QoL. Furthermore, increased negative beliefs regarding the consequences, cyclic nature and emotional impact of MCI was significantly associated with increased distress or poorer QoL in this sample. These results are consistent with previous research demonstrating associations using the Illness Perception Questionnaire (Evans & Norman, 2009; Ferenbach *et al.,* 2011; Kaptein *et al.,* 2006), and correspond with findings from previous studies with MCI patients (Stevenson *et al.,* 2014; Lin & Heidrich, 2012).

Four types of illness perception, namely chronic timeline, control (personal and treatment) and coherence, were not associated with distress or QoL in this sample. This pattern of results is consistent with research investigating illness perceptions in populations with cognitive impairment (Lin *et al.,* 2012; Lingler, *et al.,* 2016; Hurt *et al.,* 2011; 2014). This pattern may reflect the unique nature of adjustment to neurological conditions. Nevertheless, it is important to attempt an explanation for this pattern of results in the current sample. Although the majority of the sample considered MCI to be a chronic condition, this was not associated with poorer psychosocial adjustment. This could be explained by research, which

suggests that older adults regard cognitive impairment to be a natural part of the ageing process (Clare, Goater & Woods, 2009). Although, the current sample had slightly more positive perceptions regarding personal and treatment control compared to Lin *et al.* (2012) this was not significantly associated with reduce distress or improved QoL. This result could be related to the structure of the IPQ-MCI, were participants can provide a mid-point, neutral answer (*'neither agree nor disagree'*). Previous research indicates that participants are more likely to select these questionnaire options when they lack knowledge on the subject matter (Baka, Figgou & Triga, 2012; Nadler, Weston & Voyles, 2015). Lack of knowledge regarding treatments for MCI and ambiguity surrounding etiology and prognostic trajectory may therefore have resulted in neutral rather positive or negative perceptions for these items (Fang *et al*., 2017; Gomersall *et al*., 2015; Karakaya *et al*., 2013). Moreover, executive functioning difficulties observed in MCI patients may result in compromised decision-making capabilities, potentially leading to a higher number of mid-point neutral responses. Although the IPQ-MCI was selected for use in the current study due to its specificity for people with MCI, it may increase central tendency bias. Accordingly, future studies may wish to consider the suitability of the IPQ-MCI, in its current form, for use with this population. Nevertheless, it should be acknowledged that the current study was only powered to detect large effects for correlation analyses. It could therefore be the case that small to moderate effects were present, but went undetected.

Cognitive impairment and adjustment to MCI

Contrary to previous research in populations with cognitive impairment (Biringer *et al.,* 2005; Spitz, Schönberger & Ponsford, 2013; Stillman, Rowe, Arndt & Moser 2012), there was no significant association in the current sample between severity of memory and thinking problems (as measured by the MoCA) and distress. While this was unexpected, other research in populations with neurological conditions (Ferenbach *et al.,* 2011; Spain *et al*., 2007) have also found no significant impact of disease severity on emotional adjustment outcomes. These results may be explained by the limited scope of the MoCA, as

a short cognitive screening tool, to accurately measure participant cognitive functioning. Nevertheless, the MoCA does demonstrate high sensitivity in an MCI population (Freitas *et al.,* 2014) and all participants had been formally diagnosed with MCI following a comprehensive clinical assessment with a trained health professional.

Interestingly, a higher number of self-reported MCI symptoms was significantly associated with poorer QoL. This suggests that subjective, rather than objective MCI symptoms have more bearing on life satisfaction following diagnosis. This pattern of results is consistent with findings from Lin and Heidrich (2012), and Stevenson *et al.* (2014).

Illness perceptions versus cognitive impairment

Our results suggest that appraisals of MCI explain significantly greater variance in depression and QoL than objective cognitive impairment. This is consistent with research in other health populations (Groarke *et al.,* 2004; Severeijins *et al.,* 2001; Spain *et al.,* 2007). The results therefore suggest that patient beliefs about MCI have greater bearing on mood and life satisfaction following diagnosis, than the severity of their memory and thinking problems. Contrary to our hypothesis, neither cognitive impairment nor threat appraisals significantly predicted anxiety. This finding was unexpected, but supported our hypotheses that an additional variable (i.e. cognitive fusion) may have a mediating role in determining adjustment outcomes in this population.

The role of cognitive fusion

Consistent with previous research in older adults (Thomson, Morris, Quigley and Gillanders, 2015) and people with cancer and multiple sclerosis (Gillanders *et al.,* 2014; 2015), moderate to strong associations were found between cognitive fusion (CFQ) and psychosocial variables (anxiety, depression and QoL) in the current sample.

The results from conditional process analyses, were consistent with the ACT model, and indicated that cognitive fusion significantly mediated the relationship between threat appraisals and anxiety. In other words, the results suggest that having more threatening appraisals of MCI, combined with increased levels of cognitive fusion, predicts anxiety. This model was also found to be significant in predicting depression. Therefore, the results indicate that threatening appraisals of MCI, together with higher levels of cognitive fusion, predicts depression in this population. Cognitive fusion was not found to significantly mediate the relationship between threatening appraisals of MCI and QoL. Although this result was contrary to hypotheses, it was consistent with findings from a study investigating the role of cognitive fusion in adjustment to cancer (Gillanders *et al.,* 2015).

Theoretical implications

The current study tests a model of adjustment, utilising constructs from two distinct theoretical models (ACT and the CSM). Interestingly, our results provide initial support for the existence of inter-relationships between ACT and CSM processes, namely illness perceptions and cognitive fusion. Our results further add to the evidence-base of studies finding significant relationships between CSM and ACT constructs in people with multiple sclerosis (Ferenbach *et al.,* 2011), cancer (Gillanders *et al.,* 2015) and long term conditions (Graham *et al.,* 2016). The combination of these theoretical models could guide the development and application of psychological interventions. A recently published review by Karekla, Karademas and Gloster (2018) provides a theoretical rationale for the integration of CSM and ACT constructs to inform the development of interventions for patients with chronic illness. Future studies, specifically with an MCI population, may wish to investigate the relative influence of other CSM (e.g. coping) or ACT processes (e.g. acceptance or experiential avoidance) on adjustment outcomes. This may offer further information on the overlap between these theoretically distinct models.

Clinical implications

To the best of our knowledge, there are currently no best practice guidelines for clinicians in the UK regarding assessment and management of psychological problems in patients with MCI. This is surprising given the published research suggesting there is a higher prevalence of anxiety and depression in this population group (Ismail *et al*., 2017; Mirza *et al.,* 2016). In the current sample, 21% of participants met clinical criteria for anxiety and 12% met clinical criteria for depression. Presumably, levels of distress were lower in the study sample due to exclusion of care home residents and participants with significant co-morbid physical or mental health issues. Nevertheless, undiagnosed, clinical levels of distress were still present.

Improving assessment procedures for early detection of psychological problems in older adults is necessary due to reduced help-seeking in this population, particularly amongst those with comorbid cognitive or physical health issues (Byres, Arean, Yaffe, 2012; Conner *et al.,* 2010). Our results suggest that health professionals could utilise the IPQ-MCI and the CFQ to identify MCI patients at increased risk of distress or reduced QoL following diagnosis.

Our results also raise some interesting questions about the potential for psychological interventions to improve adjustment outcomes in an MCI population. Threatening appraisals of MCI significantly predicted depression and QoL in the current sample. Cognitive modification treatments, such as CBT, may therefore hold potential to improve mood and life satisfaction in MCI patients by attempting to directly change maladaptive beliefs about the condition. In particular, the current study suggests that negative beliefs about the consequences (e.g. ‘MCI will progress to dementia’) or cyclic nature (e.g. ‘MCI is very unpredictable’) of MCI should be targeted. There has only been one controlled study to date investigating the effectiveness of a CBT group intervention for MCI patients (Banningh *et al.,* 2011). Interestingly, the study found significantly greater acceptance of MCI, as measured by the Illness

Cognition Questionnaire (ICQ; Evers *et al.,* 2001) following the CBT group when compared to the waiting list control group (p<0.034), but found no significant differences on measures of general wellbeing or distress (Banningh *et al.,* 2011).

Treatments, such like ACT, which directly target cognitive fusion may offer greater potential to reduce distress in patients adjusting to MCI. ACT may be more fitting for MCI patients, as it would aim to change the function rather than the form of threatening illness perceptions. This approach may be preferable to direct cognitive-change techniques synonymous with CBT, as patient perceptions about their condition could be realistic (e.g. 'MCI strongly affects the way others see or treat me). Rather than attempting to directly modify perceptions, ACT would attempt to reduce the regulatory effect perceptions were having on patient behaviour (e.g. social avoidance). Further research will be necessary to evaluate the utility of ACT with MCI patients, however a recent systematic review suggests that ACT is an effective intervention for reducing distress in older adult populations (Ross, Whitfield, Gillanders & Guzmán, 2018).

Previous research indicates that receiving an MCI diagnosis can evoke a broad range of emotional responses in patients including worry, ambivalence or relief (Dean & Wilcock, 2012; Gomersall *et al.,* 2015; 2017; Meilak, Partridge, Willis & Dhesi, 2016). This is likely to reflect the prognostic uncertainty associated with an MCI diagnosis, whereby cognition may improve with time, remain static or progress to dementia. Our results further highlight the importance of patient interpretations of MCI on psychosocial adjustment outcomes. Correspondingly, it is important for health professionals to remain mindful of the language used to convey an MCI diagnosis.

In the current sample, there was large variability in understanding of MCI. Implementation of a post-diagnostic support (PDS) pathway for MCI patients, their family and/or carers could help increase knowledge and address any misperceptions about the condition. The impact of PDS warrants further investigation in this population, however it could serve as a potential avenue to

enhance feelings of personal control via promotion of self-management information. Future studies may wish to explore the impact of a cognitive-modification based PDS intervention on psychosocial adjustment outcomes in MCI patients. Given our findings, the intervention could utilise the Representational Approach to Patient Education, which is an approach informed by the CSM and directly targets illness misperceptions through patient education (Donovan *et al.,* 2007). Scotland's National Dementia Strategy 2017-2012 (The Scottish Government, 2017) strongly advocates that PDS should be offered to patients following dementia diagnosis. Further research is warranted to determine whether PDS could hold utility for patients adjusting to MCI.

At present, our suggestions regarding interventions for adjustment difficulties in MCI are largely speculative and further investigation is warranted. Nevertheless, our study outlines some potential avenues for future research.

Strengths and limitations of the current study

A number of methodological limitations must be acknowledged. The study employs a cross-sectional design, which prohibits inference of causality. We cannot determine whether higher distress symptoms and poorer QoL have caused greater cognitive impairment and increased threat appraisals, or vice versa. A longitudinal design, where outcomes are measured prior to diagnosis and at several time-points post-diagnosis or following psychological intervention, would provide richer data regarding variations in adjustment patterns. Similarly, a limitation of conditional process analyses, is that it only allows for investigation of a linear model, whereby only one predictor, mediator and outcome variable is entered at a time. This is somewhat restrictive, as it does not allow for analyses of multiple interactions between variables. In order to conduct this type of more complex analysis, structural equation modeling would be necessary, however this requires a much larger sample size (n>200) (Kim, 2009).

A clear limitation of the study is the low sample size and power. Although bootstrapping methods are robust in dealing with non-parametric data and low sample sizes, Fritz and MacKinnon (2007) suggest the conditional process analyses were only powered to detect large effects. Similarly, *a priori* power calculations suggest the correlation analyses were only powered to detect large effects. The regression analysis was significantly underpowered and accordingly, the results should be interpreted with a degree of caution. The sample size may not have been large enough to detect smaller effects and therefore the findings may be susceptible to type II error. Further, as multiple comparisons have been computed with a small sample this also increases the chance of type I error.

Several factors contributed to low recruitment. Firstly, clinicians referred fewer than expected MCI patients to the study. This may reflect published literature, which suggests that clinicians are less likely to discuss participation in clinical research with older adults, in particular those with cognitive impairment (McMurdo *et al.,* 2011). Several other factors may have prevented clinician referral including time pressures during memory clinic appointments, variation in diagnostic practices and lack of contact with patients in the three to nine months post diagnosis. There is no universally agreed guidance on follow-up appointments with MCI patients and therefore a large proportion of patients are discharged from memory clinic services directly following diagnosis.

Secondly, the opt-in recruitment method may have reduced overall participation in the study. Although this recruitment method was a condition of ethical approval, it may have placed greater demand on the cognitive capabilities of the sample. The memory and thinking difficulties synonymous with MCI may have compromised participants' ability to read, process and retain the study information, complete the 'opt-in' slip and remember to return it in the post. Furthermore, individuals with poorer adjustment, lower life satisfaction, and increased distress may have been less likely to opt-in. Previous literature has highlighted the challenges associated with recruiting older adults with late-life depression (Thompson, Heller & Rody, 1994) and anxiety (Wetherell & Gatz,

2001) into research studies. In order to maximise participation and increase sample representativeness, the sample were offered home visits and flexible appointment times. This did increase uptake amongst older adults with mobility issues (n=8) who completed the study at home.

Finally, participation was reduced as a result of the study eligibility criteria. A strict inclusion and exclusion criteria was employed to reduce the potential for confounding factors; however it led to a significant proportion of MCI patients being excluded following case-note review due to the presence of comorbid problems. It seems probable that the strict eligibility criteria also discouraged clinicians from more readily discussing participation in the study with MCI patients.

Demographic information regarding ethnicity or socioeconomic status was not collected and therefore it is difficult to provide information regarding the diversity of the sample. Accordingly, the results are less generalisable to the wider MCI population

The study has a number of strengths which should be acknowledged. Few studies have explored adjustment to MCI using quantitative methodology. This study has progressed research in this area by investigating theoretically driven, inter-relationships using more sophisticated statistical techniques (conditional process analyses). The study also recruited a clinical sample with a broad age range (62 – 90 years) and a formal MCI diagnosis. Another strength of the study is that it measured adjustment variables within a specific three to nine month time frame post diagnosis. This time period was chosen as the study aimed to investigate individuals living with MCI, as opposed to those initially reacting to the diagnosis. Furthermore, the nine month boundary and the inclusion of a cognitive assessment measure (MoCA) most likely minimized the inclusion of participants who had experienced remittance of cognitive problems or further cognitive decline.

Conclusion

The current study demonstrates additional support for the role of illness perceptions in psychosocial adjustment to MCI. Moreover, the study indicates that cognitive fusion, a construct central to ACT, may play an additional role in determining adjustment outcomes. The results need to be replicated in a larger sample, however the study provides promising evidence to suggest that ACT-based interventions, which cultivate defusion from cognitive content (e.g. illness perceptions), could have utility with individuals experiencing distress in relation to an MCI diagnosis. Furthermore, our findings suggest that illness perceptions could be modified, from within a theoretically consistent ACT-model, to improve QoL amongst patients adjusting to MCI.

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LIST OF APPENDICES

Appendix A: Journal of Contextual Behavioral Science author guidelines

JOURNAL OF CONTEXTUAL BEHAVIORAL SCIENCE

AUTHOR INFORMATION PACK

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ISSN: 2212-1447

DESCRIPTION

The *Journal of Contextual Behavioral Science* is the official journal of the Association for Contextual Behavioral Science (ACBS).

Contextual Behavioral Science is a **systematic and pragmatic approach** to the understanding of behavior, the solution of human problems, and the promotion of human growth and development. Contextual Behavioral Science uses **functional principles and theories** to analyze and modify action embedded in its historical and situational context. The goal is to **predict and influence behavior**, with precision, scope, and depth, across all behavioral domains and all levels of analysis, so as to help create a behavioral science that is more adequate to the challenge of the human condition.

Contextual behavioral science is a strategic approach to the analysis of human behavior that proposes the need for a **multi-level** (e.g. social factors, neurological factors, behavioral factors) and **multi-method** (e.g., time series analyses, cross-sectional, experimental) exploration of **contextual and manipulable** variables relevant to the prediction and influence of human behavior.

The journal considers papers relevant to a contextual behavioral approach including: Empirical studies (without topical restriction - e.g., clinical psychology, psychopathology, education, organizational psychology, etc.) Brief reports on preliminary, but provocative findings Reviews (systematic reviews and meta-analyses are preferred) and Conceptual and philosophical papers on contextual behavioral science

We are particularly interested in: Papers emphasizing the study of core **behavioral processes** that are relevant to a **broad range of human problems** Papers **bridging different approaches** (e.g., connecting behavioral approaches with cognitive views; or neurocognitive psychology; or evolutionary science) Papers that **challenge** a contextual behavioral science approach from an informed perspective

The journal welcomes papers written by researchers, practitioners, and theoreticians from different intellectual traditions. What is distinctive is not a narrowly defined theory or set of applied methods but whether the methodology, conceptualization, or strategy employed is relevant to a contextual behavioral approach.

Special Issues

The Journal welcomes suggestions for Special Issues. Proposals for a themed Special Issue should be sent to the Editor-in-Chief, Emily Sandoz at emilysandoz@louisiana.edu, and should include suggested Executive, Advisory or Guest Editors, a proposed call-for-papers, 6-10 provisional authors and topics (specific titles or general areas), a proposed timeline for submission, peer-reviewing, revision and publication. All manuscripts in a special issue will be subject to the normal process of peer-review.

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EDITORIAL BOARD

GUIDE FOR AUTHORS

Types of article

All manuscripts must clearly and explicitly be of relevance to CBS. You may find the JCBS article "Contextual Behavioral Science: creating a science more adequate to the challenge of the human condition" helpful in assessing whether your manuscript is likely to be of interest to readers of this journal.

Articles should fall into one of seven categories:
1. Empirical research (up to 6000 words)
2. Brief empirical reports (up to 3000 words)
3. Review articles (up to 10,000 words)
4. Conceptual articles (up to 6000 words)
5. In practice (up to 3000 words)
6. Practical innovations (up to 3000 words)
7. Professional interest briefs (up to 3000 words)

Word limits exclude references, tables and figures but include the abstract

1. Empirical research. JCBS welcomes manuscripts across a breadth of domains from basic behavioral science to clinical trials. Research concerning the measurement and testing of process of change is particularly welcome. Potential methodologies include but are not limited to: randomized controlled trials, single case experimental designs, cross-sectional and prospective cohort studies, mixed-methods designs, small scale analog studies. Papers reporting null findings are also welcome if their methodology is sound and their power sufficient. Authors of such papers will need to emphasize the implications of their findings for future research and practice.

2. Brief empirical reports. Manuscripts in this section may report preliminary, provocative or replicated results. Empirically sound methodology and adequate power remain important considerations.

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4. Conceptual articles. Manuscripts in this section should address conceptual or theoretical issues relevant to CBS. This may include papers that discuss relevant philosophical assumptions and traditions, or conceptual papers which explore aspects of or inconsistencies in contextual behavioral theory and science.

5. In practice. Manuscripts in this section are designed to make CBS useful to practitioners from a wide variety of areas. Manuscripts must be written in an accessible style and should be easily understood by practitioners who are not experts in research or basic behavioral science. Manuscripts should provide both clear insights for new practitioners as well as stating the questions that remain to be answered by future research.

6. Practical innovations. Manuscripts in this section seek to apply the findings and applications of CBS to under-studied, under-served or novel areas. The scope of these manuscripts is limited only by the journal's broad mission: creating a science more adequate to the challenge of the human condition.

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A Theory section should extend, not repeat, the background to the article already dealt with in the Introduction and lay the foundation for further work. In contrast, a Calculation section represents a practical development from a theoretical basis.

Results

Results should be clear and concise.

Discussion

This should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

Conclusions

The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.

Appendices

If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

Essential title page information

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• ***Corresponding author.*** Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. This responsibility includes answering any future queries about Methodology and Materials. **Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.**
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Abstract

A concise and factual abstract is required. The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separately from the article, so it must be able to stand alone. For this reason, References should be avoided, but if essential, then cite the author(s) and year(s). Also, non-standard or uncommon abbreviations should be avoided, but if essential they must be defined at their first mention in the abstract itself.

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Immediately after the abstract, provide a maximum of 6 keywords, using American spelling and avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

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Acknowledgements
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List funding sources in this standard way to facilitate compliance to funder's requirements:

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Reference to a conference paper or poster presentation:
Engle, E.K., Cash, T.F., & Jarry, J.L. (2009, November). The Body Image Behaviours Inventory-3: Development and validation of the Body Image Compulsive Actions and Body Image Avoidance Scales. Poster session presentation at the meeting of the Association for Behavioural and Cognitive Therapies, New York, NY.

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Appendix B: Quality assessment criteria

Psychosocial adjustment to mild cognitive impairment

QUALITY ASSESSMENT CRITERIA

1. Does the study design provide sufficient evidence that distress/ physical functioning/ psychological flexibility outcomes are due to the ACT intervention?	
Randomised control trial (RCT)	Good
Non-randomised control trial/ multiple baseline	Fair
Repeated measures design / uncontrolled trial	Poor
Single case experimental design	Unsatisfactory/ Unclear/ N/A
2. Are the recruitment method and inclusion/ exclusion criteria appropriate to ensure a representative sample that can be generalised?	
A representative recruitment procedure was selected to minimise selection bias and suitable inclusion/ exclusion criteria applied to address the study aims	Good
A convenience recruitment procedure was selected, however adequate effort has been made to ensure sample representativeness. The inclusion/exclusion criteria are adequately appropriate to address the study aims	Fair
A convenience recruitment procedure was selected, however inadequate effort has been made to ensure sample representativeness, to reduce selection bias. The inclusion/ exclusion criteria are inappropriate to address the study aims.	Poor
Recruitment method inappropriate and no attempt made to apply inclusion/ exclusion criteria or address participant characteristics.	Unsatisfactory/ Unclear/ N/A
3. Sample size (power) is sufficient for analysis relating to pre and post outcome measures?	
Number of participants who completed both pre & post measures in the intervention group is sufficient to achieve Power of at least 0.8, where effect size is anticipated to be medium & alpha is 0.05	Good
Number of participants who completed both pre & post measures in the intervention group is sufficient to achieve Power of at least 0.7, where effect size is anticipated to be medium & alpha is 0.05.	Fair
Number of participants who completed both pre & post measures in the intervention group is sufficient to achieve Power of less than 0.7, where effect size is anticipated to be medium & alpha is 0.05.	Poor
Sample size not reported/ Study did not consider power/ study recruited an insufficient number of participants to be adequately powered.	Unsatisfactory/ Unclear/ N/A

1

4. Is the allocation process appropriate to address allocation bias?	
Appropriate process of allocation to treatment groups is applied to reduce bias and investigators are blinded (e.g. random allocation)	Good
Inadequate process of allocation to groups to reduce bias (e.g. poor randomisation method).	Fair
Control group not randomised	Poor
No control group	Unsatisfactory/ Unclear/ N/A
5. Are groups comparable at baseline on key characteristics (e.g. Age, gender, problem severity etc.)	
The treatment and control groups are comparable at baseline OR sufficient attempts have been made to statistically control for the differences.	Good
The treatment and control groups are only adequately comparable at baseline OR only adequate attempts have been made to control for differences.	Fair
The treatment and control groups are not comparable at baseline and no attempts have been made to address the differences.	Poor
No control group.	Unsatisfactory/ Unclear/ N/A
6. Outcome measures of distress, physical functioning and psychological flexibility are robust for an older adult population, are appropriately administered and well-validated	
The primary distress, physical functioning and psychological flexibility measures are suitable, valid and reliable for an older adult population; are standardised and appropriately administered.	Good
Most of the primary distress, physical functioning and psychological flexibility measures are only adequately appropriate, valid and reliable with an older adult population; adequately standardised or only adequately administered.	Fair
Less than 50% of the primary distress, physical functioning and psychological flexibility measures are adequately appropriate, valid and reliable for an older adult population and are adequately administered.	Poor
Primary distress, physical functioning and psychological flexibility measures are not appropriate for an older adult population OR these are inappropriately standardised/ administered.	Unsatisfactory/ Unclear/ N/A
7. Follow-up measures are administered to evaluate if effects are maintained long-term	
Follow-up primary measures are given ≥ 12 months	Good
Follow-up primary measures are given ≥ 6 months	Fair
Follow-up primary measures are given < 6 months	Poor
No follow-up primary measures administered.	Unsatisfactory/ Unclear/ N/A

8. Treatment protocol is suitable for reducing distress and/or improving physical functioning and/or improving psychological flexibility outcomes with older adults	
A sufficiently detailed ACT treatment protocol is used and this is appropriate to reduce distress OR improve physical functioning/ psychological flexibility outcomes (e.g. sufficient number of sessions, clear and valid protocol rationale/ content, sufficient level of therapist input).	Good
An adequately detailed ACT protocol is used or this is only partially appropriate to reduce distress OR improve physical functioning/ psychological flexibility outcomes (number of sessions, protocol rationale/ content, level of therapist input).	Fair
The ACT protocol is not sufficient to ensure reliability or it is not adequate to reduce distress OR improve physical functioning/ psychological flexibility outcomes (number of sessions, protocol rationale/ content, level of therapist input).	Poor
No treatment protocol is used.	Unsatisfactory / Unclear/N/A
9. Intervention is appropriately conducted and adherence to protocol is suitably assessed	
The intervention is carried out by therapists with sufficient training in ACT, treatment fidelity is measured (e.g. audio/ video tapes rated independently/ by a supervisor) and fidelity is rated as high.	Good
The intervention is carried out by adequately trained therapists AND fidelity to treatment was suitably measured and considered acceptable OR fidelity was rated as high but some weaknesses in measurement (self or participant rated) OR fidelity was not rated however supervision was provided by a practitioner experienced in ACT.	Fair
Intervention is not carried out by suitably trained therapists OR fidelity to treatment was rated as low AND/ OR had considerable weaknesses in measurement.	Poor
No information about the therapists' background/ training or procedure to assess treatment fidelity.	Unsatisfactory / Unclear/N/A
10. Analysis is appropriate for the study aims, measures or design, and outcomes are appropriately reported.	
An appropriate statistical analysis is conducted (excl. missing data analysis) and the outcomes are appropriately reported.	Good
An adequately appropriate statistical analysis is conducted (excl. missing data analysis), or the outcomes are only adequately reported.	Fair
Inappropriate or poorly conducted statistical analysis is used or the outcomes are poorly reported.	Poor
Statistical analysis not carried out or reported	Unsatisfactory / Unclear/N/A

11. Attrition rates are low or comparable to control group at post-treatment	
Attrition rates are low (≤ 20%) or equivalent to control group at post-treatment	Good
Attrition rates are moderate (≤40%) or moderately different from control group at post-treatment	Fair
Attrition rates are high or differ substantially from control group at post treatment	Poor
Attrition rates are not reported or considered.	Unsatisfactory / Unclear/N/A
12. Attrition rates are low or comparable to control group at follow-up	
Attrition rates are low (≤ 20%) or equivalent to control group at follow-up	Good
Attrition rates are moderate (≤40%) or moderately different from control group at follow-up	Fair
Attrition rates are high or differ substantially from control group at follow-up	Poor
Attrition rates are not reported or considered.	Unsatisfactory / Unclear/N/A
13. Method to address missing data is suitable	
No missing data or suitable method to address missing data is used (e.g. intention to treat analysis, maximum likelihood estimation).	Good
An adequate method to address missing data is used.	Adequate
Missing data is poorly address.	Poor
No attempt to consider missing data in the analysis.	Unsatisfactory / Unclear/N/A
Overall quality rating	
≥75% of quality items rated as 'good'	High
≥50% of quality items rated as 'good'	Acceptable
<50% of quality items rated as 'good'	Low

Appendix C: Psychology and Aging author guidelines

Manuscript Preparation

Prepare manuscripts according to the *Publication Manual of the American Psychological Association* (6th edition). Manuscripts may be copyedited for bias-free language (see Chapter 3 of the *Publication Manual*).
Review APA's Checklist for Manuscript Submission before submitting your article.
Double-space all copy.

Other formatting instructions, as well as instructions on preparing tables, figures, references, metrics, and abstracts, appear in the *Manual*. Additional guidance on APA Style is available on the APA Style website.

Length

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Articles do not typically exceed 8,000 words, excluding references, tables, and figures. Shorter manuscripts are equally welcome.
Articles exceeding the 8,000 word limit may be considered if they offer an especially novel theoretical framework, or complex methodology or statistical approach that requires more extensive exposition.

Brief Reports

The Brief Report format is reserved for particularly "crisp," theoretically noteworthy contributions that meet the highest methodological standards.
Brief reports are typically no longer than 3,500 words, excluding references, tables, and figures, and include no more than two tables or figures.
Papers in this format differ in length from regular articles, but not in rigor.
Below are additional instructions regarding the preparation of display equations, computer code, and tables.

Title Page

The first manuscript page is a title page, which includes a title of no more than 12 words, the author byline and institutional affiliation(s) where the work was conducted, a running head with a maximum of 50 characters (including spaces), and the author note.

Abstract and Keywords

All manuscripts must include an abstract typed on a separate page. After the abstract, please supply up to five keywords or brief phrases.
For regular articles, abstracts are no longer than 250 words; for brief reports, no longer than 100 words.

References

List references in alphabetical order. Each listed reference should be cited in text, and each text citation should be listed in the References section.
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  Hughes, G., Desantis, A., & Waszak, F. (2013). Mechanisms of intentional binding and sensory attenuation: The role of temporal prediction, temporal control, identity prediction, and motor prediction. *Psychological Bulletin, 139,* 133–151. http://dx.doi.org/10.1037/a0028566
- **Authored Book:**
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- **Chapter in an Edited Book:**
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The minimum line weight for line art is 0.5 point for optimal printing.
For more information about acceptable resolutions, fonts, sizing, and other figure issues, please see the general guidelines.
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We strongly encourage you to use MathType (third-party software) or Equation Editor 3.0 (built into pre-2007 versions of Word) to construct your equations, rather than the equation support that is built into Word 2007 and Word 2010. Equations composed with the built-in Word 2007/Word 2010 equation support are

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To construct your equations with MathType or Equation Editor 3.0:

- Go to the Text section of the Insert tab and select Object.
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If you have an equation that has already been produced using Microsoft Word 2007 or 2010 and you have access to the full version of MathType 6.5 or later, you can convert this equation to MathType by clicking on MathType Insert Equation. Copy the equation from Microsoft Word and paste it into the MathType box. Verify that your equation is correct, click File, and then click Update. Your equation has now been inserted into your Word file as a MathType Equation.

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Appendix D: Ethical approval documentation

Lothian NHS Board

South East Scotland Research Ethics Committee 01

Waverley Gate
2-4 Waterloo Place
Edinburgh
EH1 3EG
Telephone 0131 536 9000

www.nhslothian.scot.nhs.uk

NHS Lothian

Please note: This is the favourable opinion of the REC only and does not allow you to start your study at NHS sites in England until you receive HRA Approval

Date 15 December 2016
Your Ref
Our Ref

Enquiries to: Sandra Wyllie
Extension: 35473
Direct Line: 0131 465 5473
Email: Sandra.Wyllie@nhslothian.scot.nhs.uk

15 December 2016

Miss Kerry Ross
Trainee Clinical Psychologist
NHS Lothian
Clinical Psychology Department, School of Health in Social Science
Doorway 6, Old Medical School
Teviot Place, Edinburgh
EH8 9AG

Dear Miss Ross

Study title: **Psychological adjustment to mild cognitive impairment in older adults: The role of illness perceptions, cognitive impairment and cognitive fusion.**
REC reference: **16/SS/0215**
IRAS project ID: **212507**

The Research Ethics Committee reviewed the above application at the meeting held on 07 December 2016. Thank you for attending to discuss the application.

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 the REC Manager Mrs Sandra Wyllie, sandra.wyllie@nhslothian.scot.nhs.uk. 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

The members of the Committee present 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.

University Hospitals Division

NHS Lothian

Queen's Medical Research Institute
47 Little France Crescent, Edinburgh, EH16 4TJ

FM/CF/approval

26 January 2017

Research & Development
Room E1.12
Tel: 0131 242 3330

Email:
accord@nhslothian.scot.nhs.uk

Director: Professor David E Newby

Ms Kerry Ross
NHS Lothian
Lothian Older People's Psychology Service
Royal Edinburgh Hospital
Morningside Terrace,
Edinburgh
EH10 5HF

Dear Ms Ross

Lothian R&D Project No: 2016/0320 **REC No:** 16/SS/0215

Title of Research: Psychological adjustment to a diagnosis of mild cognitive impairment 1

Participant Information Sheet:
Version 3.0, dated 24 January 2017 (Clinic)
Version 3.0, dated 24 January 2017 (Casenote)

Consent Form:
Version 1.0, dated 8 November 2016

Protocol: Version 2.0, dated 22 January 2017

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

Please note that the NHS Lothian 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 NHS Lothian.

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 quarterly recruitment figures thereafter.
2. Date the final participant is recruited and the final recruitment figures.
3. Date your study / trial is completed within NHS Lothian.

I wish you every success with your study.

Yours sincerely
Fiona McArdle.

Ms Fiona McArdle
Deputy R&D Director

CC: Mr Tim Montgomery, Director of Operations, REH
Mr Aris Tyrothoulakis, General Manager for Diagnostic Services, RIE
Miss Amanda Stevenson, NHS Lothian, Psychology Department

STA034

Appendix E: Demographic questionnaire

Psychosocial Adjustment to Mild Cognitive Impairment Study

Demographic Questionnaire

Please answer the questions below:

Date of birth		*Age*	
Gender		*Marital status*	
Do you have any sight or hearing difficulties?			
Wearing glasses, if needed?			
Wearing hearing aids, if needed?			
Working or retired?			
Age at retirement?			
Current/ previous employment?			
Years of education?			
Date of mild cognitive impairment (MCI) diagnosis?			
Years since memory and/ or thinking problems began?			
Any physical health problems or symptoms?			
Participant ID: (Researcher to complete)			

Appendix F: Participant information sheet

Psychosocial adjustment to a diagnosis of mild cognitive impairment in older adults: The role of illness perceptions, cognitive fusion and cognitive impairment.

Participant Information Sheet

Invitation

We're inviting you to take part in a research study. Before you decide if you want to take part, it is important for you to understand why the research is being done and what it would involve for you.

Please take time to read the following information about the study, and perhaps talk it over with others. If there is anything that is unclear, or if you have any questions, please do not hesitate to ask the Chief Investigator (contact details at the end of this information sheet).

What's the study for?

We're interested in how people adjust to getting a diagnosis of mild cognitive impairment (sometimes referred to as memory and/or thinking problems).

We know that the beliefs people have about their health can affect their emotional wellbeing and quality of life. We want to understand more about this relationship and whether other factors affect how people adjust emotionally and socially to this diagnosis.

Why have I been chosen?

Because you have been given a diagnosis of mild cognitive impairment in the past 3 to 9 months.

Do I have to take part?

No - taking part in the study is entirely up to you.

If you do agree to take part, you can leave the study at any time. You won't be asked to give a reason and leaving won't affect the care you get from the NHS.

What happens if I take part in the study?

If you decide to take part, we'll ask you to:

- Sign a consent form which states that you understand the nature of the research and that you are willing to take part.
- Meet with the Chief Investigator for an appointment, which will last about **1 hour**.

Appointments will be held at NHS clinics across the Lothians and Lanarkshire. Please note that we cannot provide you with travel expenses to attend appointments. For this reason, we will try to meet you at an NHS clinic close to where you live. Home visits may also be possible.

The Chief Investigator will book your appointment with you over the phone. You can tell her the place, date and time that suit you best.

At the appointment we'll assess your memory and your thinking. Then you'll complete six questionnaires. The Chief Investigator will help you to fill these out if needed.

Will I benefit from taking part?

You will not benefit directly from taking part in the study. However, taking part would help us to boost research in this area. We hope that this research will help us to better understand and help others in the future.

What are the possible risks or disadvantages of taking part?

Some of the questionnaires ask about sensitive things, and explore your mental health and diagnosis of mild cognitive impairment. It is possible that some people may find this tiring or upsetting. If this happens to you, the Chief Investigator will be able to provide immediate support and will offer you a break or the option to come back another time. The Chief Investigator can also tell you about support services if needed.

Is taking part kept confidential?

All of the personal data we collect from you will stay confidential. Your data will be stored securely at an NHS site. Only the Chief Investigator and their Clinical and Research Supervisors will see your data - but also the study Sponsor, an authorised individual from NHS Scotland or the University of Edinburgh might also want to review your data to make sure the study is being carried out to a high standard and in line with study protocol.

We'll write to your GP just to say that you are taking part in the study. We'll only tell your GP more than that if your answers to the questionnaires indicate you're having significant difficulties or distress that need investigated further, for example a significant decline in your memory or thinking ability. We have a duty of care to pass on information to your GP or other professionals (e.g. a psychiatrist), if we have concerns about you, or someone else's, safety or wellbeing. The Chief Investigator would discuss this with you and let you know what other professionals could do to help.

What will happen to the results of the research study?

The results of the study will form part of a University of Edinburgh Doctoral thesis. The results of the study will also be submitted to academic journals for publication.

If you opt on the consent form to hear about the results of the study, we'll send you a written summary when the study ends (approximately March 2018).

Who's organising and funding the research

The study is being organised by Kerry Ross (Chief Investigator and Trainee Clinical Psychologist) under the supervision of Dr. Azucena Guzman (Chartered Clinical Psychologist and Lecturer in Health and Ageing, University of Edinburgh) and Dr. Amanda Stevenson (Clinical Psychologist NHS Lothian/ NHS Lanarkshire). Both NHS Lothian and the University of Edinburgh are supporting the study.

Who has reviewed the study?

It's been reviewed and approved by:

- The School of Humanities and Social Sciences Research Ethics Committee at the University of Edinburgh
- The South East Scotland Research Ethics Committee

What to do now?

If you're interested in taking part in the study, please complete the slip at the end of your invite letter and return to the NHS clinician who gave you this information sheet. You can also return the slip via post in the stamped address envelope provided. The Chief Investigator will then phone you in the coming weeks to talk it over with you. If you decide to go ahead, we'll arrange an appointment with you.

Who can I contact if I have questions or concerns about the research?

If you have any questions or queries about the study, phone the Chief Investigator, Kerry Ross on 0131 537 6901 or email her at (Kerry.Ross@nhslothian.scot.nhs.uk).

If you would like to discuss this study with someone independent of the research, you can contact:

Dr Angus MacBeth (Department of Clinical and Health Psychology, University of Edinburgh) on 0131 650 3893.

If any problems happen during the study, you can contact:

Professor Charlotte Clarke (Head of School) on 0131 650 4327.

If you wish to make a formal complaint, you can contact:

Patient Experience Team
2nd Floor, Waverley Gate
2 - 4 Waterloo Place
Edinburgh
EH1 3EG
Tel: 0131 536 3370
Feedback@nhslothian.scot.nhs.uk.

Thank you for considering taking part in this study.

Appendix G: Preliminary analyses: meeting the assumptions of parametricity

The following outlines the steps that were completed to ensure assumptions of parametric testing were met prior to conducting correlation and regression analyses.

Linearity and homoscedasticity

Standardised residual plots were visually inspected and assumptions of linearity were confirmed. Independence of residuals was checked using the Durbin-Watson statistic and all were found to be close to 2, indicating no presence of autocorrelation in the sample (Field, 2009). Residual scatterplots were visually inspected for the regression analyses and confirmed the assumption of homoscedasticity was met as there was no clear evidence of linearity or funneling.

Multi-collinearity

Pearson's correlations were conducted to test the assumption of multi-collinearity. The strongest correlation (r=.69) was below the recommended level (r≥.90) (Field, 2009) and therefore multi-collinearity was ruled out. The variance inflation factor (VIF) and tolerance statistics were also checked and were well within suitable limits (VIF <1.01) and (tolerance >.99)

Normality

As recommended by Field (2009), histograms and QQ-plots were visually inspected to assess the normality of the data. To ensure parametricity, transformations were performed on variables with a skewed distribution. A square root transformation resulted in the most normal distribution for GAI, GDS and chronic timeline variables, whilst a logarithmic 10 transformation was optimal for the treatment control variable. Although on visual inspection the CFQ histogram showed a slight positive skew, skew and kurtosis z-scores were within acceptable

limits (<1.96) (Ghasemi & Zahediasi, 2012), therefore no transformation was carried out. Details of z-scores and transformations are provided in Table C1.

Table C1: Variable transformations

	Untransformed		Transformed		
Variable	Visual of histogram/ QQ-plot	Z-scores skew/ kurtosis	Method	Z-scores skew/ kurtosis	Conclusion
MoCA	Normal	0.33/ 0.69	N/A		Normal
GAI-SF	Postive skew	0.34/ 1.14	Sqrt	0.05/1.44	Normal
GDS-5	Positive skew	1.21/ 1.79	Sqrt	0.63/ 0.17	Normal
CFQ	Slight positive skew	0.66/ 0.41			Normal
QoL-AD	Normal	0.49/ 0.10			Normal
Identity	Normal	0.41/ 0.38			Normal
Chronicity	Slight negative skew	0.83/ 0.13	Sqrt	0.29/ 1.06	Normal
Consequences	Normal	0.50/ 0.69			Normal
Personal control	Normal	0.88/ 0.44			Normal
Treatment control	Negative skew	1.57/ 3.93	Log10	0.48/ 1.14	Normal
Coherence	Normal	0.01/ 0.93			Normal
Cyclic	Normal	0.19/ 0.79			Normal
Emotional representation	Normal	0.01/ 0.27			Normal

Note: CFQ: cognitive fusion questionnaire; **GAI-SF**: Geriatric anxiety inventory – short form; **GDS-5**: Geriatric depression scale – five item; **Log10**: Logarithmic 10; **MoCA**: Montreal cognitive assessment; **Sqrt**: Square root; **QoL-AD**: Quality of Life – Alzheimer's disease

Outliers

Mahalanobi's distance statistic was utilised to check for the presence of significant outliers. Based on the number of predictors and sample size, Barnett and Lewis' (2004) critical value table suggests that a Mahalanobi's distance value greater than 13.82 indicates the presence of an influential outlier. Across the three regression analyses the Mahalanobi's statistic did not exceed 8.99, therefore indicating the presence of no significant outliers.