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Applying health psychology theory to practice:
informing and developing interventions for
long-term conditions

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the Professional Doctorate in Health Psychology

School of Health Sciences

City, University of London

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SECTION A

PREFACE

This portfolio of competence demonstrates the development of a trainee health psychologist working in an acquired brain injury centre over the three years of supervised practice, and more recently in a hospital stroke unit and neuro-rehabilitation department. Completing this training has given the trainee the skills, knowledge and confidence to promote health psychology theory and implement health psychology-based interventions in their work with people with neurological conditions.

Section B – Research

Thesis

The author was exploring mindfulness-based interventions for people with long-term conditions when they were invited to become involved in a pilot randomised controlled trial, assessing the feasibility of improving the non-motor symptoms of people with Parkinson's disease through an adapted, remote-delivery mindfulness cognitive behavioural therapy. Being part of an experienced research team at the protocol discussion stage was an excellent opportunity for a researcher who had only previously been involved in student studies and allowed them to contribute a novel putative mediating construct to the doctoral study, which focused on the possible mediators and moderators in the relationship between trial arm and psychological outcomes.

The trainee's recent multi-disciplinary team working experience with people with Parkinson's disease has been an invaluable resource in understanding the non-motor symptoms and distress in this population, and when considering suggestions for future, larger-scale trials of this intervention. Understanding the reality of living with both non-motor and motor symptoms, only partially controlled by medication, and with an uncertain and unpredictable disease trajectory, has provided the motivation to complete a study that required learning challenging new quantitative statistical skills. Being able to offer a person who has been newly diagnosed with Parkinson's disease, and who has yet to experience any cognitive impairment, a non-pharmacological pathway that may help them cope better with symptoms, including

anxiety and depression, increase the patients' ability to manage more severe symptoms as the disease progresses. Understanding which of the mediating constructs may most influence successful outcome will enable targeted interventions, that could not only reduce the skill-learning burden for the patient with Parkinson's disease, but would improve cost-effectiveness in delivery. Parkinson's disease clinical nurse specialists are often the prime contact for outpatients and frequently deal with concerns about the uncertainty of the disease. Being able to improve patient self-efficacy in self-management of anxiety and depression symptoms will enable the clinical staff to guide the patient to better manage their other symptoms.

Supplementary research

Three papers have been devised and submitted, but without publication success at the time of writing. A paper on a systematic review, on which the author acted as a consultant, describing the lack of inclusion of people with severe mental illness in trials of education interventions for type II diabetes mellitus, has been submitted twice, but on each occasion, they have been rejected. A third attempt will be undertaken after revision. A paper reporting a systematic review of the literature on the utility of illness perceptions in the management of people with functional neurological symptom disorder has also been submitted and rejected following review. Each opportunity for review has contributed to improving the articles, and both will, after further revision and careful consideration of appropriate journals, be resubmitted.

A third article describing the trainee's application of health psychology theory and practice within neurological settings and decrying the lack of access for health psychologists to neuropsychology training, has been submitted to the Health Psychology Update and is awaiting review.

Section C - Professional Practice

Teaching and training of health professionals

Following the completion of a successful behaviour change intervention case study with a functional neurological symptoms (FNSD) patient, it became clear that other members of the multidisciplinary team were not as confident when treating patients with this diagnosis. People with FNSD often present with stroke-like symptoms, and while no brain pathology is noted on imaging, inconsistencies with stroke presentation can be detected on clinical examination. While the aetiology is often complex, and is probably best explained in biopsychosocial terms, the treatment includes physiotherapy and psychology, with occupational therapy where available, and follows a similar pathway to stroke rehabilitation. Successful reversal of the symptoms (which may be cognitive and sensory as well as physical) is achievable with early intervention and good rapport with the patient. However, this approach is reasonably novel, and despite the prevalence of this condition (between 10 and 20% at the brain injury centre), and the NICE recommendations, there remains controversy within health care professions as to how to manage people with FNSD, with many still believing that people with FNSD are not as “deserving” as people with recognised brain pathology.

Three teaching sessions lasting 1-1.30 hours were organised so that everyone within the team who wished to attend could access a session. The staff were engaged by inviting them to discuss the emotions elicited when working with this population, including the feelings of low self-efficacy. After interactive teaching of the theory-based explanations of symptom perception, assessment and maintenance, and a description of the successful case study, all but one participant reported greater confidence in dealing with this patient group.

Teaching and training of general population

A seminar was planned and delivered to a group of Health Psychology Master's students on “medically unexplained symptoms” (a term that is no longer used, with functional or persistent physical symptoms being preferred). The students had no health care working experience, and the first half of the seminar was more general

and included teaching on health psychology models, illustrated with studies on functional conditions such as irritable bowel syndrome and chronic fatigue. An early slide warned the small group that these subjects often aroused conflicting thoughts and emotions, and indeed, one participant did share that they had experienced disbelief and poor treatment for their own functional symptoms. Teaching a small, intimate, but very diverse group of students, some of whom felt mandated to be there, was challenging, but the experience and the supervisor's observations of the session were extremely useful, and the author has since taken more opportunities to expand their teaching and training practice.

Consultancy

For this competency, the author was asked to contribute to a systematic review of the exclusion of people with severe mental illness in trials of self-management education for people with type II diabetes mellitus, for which the client, a research group based at the university, had already started the preliminary searches. The task involved assessing 1245 study abstracts, reading the full papers if needed, contacting the authors if the exclusion criteria were not explicit, collating and cataloguing the data, and finally, writing two versions of the paper for journal submission. The first contract underestimated the time involved and was renegotiated so that some of the hours were included in supervised practice for the doctorate. This consultancy experience provided the trainee with a greater understanding of working collaboratively in an academic field.

Behaviour change intervention

Therapeutic interventions for people who have an acquired brain injury or neurological symptoms, require motivating them to change behaviours that may be hindering rehabilitation. People with FNSD may not have the same brain pathology as people with neurological conditions but do have similar symptoms. Many display pre-morbid "boom and bust" behaviours that may have contributed to both symptom development and symptom maintenance. Learning to self-regulate, as well as exploring their emotional state during therapy, can help reverse FNSD symptoms. The Common-Sense Model (Leventhal & Diefenbach, 1991) can help

explain how emotional and cognitive interpretation of physical symptoms leads to maladaptive coping behaviours. Cognitive behavioural therapy, including third-wave compassion focused therapy, and motivational interviewing, and joint working with physiotherapy and occupational therapy, have been shown to be effective in a few studies with small samples. The case study of an FNSD patient in this competency illustrated how all these techniques could be used to support the return to full function.

Section D – Systematic review

Researching interventions for people with FNSD revealed very few examples of successful outpatient cases. As illness perceptions have been shown to help people with long-term conditions, and as FNSD will, in most cases, lead to similar disability and distress, there was a need to explore whether using the Common-Sense Model and the illness perception scales had been effective in managing this condition. A comprehensive review was conducted generating a total of 233 papers, and eventually, including updating at a later date, nine met the inclusion criteria and were included in the review.

This systematic review revealed a paucity of studies, conducted mostly by a very small group of researchers, and with very few utilising the full IPQ-R and thus neglecting to examine the participant's the emotional perceptions. Nevertheless, illness perceptions were shown to be associated with psychological outcome and symptom improvement, to be predictive of outcome, and to differentiate between functional patients and patients with neurological disease. This review has demonstrated that illness perceptions warrant further exploration in this group of complex patients, and the measures could be useful in helping to understand the patient's beliefs and willingness to engage in therapy.

Conclusion

The competencies demonstrated in this portfolio have contributed to the author's working as a reflective scientist practitioner in neurological settings, a health care area that straddles mental and physical health. Working alongside many other

therapies, as a trainee health psychologist, has led to reflection on how health psychology theory contributes to the understanding of complex long-term conditions, and how further work is needed to enable health psychologists to devise and implement interventions for people with neurological conditions.

SECTION B – RESEARCH

Exploring mechanisms of change in a pilot randomised trial of a distant delivery mindfulness intervention for people with Parkinson's disease.

Abstract

People with Parkinson's disease report high levels of non-motor symptoms, including anxiety and depression, that are difficult to treat pharmacologically. Mindfulness-based interventions have been shown to be effective in other long-term conditions. This pilot study explored how a mindfulness-based intervention may have had an effect and for whom, with a view to informing future studies. Volunteers were randomised to a remote delivery, eight-week mindfulness cognitive behavioural group therapy intervention (n=40) or wait-list (n=38), and measures for psychological outcomes and putative mediators were taken at baseline, 4 weeks, 8 weeks and 20-week follow-up. The study showed that all the outcome measures changed in a positive health direction in the intervention group. The intervention had a small effect on decentering ($d=.36$) and acceptance ($d=.27$) by mid-point, before depression at 8 weeks ($d=-.28$) and anxiety at follow-up ($d=-.29$), indicating an indirect effect between trial arm and levels of distress. Mediation and moderation analysis were conducted using PROCESS, time-lagging the mediators to the outcome variables, but no combined or individual indirect effects had confidence intervals entirely above or below zero, thus mediation cannot be confirmed. When the end of intervention mediators were analysed with the follow-up levels of anxiety and depression, there is evidence of inconsistent mediation, or possible suppression effects. Moderation analysis revealed that the effect on anxiety levels was moderated by gender, with women benefitting more from the mindfulness intervention. Moderated mediation analysis also indicated that the effect of the trial arm on levels of acceptance was conditional by age and time since diagnosis, and the effect of trial arm on levels of mindfulness skills by age, meaning that younger, newly-diagnosed patients were more able to increase mindfulness skills and acceptance.

1 Introduction:

1.1 Parkinson's disease

First described in 1817 by Dr James Parkinson in his "Essay on the Shaking Palsy" (Parkinson, 2002), Parkinson's disease (PD) is a chronic and progressive neurological disease affecting around 127,000 people in the UK (Parkinson's UK, 2017), or around 1 person in 500. PD is more common in men than women (1.5:1), the mean age of onset is 65 (Connelly & Lang, 2014) and the incidence increases with age (De Lau & Breteler, 2006).

It is usually diagnosed when the substantia nigra (within the basal ganglia) starts losing the cells that produce dopamine, a neurotransmitter responsible for the regulation of voluntary movement, resulting in the motor symptoms becoming evident. Motor symptoms only become evident after 70-80% of striatal dopaminergic content is lost, presumably because of the remaining neurons acting to compensate (Hemmerle, Herman & Seroogy, 2012). Motor symptoms include tremors, freezing, stiffness and slowness of movement.

Other specific neurochemical disruption may also be involved and is also implicated in the development of non-motor symptoms, such as low mood, anxiety, depression, sleep dysfunction, fatigue and central pain, and which may precede any PD motor signs (Marras & Chaudhuri, 2016).

The combined effect of motor and non-motor symptoms has been shown to reduce health-related quality of life (Soh, Morris, & McGinley, 2010), and non-motor symptoms (anxiety and depression) have been demonstrated to have more effect on health status than motor symptoms (Hinnell, Hurt, Landau, Brown & Samuel, 2011). Drug treatment for PD is aimed at modifying dopamine levels in the brain to stabilise motor symptoms, but as the disease progresses and treatment time lengthens, the effectiveness of the drugs declines. There may be daily fluctuations of symptoms (as medication dose wears off and symptom return) as well as increasing delay in the dose showing benefit to symptoms. Dopaminergic treatment for motor symptoms

may also have an iatrogenic effect on non-motor symptoms (Chaudhuri, Odin, Antonini, & Martinez-Martin, 2011), and may cause serious side effects like hallucinations, which are also a potential symptom of Parkinson's (Connelly & Lang, 2014).

1.1.1 Non-motor symptoms in Parkinson's disease

Recognition of the non-motor symptoms' contribution to burden in PD patients is growing amongst health care providers (Pfeiffer, 2016). In an Italian multi-centred survey (n=1072), non-motor symptoms were reported by 98.6% of PD patients, with fatigue as the most common (58%), followed by anxiety (56%), pain (38%) and insomnia (37%) (Barone et al, 2009). A recent systematic review and meta-analysis of non-motor symptomology prevalence in PD literature found significant clinical heterogeneity among the included studies and reported the prevalence of depression at 51.7% and of anxiety at 46.7% (Tagliati, Chaudhuri & Pagano, 2014). Some non-motor symptoms of Parkinson's disease are also commonly found in people as they age, but Parkinson's disease patients report a greater number of symptoms, and with greater frequency and severity (Krishnan, Sarma, Sarma, & Kishore, 2011; Khoo et al, 2013). Chaudhuri et al (2011) list 48 different non-motor symptoms in PD and report that a typical patient describes 10-12 non-motor symptoms (Chaudhuri et al, 2006).

Cognitive impairment is a common feature in people with PD and has been shown to predict reduced coping, lower quality of life and higher anxiety and depression in people with PD (Hurt et al, 2012). Depression and anxiety have both been reported as the most prevalent non-motor symptoms in PD even when the disease is not at an advanced stage and depression may be present even before motor symptoms are evident (Barone et al, 2009).

Depression in PD has frequently been explained by biological mechanisms, such as disruption to brain chemistry (Burn et al, 2012). However, a bio-psychosocial model is gaining traction in explorations of the causal and maintenance factors of depression, which in turn informs management of depressive symptoms in

Parkinson's disease (Hurt, Weinman, Lee, & Brown, 2012; Hurt, Burn, Hindle, Samuel, Wilson, & Brown, 2014).

Depression in PD has been associated with higher functional disability (Brown, McCarthy, Gotham et al, 1988), with a reduction in motor function and daily living measures (Riedel et al, 2010) and higher mortality (Hughes, Ross, Mindham, et al, 2004). Many symptoms of depression are difficult to differentiate from those of PD (including psychomotor retardation) which makes the diagnosis of depression challenging (Lieberman, 2006), however two distinct clinical phenotypes, one "anxious-depressed" and the other "depressed" have been identified (Brown, Landau et al, 2011).

Anxiety also shares somatic symptoms with PD, making diagnosis difficult, and has until recently not been the subject of as much research as depressive mood in Parkinson patients (Dissanayaka et al, 2016). Anxiety has been shown to be prevalent in 25-40% of people with PD (Simuni & Fernandez, 2013), and the incidence of anxiety independent of depression has been demonstrated by Brown, Landau et al (2011) using latent class analysis (22% of n= 513 patients with PD). The same participants were examined 4 years later (with 64.1% of the sample still participating) and showed stable class membership in the anxious and anxious-depression groups and high resilience in the psychologically healthy group. Higher baseline depression, psychiatric history and younger age onset of PD predicted whether distress was stable over the 4-year period, which the authors suggest may indicate vulnerability factors (Landau et al, 2016). The authors also noted that over 25% of people in the "moderate anxiety" class at year 1 were classed as one of the two anxiety and depression classes a year later, and a third of participants moved in the other direction, indicating that remission from depressive symptoms did not lead to a reduction in significant anxiety. Anxiety may also be masking depression and Landau and colleagues make the point that there continues to be little research in anxiety and its treatment, despite a clear case for further management direction (Deane et al, 2014).

Anxiety has also been shown to be associated with freezing of gait in PD, a major cause of falls, and may be implicated, through the attentional demands that anxiety provokes, in the development of freezing (Martens, Hall, Gilat, Georgiades, Walton, & Lewis, 2016). These authors conclude that early treatment of anxiety may prevent the onset of freezing, thus reducing the potential impact on quality of life and apathy (Perez-Lloret et al, 2014).

1.1.2 Treatments for non-motor symptoms

Little evidence base exists of effective treatments for non-motor symptoms (Connolly & Lang, 2014) and a recent report stated that non-treatment of non-motor symptoms is common – only 28% of those with moderate to severe depression were being prescribed pharmacological treatment and only 2% of people were being treated for REM sleep behaviour disorder despite screening positive (Pfeiffer, 2016).

The lack of treatment of non-motor symptoms is partly due to barriers to help-seeking which include lack of awareness that symptoms are associated with PD, embarrassment at discussing sexual, urinary and bowel problems, and medical staff focus on motor symptoms (Hurt, Rixon, Chaudhuri, Moss-Morris, Samuel, & Brown, 2016). Furthermore, anxiety and depression symptoms in Parkinson's disease have been found to be unrecognised by neurologists in routine clinics (Shulman, Gruber-Baldini, Anderson, Fishman, Reich, & Weiner, 2002), and low mental health literacy, lack of referral and transport access have been found to be barriers to help-seeking in mood disorders in people with PD (Dobkin, Rubino, Friedman, Allen, Gara, & Menza, 2013).

Further, the lack of treatment of the non-motor symptoms in PD is also due to the lack of effective pharmacological treatment. This is especially true in the case of depression in PD (Pfeiffer, 2016; Frisina, Borod, Foldi, & Tenenbaum, 2008) and it has been shown that people with depression and PD report less benefit from antidepressants than people without PD (Weintraub et al, 2005). A systematic review and meta-analysis of anti-depressant use and effectiveness in PD concluded

that there were too few included trials and too many methodological drawbacks to establish that antidepressant medications were effective long-term or with tolerable side effects (Rocha, Murad, Stumpf, Hara & Fuzikawa, 2013). More recently, a systematic review examining all anti-depressive treatments for PD found a significant positive effect with selective serotonin reuptake inhibitors (SSRI) as a treatment for depression but also noted that SSRIs are associated with PD motor symptom changes and with interactions with motor symptom pharmacologic treatments (Dobkin et al, 2011).

Standard pharmacological treatment for anxiety is also not effective in people with PD (Weintraub et al, 2005) or has been found to exacerbate cognitive and motor symptoms (Hanagasi & Emrie, 2005; Wermuth & Bech, 2006; Mueller et al, 2018). Treatment of acute anxiety with benzodiazepines has been shown to be associated with a significant increase in falls (Martinez-Ramirez et al, 2015).

There is increasing interest in empowering people who live with chronic, degenerative disease to self-manage their symptoms (De Ridder, Geenen, Kuijer, & van Middendorp, 2008; Challis, Hughes, Berzins, Reilly, Abell, & Stewart, 2010). People with Parkinson's disease have been participating in self-management programmes for several decades, with goal-setting, education and guided problem-solving being shown to contribute to outcome (Kessler & Liddy, 2017). The psychosocial benefits of meeting other people with PD was demonstrated to be another important ingredient in encouraging patient engagement, emerging as a dominant theme in a qualitative study of participants' experiences of a self-help programme (Mulligan, Arps, Bancroft, Mountfort, & Polkinghorne, 2011).

Specialist nurses, Expert Patient Groups, access to group education and support have all been part of the drive to promote self-management in people with long-term conditions under the framework of the House of Care, a model developed within the 5 Year Forward View (NHS England, 2014). This model promotes the patient and carer as being engaged, informed and pro-active in self-managing their long-term condition, with the health professionals being highly committed to

collaborative care (Coulter, Roberts, & Dixon, 2013). Learning new coping skills to help people self-manage their long-term conditions is fundamental to this model.

There is growing interest in non-pharmacological interventions for mood-related symptoms in PD, including a systematic review and meta-analysis that found a significant effect of CBT for treating depression in CBT (Bomasang-Layno, Fadlon, Murray, & Himelhoch, 2015). Other non-pharmacological interventions, including dance therapy, physiotherapy, and voice training have been studied, but with limited effect sizes, heterogeneity of participants, disease stage and small sample sizes, clinical effectiveness cannot be rated (Bloem, de Vries, & Ebersbach (2015).

Mindfulness training has been shown to reduce distress in health conditions like cancer, type two diabetes, chronic pain and multiple sclerosis as well as to promote more adaptive ways of coping when faced with challenging health situations (Bogosian et al, 2015; Grossman, Niemann, Schmidt, & Wallach, 2004; Van Son et al, 2013). An underpowered, non-controlled pilot study assessing an 8-week mindfulness-based intervention in groups of people with PD and their caregivers, found a very small effect ($\eta^2=.3$) in reducing levels of self-report depression (Cash, Ekouevi, Kilbourn & Lageman, 2015), none the less, suggesting that mindfulness training may be helpful in improving psychological well-being in this population.

1.2 Intervention: Mindfulness Training

Mindfulness-based therapy is rooted in Buddhist tradition and aims to develop self-regulation of awareness and attention towards the present moment, and to becoming more open and accepting of experiences, however painful they may be. The goal of mindfulness-based training is not to change the experience of a person, but to change the way in which a person responds to experiences. Mindfulness-based training has been shown in many studies and reviews to be positively associated with changes in self-reported levels of mindfulness skills, which in turn have predicted better clinical outcomes (Chiesa et al, 2014; Alsubaie et al, 2017).

Different sorts of mindfulness-training have evolved – Jon Kabat-Zinn (1990) developed mindfulness-based stress reduction (MBSR) targeting chronic pain or anxiety disorders, using secular meditation techniques and gentle yoga exercises within a collaborative group setting. The facilitator encourages mindfulness attitudes of non-judgement, acceptance, beginner’s mind, curiosity and nonattachment amongst others, aiming at developing skills of noticing physical sensations, experiences, thoughts or feelings. A systematic review found that meditation studies for psychological stress and well-being had small to medium effects on anxiety, depression and pain (Goyal et al, 2014).

Mindfulness-based cognitive therapy (MBCT) was developed for people with relapsing depressive symptoms by CBT experts interested in helping people develop resilience (Segal et al, 2002; Kuyken et al, 2008). This training is also delivered over an 8-week period, usually in 2 hour-long sessions and in groups of up to 12 people, and shares many of the practices of MBSR, including a body scan and sitting and walking meditations, but focusing on understanding depression rather than stress. Participants are encouraged to identify automatic thinking patterns and to acknowledge them as just thoughts, allowing them to come and go, and not to ruminate. Unlike in traditional CBT, participants are gently directed to not challenge or replace thoughts but to see them as impermanent, and to practice activities that promote wellbeing and pleasure. Mindfulness-based training requires considerable commitment - participants are expected to practice for approximately an hour a day during the course and day retreats are recommended during and after the course ends, and each of the 8 weekly sessions includes an opportunity for participants to share their practice experience (Shapiro & Carlson, 2009).

1.2.1 Mindfulness-based interventions in clinical populations (physical health)

Mindfulness-based interventions were first implemented in people with chronic pain syndromes and it was found that following a MBSR intervention, levels of reported pain and mood had improved (Kabat-Zinn, 1982; Chiesa & Serretti, 2010). Cancer patients have also reported significant gains in psychological well-being

following mindfulness training (Bränström et al, 2010) and there is promising evidence of mindfulness being positively correlated to cardiovascular health outcomes (Loucks et al, 2015).

Mediation studies of mechanisms of mindfulness in interventions for people with physical health conditions have also contributed to conceptualising how the process effects change in psychological outcomes: Bogosian et al's (2016) pilot RCT study of a mindfulness intervention for people with multiple sclerosis used mixed methods to explore putative mediators, and found that decentring had the largest mediating effect on distress and that self-compassion increased, but at a slower rate.

1.2.2 Mindfulness-based interventions for people with Parkinson's disease

While mindfulness training has been shown to improve the psychological well-being of people with mental health problems, stress, cancer, as well as of people with chronic, progressive diseases like multiple sclerosis (Bohlmeijer, Prenger, Taal, & Cuijpers, 2010; Bogosian et al, 2015), there have been very few studies that have examined if people with PD benefit from MBIs. A pilot study of a mindfulness-based stress reduction group therapy intervention including people with Parkinson's disease and their care-givers demonstrated significant improvements in depression symptoms and self-reported everyday cognitive functioning, as well as mindfulness levels, for all participants (Cash et al, 2016).

The experiences of people with PD who participated in another mindfulness-based cognitive therapy course were examined qualitatively and revealed that the intervention enabled better coping through changing ways of coping and adapting existing coping skills, including reducing social avoidance. This study also found that mindfulness meditation enabled the participant to temporarily experience a freedom from the physical constraints of their PD (e.g. a reduction in tremor when meditating). The participants (n=12, with 11 completers) reported that they found the intervention both acceptable and beneficial (Fitzpatrick, Simpson & Smith, 2010).

Alternative treatments appear to be welcomed by people with PD, but they remain under-researched (Frisina et al, 2008). Mindfulness training has been demonstrated to improve psychological and physical well-being in a variety of health conditions, and has shown promising benefit to people with neurological conditions including some pilot studies in people with PD. Examining which mechanisms of MBIs have the most effect in this population would enable more targeted and effective interventions.

1.2.3 Theories of Mindfulness

Whilst empirical evidence of the benefits of mindfulness-based interventions has been demonstrated, there is a lack of theoretical consensus as to how mindfulness practice effects these changes or how best to measure the constructs within those theories. Metacognitions, attentional focus, emotion regulation and neurobiological processes have all been hypothesised to mediate in the relationship between mindfulness training and well-being outcomes. There is also an increasing contribution from neuroscientists, examining structural and functional differences and changes in people who are expert meditators and naïve participants undergoing mindfulness training. Each study adds to the understanding of how mindfulness interventions may be effective in promoting well-being, but at the same time, the wide-ranging concepts and neural correlates implicated highlight the complexity of the effect of this seemingly outwardly simple practice.

Meditation practice is frequently described as paying attention purposely and without judgement in the present moment (Kabat-Zinn, 1990), and attention plays a central role in many explanatory frameworks (Table 1): for instance, Shapiro, Carlson, Astin, & Freedman, (2006) posit that attention, intention and attitude are the umbrella components of mindfulness, and while there is no definitive model of mindfulness processes, there are common constructs that are theorised to be key ingredients (Table 2) and semantic differences require that their fundamental characteristics are made explicit. This present study will focus on Shapiro et al's 2006 model of mindfulness process, which includes five distinct psychological constructs which predict psychological health outcomes: decentring, or re-

perceiving, being the meta-mechanism which in turn predicts four further mechanisms: values clarification, self-regulation, cognitive/behavioural flexibility and exposure (Figure 1).

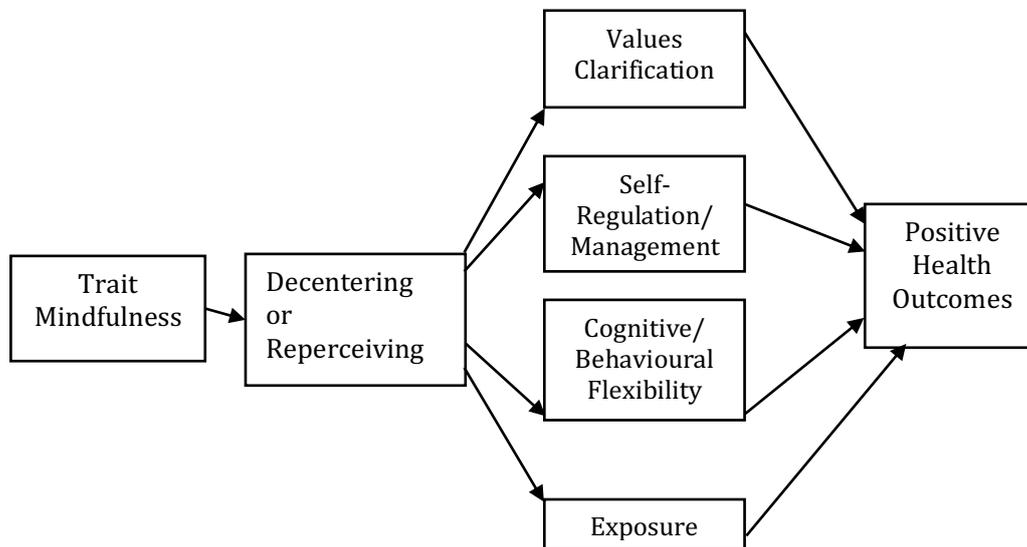


Figure 1. Shapiro et al's (2006) theoretical model of mindfulness mechanisms

In this model, reperceiving or decentering, is described as the shift in perspective that distances oneself from thoughts and feelings, which in turn is posited as the mechanism that mobilises the other four. Values clarification has been suggested as leading to increased value-led behaviour, through changing from acting reflexively to reflectively (acting impulsively to acting thoughtfully) and with self-compassion. Self-regulation refers to the monitoring and adaption of behaviour, including reduction in avoidance behaviours, to achieve goals. Having flexibility in cognitive and behavioural functioning involves being aware of the environment and responding appropriately. Exposure implies the ability to manage uncomfortable and negative emotional states and is associated with distress intolerance and the intolerance of uncertainty (Dugas, Gosselin, & Ladouceur, 2001; Shapiro et al, 2006; Simons & Gaher, 2005). Decentring has been shown to increase more following mindfulness training than after two other relaxation techniques (progressive muscle relaxation and loving kindness meditation) (Feldman, Greeson, & Senville,

2010), and mindfulness and decentring scores were shown to be strongly correlated and predictive of psychological symptom change in a MBSR intervention (Carmody, Baer, Lykins, & Olendzki, 2009). This last study demonstrated that values clarification and cognitive/behavioural flexibility mediated the relationship between the combined mindfulness and decentring scores, and psychological distress scores, but not levels of self-regulation and experiential avoidance.

There is a proliferation of models that have been posited to describe the constructs included in possible mechanisms of change, some of them described in Table 1. While there is no definitive theory of how mindfulness affects change, authors have suggested different constructs that may play a part in the process. With reference to the original description of the state of mindfulness as of being in the present moment, with an attitude of non-judgement, attention is considered to be a fundamental mechanism which is developed by changes to trait mindfulness through training. Paying attention to the present moment, both reduces rumination on past events, and reduces worry about future events. Increased emotional regulation, or non-reactivity, is another construct widely held to be an important outcome of MBIs and is closely associated with acceptance. Exposure is another construct that is included in both Shapiro et al's 2006 model and that of Hölzel, Lazar, Gard, Schuman-Olivier, Vago, & Ott (2011), and has been linked to intolerance of uncertainty, a construct that is increasingly examined in psychopathology. Neuro-imaging studies, particularly those using functional magnetic resonance imaging (fMRI), can contribute to our understanding of the mechanisms of MBIs by adding to evidence that had previously been exclusively self-report, however, there remains much heterogeneity in samples and methodology (Young et al, 2017).

TABLE 1. MODELS OF MECHANISMS OF MINDFULNESS			
Model	Authors	Key constructs	Empirical evidence
Psychological	Shapiro, Carlson, Astin, & Freedman (2006)	Attention, intention and attitude. Decentering is meta-mediator between mindfulness and symptom change, with values clarification, self-regulation, cognitive/behavioural flexibility, exposure. (see figure 1.)	Carmody, Baer, Lykins, & Olendzki (2007). Found that values clarification and flexibility were mediators, but not self-regulation and experiential avoidance. Brown, Bravo, Roos, & Pearson (2014). Tested the Shapiro et al model of mediation in a college student sample using the Five Facets of Mindfulness measure (Baer, Smith, Hopkins, Krietemeyer, & Tony, 2006). Four out of five of their facets predicted higher decentering which in turn predicted the mediators and the psychological outcomes.
	Lindsay & Creswell (2015, 2016)	Monitoring and Acceptance Theory: Training increases attention and acceptance.	Baer, Carmody & Hunsinger, (2012) -evidence that monitoring skills (part of attention) are cultivated faster than acceptance skills.
Neuroscience	Hölzel et al, 2011	The enhanced self-regulation model Reappraisal, exposure, extinction, reconsolidation. Reperceiving or decentering.	Farb et al (2007) – brain activity study showed mindfulness group had changes in medial prefrontal cortex interpreted as higher body awareness and greater detachment from self. Hölzel et al, 2011. Structural changes in grey matter after mindfulness training.

	Tang, Hölzel & Posner (2015)	<p>Emotion regulation Mindfulness training equivalent to exposure therapy, mindfulness enhances ability to extinguish conditioned fear.</p> <p>Attention, emotional processing and regulation, exposure, self-awareness.</p>	Pickut et al, 2013. Grey matter density increased in MBI group, example of neuro-plastic changes in structure and function of brain areas involved in attention, emotion and self-awareness regulation.
	Young et al, 2017	The insula, a region of the frontal lobe, is associated with enhanced present moment awareness .	fMRI images have shown increased activity in insula following mindfulness training.

Table 2. Constructs included in this study, with evidence of mediation role

Construct and equivalent in Shapiro's model	Shown to be a mediator between MBI and psychological outcomes
Acceptance - flexibility	Bogosian, Hughes, Norton, Silber, & Moss-Morris, 2016 Lin, Klatt, Mccracken, & Baumeister, 2018
Decentering - re-perceiving	Bogosian, Hughes, Norton, Silber, & Moss-Morris, 2016 McCracken, Barker, & Chilcot, 2014 Brown, Bravo, Roos, & Pearson, 2015 Franquesa et al, 2017
Self-compassion - values clarification	Bogosian, Hughes, Norton, Silber, & Moss-Morris, 2016 Gu, Cavanagh, & Strauss, 2017
Mindfulness - self-regulation and attention	Lau, Leung, Wing, & Lee, 2017 Gu, Cavanagh, & Strauss, 2017 Bränström, Kvillemo, Brandberg, & Moskowitz, 2010 Franquesa et al, 2017
Exposure - intolerance of uncertainty	NONE – except Brown, Bravo, Roos, & Pearson, 2015 used distress tolerance scale (Simons & Gaher, 2005).

2 MEDIATION ANALYSIS

Mediation analysis aims to discover the active therapeutic ingredients of a treatment for a particular population – in this case through examining which particular elements of the mindfulness intervention and process effect changes in the psychological outcomes of people with PD. The focus of the analysis should be informed by theory, supported in the literature, and also be plausible in the target population (Kazdin, 2007). Temporal differences in change, with the mediator showing an effect before the outcome, strengthens any causal chain claim (Kraemer, Wilson, Fairburn, & Agras, 2002), and mediation can be inferred without a statistically significant main effect (Hayes & Rockwood, 2017). Key ingredients are important as traditional mindfulness is a broad instrument, and there may be aspects of the therapeutic process that work better, while others may be iatrogenic, or may suppress the benefits of others (Johnson & Wade, 2017).

This study will examine five potential mediators – four included because they have been demonstrated in a similar neurological or long-term condition to mediate between trial arm and psychological well-being outcomes, and one a construct that has been theoretically and empirically demonstrated to be associated with psychological distress and with people with Parkinson’s disease.

2.1 Putative Mediators in the Present Study:

A randomised controlled pilot trial of a mindfulness cognitive behavioural therapy-based intervention on several common non-motor symptoms in people with Parkinson’s disease (protocol in Bogosian et al, 2017), included depression and anxiety as primary outcomes and fatigue, pain and insomnia as secondary outcomes. These symptoms are commonly reported by people with Parkinson’s disease (Barone, 2009; Tagliati et al, 2015) and have been shown to be potentially modifiable with non-pharmacological interventions (Harrison, McCracken, Bogosian & Moss-Morris, 2014; Bogosian et al, 2015; Romenets et al, 2013; Videnovic, 2017). This secondary analysis will explore some putative mediators in the relationship between a mindfulness-based intervention and the primary

outcomes, depression and anxiety scores, in people with Parkinson's disease, aiming to understand the mechanisms of any intervention effect, and to inform any future large-scale study. Exploring the mechanism of therapeutic change involves exploring mediation, moderation and mediated moderation analyses, to understand the processes that lead from intervention to outcome (Kazdin, 2007). Each of these processes will be examined in turn.

Mechanisms of mindfulness that have previously been demonstrated to mediate the intervention effect on distress in people with other chronic, and incurable diseases, (decentering, acceptance, self-compassion and mindfulness levels) are included (eg: Bränström et al, 2010; Bogosian et al, 2016). Bogosian et al (2016) suggested that there were unmeasured mediators in their study of the effects of an MBI on people with MS, as three out of the four mediators only explained a small amount of variance in the outcomes. To explore further possible mediators, intolerance of uncertainty, a construct that is relevant both theoretically in mindfulness literature (Kraemer, O'Bryan & McLeish, 2016), and clinically in Parkinson's disease studies (Brown & Fernie, 2015), but which has not been explored as a putative mediator in mindfulness-based interventions for people with PD with psychological outcomes, is introduced.

Each included mediator will be described in detail – and is shown in Figure 2.

2.1.1 Acceptance

Mindfulness research defines acceptance differently to coping literature – wherein worse outcomes may follow acceptance or relinquishment (Reed, Kemeny, Taylor 1994). In mindfulness, acceptance is likened to willingness, and increasing acceptance of conditions/symptoms has been shown to be effective in improving adjustment to chronic pain (McCracken, 1998). Lindsay & Creswell (2016) describe acceptance as being the lens through which monitoring of experience takes place, a perspective in how monitoring is undertaken.

In PD, like other chronic illnesses, acceptance may be an important part of better adjustment, but it may have to follow changes in other mindfulness processes. Bogosian et al (2016) found that people with MS took longer to develop acceptance than decentering.

2.1.2 Decentering

Decentering can be described as not becoming caught up with thoughts – but acknowledging them and responding consciously, not reacting or avoiding them. Decentering has been shown to be an important mediator between mindfulness training and emotional distress in people with chronic, progressive illness (Bogosian et al, 2016). Shapiro et al's 2006 model of the mechanisms of mindfulness proposes that re-perceiving (or decentering, Safran & Segal, 1990) is the meta-mechanism of action: it is through this process that the other mechanisms lead to change in outcomes. They argue that decentering is part of the developmental process, and that mindfulness practice further develops the ability to detach from one's personal internal experience, strengthening the observing self, experiencing without judgement (Shapiro & Carlson, 2009).

Shifting perspective enables people with chronic illness to maintain an identity beyond their health condition: being able to acknowledge thoughts and emotions about the illness but being able to maintain a distance that allows more choice in how to pursue those emotions and thoughts. A study including people with multiple sclerosis (MS) (Bogosian et al, 2016) suggested that decentering was a mediating mechanism that acted before acceptance, and that decentering was the largest change and largest mediating effect between the mindfulness intervention and anxiety and depression scores, both immediately after the intervention and at the 3-month follow-up.

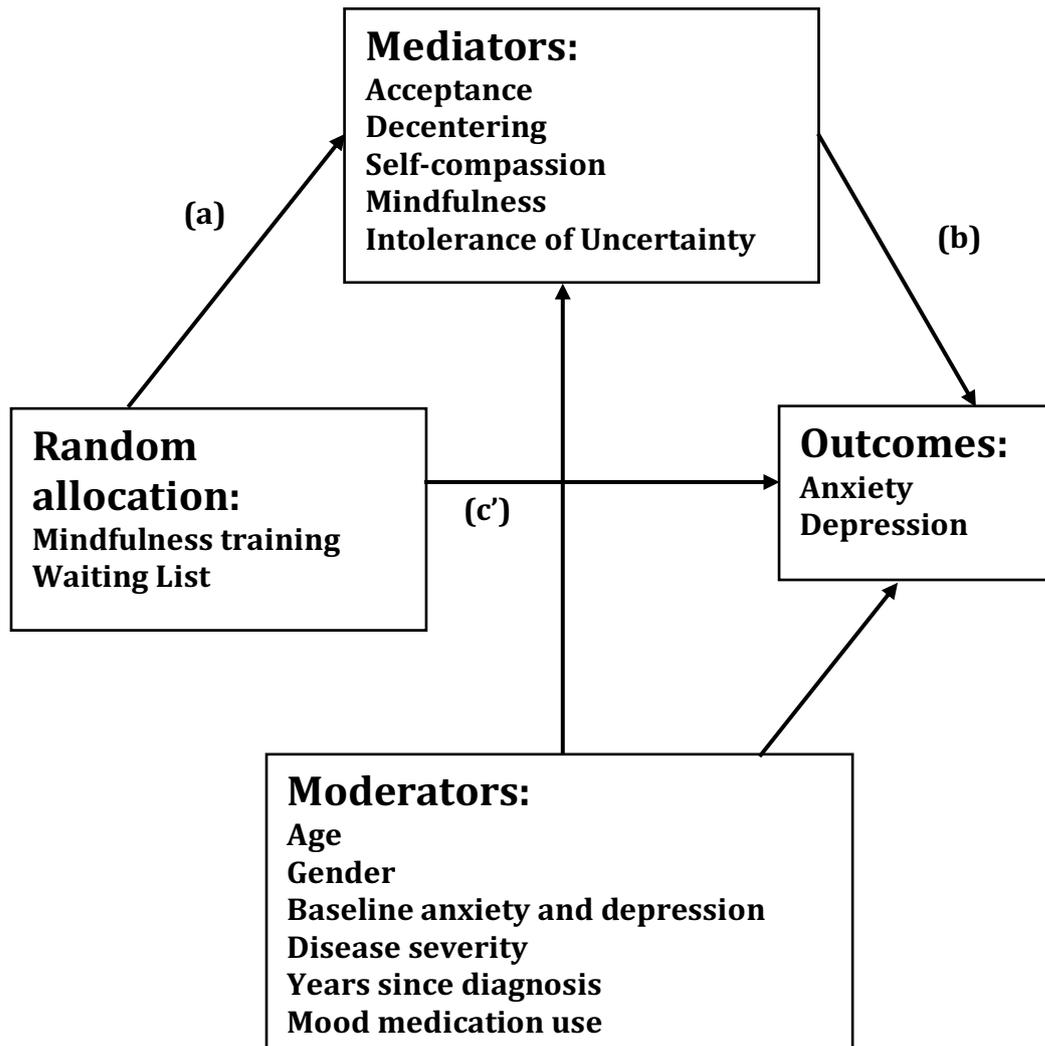


Figure 2. Diagram showing the expected associations between random allocation and outcome, between putative mediators and outcome, and measured covariates. (c') represents the direct effect, and (a) and (b) represent the indirect effect. The moderators have an effect on both the mediators and the outcomes.

2.1.3 Self-compassion

Self-compassion has been defined as “an orientation of mind that recognizes pain and the universality of pain in human experience and the capacity to meet that pain with kindness, empathy, equanimity and patience. While self-compassion orients to our own experience, compassion extends this orientation to others’ experience” (Feldman & Kuyken, 2011, p145). Kirstin Neff describes three components of self-compassion: self-kindness, common humanity, and mindfulness, and considers the construct to be closely related to self-regulation (Neff 2003a). Self-compassion has

been shown to be positively correlated with age, to psychological well-being and to be a moderator of the relationship of self-rated health and depression (Homan, 2016).

Randomised controlled trials of mindfulness-based interventions for people with depression (Kuyken et al, 2010) and chronic fatigue (Rimes & Wingrove, 2011), showed increases in both mindfulness levels and levels of self-compassion which mediated the effects of the MBCT intervention on outcomes, and which were maintained at follow-up of 15 months and 6 months respectively.

The association between mindfulness and self-compassion was also shown to have long-term effects in other studies, with mindfulness predicting significant increases in self-compassion in an RCT of an MBCT intervention for chronic fatigue being maintained at 6 months (Rimes & Wingrove, 2011) and both mindfulness levels and self-compassion mediating the effect of an MBCT intervention at 15-month follow-up (Kuyken et al, 2010).

However, Chiesa, Anselmi, & Serretti (2014) suggest that more studies are needed to investigate the relationship between mindfulness, self-compassion and clinical outcomes, to determine if self-compassion is a mediator or if it has a direct effect on clinical outcomes. The temporal ordering of self-compassion may be significant in determining whether it is a mediator - Bogosian et al (2016) found that self-compassion had a small effect after an 8-week mindfulness intervention for people with MS, but a moderate effect at follow up (12 weeks) and concluded that self-compassion takes longer to develop than other mediating mechanisms, such as decentring and acceptance.

2.1.4 Mindfulness skills

Self-reported trait mindfulness levels have been shown to be higher in people who are expert meditators (Brown, Ryan, & Creswell, 2007). Increases in levels of mindfulness skills are correlated to increases in self-compassion, as well as to decreases in rumination and trait anxiety (Shapiro, Brown & Biegel, 2007), in mental

health populations (Dobkin, 2008) and improvement in symptoms in physical health populations including people with breast cancer (Dobkin, 2008), chronic pain (McCracken & Gutierrez-Martinez, 2011), and irritable bowel syndrome (Ljotsson, Hedman, Lindfors et al, 2011). A systematic review of mindfulness-based interventions in people with physical and/or psychological conditions found that changes to mindfulness levels were associated with better outcomes (Alsubaie, 2017).

It has been suggested that increases in levels of mindfulness are specific to mindfulness-based interventions and that active control groups undergoing therapies (such as progressive muscle relaxation) do not experience this level of benefit (Kuyken et al, 2010). Many measures have been produced to evaluate baseline and changes in mindfulness levels and skill acquisition – all are self-report with the additional difficulty that mindfulness as a concept is highly subjective and tends to higher social desirability bias (Jensen, 2012). Assessing mindfulness skills indirectly by evaluating changes in attention skills has only demonstrated small effects (Jha et al, 2007).

2.1.5 Intolerance of Uncertainty

The construct of intolerance of uncertainty (IU) has been defined as the tendency of an individual to consider the possibility of a negative event as unacceptable (Carleton, Sharpe, & Amundson, 2007) and has been demonstrated to be a dispositional risk factor for developing and maintaining significant levels of both anxiety and depression (McEvoy & Mahoney, 2011; Boswell, Thompson-Hollands, Farchione, & Barlow, 2013). Most recently IU has been a focus in General Anxiety Disorder studies, being the target of some effective therapeutic interventions (Robichaud, 2013), but it has also been found to be trans-diagnostic across mental health conditions – Talkovsky & Norton (2016) demonstrated that a reduction in IU was predictive of clinical improvement across a variety of mental health diagnoses.

Uncertainty about future events has been associated with worry and anxiety, whilst the feelings of uncontrollability about the future are associated with depression.

However, the high comorbidity of anxiety and depression indicates that the two mechanisms are closely associated (Grupe & Nitschke, 2013). Functional Magnetic Resonance Imaging (fMRI) has demonstrated that the Anterior Insula, implicated in subjective emotional awareness, becomes overactive when presented with uncertain negative threats. Grupe and Nitschke report that this over-activation is one of the most frequent neuroimaging findings in common anxiety disorders like social anxiety and fear conditioning and leads to avoidant behaviours and maladaptive decision-making.

A mediation analysis found that IU mediated the association between distress intolerance and worry (Kertz, Stevens, McHugh & Björgvinsson, 2014), and distress intolerance significantly mediated the relationship between decentering and psychological outcomes in a college student sample (Brown, Bravo, et al, 2015).

As IU is frequently included in modern anxiety disorder models, representing a fear of the unknown (Carleton, 2012) it may be particularly salient to people who have a chronic disease. Parkinson's disease is progressive and has an unpredictable and uneven course: some people may eventually have cognitive deterioration, some not; some of the motor symptoms make social interaction very difficult, and this can be exacerbated by non-motor symptoms which may be embarrassing and debilitating (Maffoni, Giardini, Pierobon, Ferrazzoli, & Frazzitta, 2017). There is an increasing lack of agency as the disease progresses and drug treatment becomes more refractory which adds to the uncertainty experienced by people with PD.

IU has been found to be related to motor fluctuations in PD, along with metacognitions, anxiety and distress (Brown & Fernie, 2015). As drug interventions gradually lose effectiveness in people with PD, both motor and non-motor symptoms fluctuate in severity and occur unpredictably. The impact of the uncertain trajectory of this disease was illustrated by the autobiographical narratives of 23 people with PD, which when qualitatively examined suggested that uncertainty was related to trust, specifically in trust in their bodies (they may fall, symptoms are unpredictable), in their identity (no longer comfortable driving,

lacking self-confidence) and in the outside world (outside home is no longer familiar) (Nijhof, 1999).

Buddhist tradition teaches that impermanence is central to life, that every experience and emotion eventually passes, whether painful or pleasurable, and becoming aware of this ephemeral nature of all experience can lead to freedom from the Western concerns over controlling future events (Shapiro & Carlson, 2009). Shapiro's model of mindfulness processes includes exposure, which is described as learning to live with emotions and body sensations, to accept them as being transitory. Psychopathology literature defines exposure as an increasing tolerance of fear stimuli, or the extinction of fear response and avoidance behaviour, with the growing awareness of the lack of catastrophic consequences (Baer, 2003). This process is also part of emotion regulation, in the way that re-perceiving body sensations and emotions from a less threatening perspective increases tolerance. A systematic review and meta-analysis of mediation studies of MBIs designed to improve mental health and well-being described six mindfulness models, four of which included exposure as a possible mechanism (Baer, 2003; Brown et al, 2007; Shapiro et al, 2006; Hölzel et al, 2011), however, none of the 20 included studies tested exposure as a mediator (Gu, Strauss, Bond & Cavanagh, 2015).

Distress tolerance has been posited as a close proxy for exposure (Brown et al, 2015); a college student sample study examining the relationship of a multi-dimensional model of the five facets of mindfulness (Baer et al, 2006) with Shapiro's model of mindfulness mechanisms found that decentring only partially mediated between the associations among the facets and psychological health outcomes, and that distress tolerance was a significant mediator. The authors reported that non-judging of inner experience, one of the five facets of mindfulness, was most strongly related to exposure, as measured by distress tolerance, which in turn was substantially related to both stress and anxiety symptoms.

Distress tolerance has been theorised to include five lower-order constructs – uncertainty, ambiguity, physical discomfort, frustration and negative emotion

(Zvolensky, Vujanovic, Bernstein, & Leyro, 2010; Bebane, Flower & Maltby, 2015). When the relationship between four cognitive constructs, including anxiety sensitivity, distress tolerance and discomfort tolerance, and anxiety psychopathology, were investigated in two non-clinical samples, intolerance of uncertainty was consistently, and significantly more robustly, associated with the symptoms (Norr, Oglesby, Capron, Raines, Korte & Schmidt, 2013). The utility of the IU construct as a trans-diagnostic maintaining risk factor in psychopathology has been supported by a clinical review by Vander Haegen & Etienne (2016) with the recommendation that IU be incorporated both in research and as a specific treatment target.

More recently IU has been shown to be a mediator in the relationship between a mindfulness-based intervention and health anxiety in a student sample (Kraemer et al, 2016), suggesting that increased levels of mindfulness lead to physical symptoms of anxiety being perceived as less threatening. IU has also been shown to explain unique variance in social anxiety, obsessive compulsive disorder and worry symptoms (McEvoy & Mahoney, 2011).

As IU is associated with both the development and maintenance of worry (Buhr & Dugas, 2002; Buhr & Dugas, 2006) and rumination (Julien et al, 2016), and mindfulness-based training has been shown to reduce levels of worry (Fisak & von Lehe, 2012) and rumination at follow-up (Philippot et al, 2012), it is hypothesised that mindfulness interventions would have a similar association with reduction in IU, as mindfulness training includes attending to the present moment rather than worrying about the future.

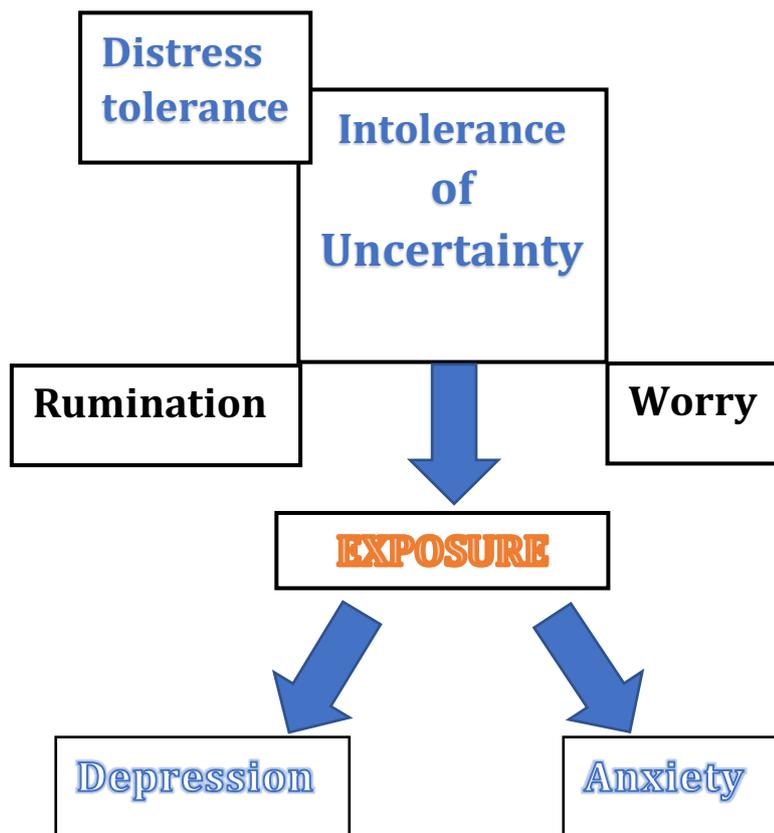


Figure 3. Simple model showing associations of constructs associated with intolerance of uncertainty and exposure as a potential mindfulness process of change

People with Parkinson’s live with an uncertain future; their disease progression and pharmacological treatment effects are unpredictable. A Priority-Setting Partnership between people with PD, their families and caregivers, and professionals clinically involved with people with PD, identified management of stress and anxiety as the second most pressing research area (the first was management of balance and falls, another area that provokes anxiety and uncertainty). These were ranked higher as areas of research aspiration than dementia, mild cognitive problems, fine motor skills and urinary difficulties (Deane et al, 2014).

2.2 Moderators

Possible moderators of the relationship between the trial arm and anxiety and depression in people with PD will also be examined (see Figure 2). Moderation analysis examines whether the intensity of the response to the intervention differs between different people in the trial and helps to establish which subsets of a population may be more or less susceptible to the therapeutic effects. Moderated mediation examines whether any of the constructs proposed as mediators are more or less responsive to the intervention, thus identifying whether certain mediators, or elements of mindfulness, may be better intervention targets for people with certain clinical or demographic features. For instance, a correlation analysis of a student sample MBI found gender differences: only women had greater reduction in negative affect and this was significantly associated with increases in levels of mindfulness and self-compassion (Rojiani, Santoyo, Rahrig, Roth, & Britton, 2017), and this gender effect was also replicated in an RCT at 15-month follow-up (Kuyken et al, 2010).

In this study, age, gender, disease severity (self-report), time since diagnosis and mood medication use were chosen as possible moderators to explore if any of these factors influenced the effect of the intervention on anxiety and depression directly, or the effect of the trial arm on the putative mediating variables, which would help identify who would most benefit from aspects of the MBI. Age of the person with PD, their disease severity and level of disability, and disease duration, have been found to be important factors in health-related quality of life in people with PD (Soh et al, 2010), and women with PD have reported more mood pathology than men (Martinez-Martin et al, 2012). Psychogenic medication use was also included, to explore for possible moderation on either the direct effect of the intervention on the psychological outcomes or the indirect pathway to any of the mediator variables.

There is an indisputable need for effective interventions to reduce the non-motor symptoms of people with PD, including psychological distress, and MBIs are beginning to be explored as training for people with long-term conditions to better manage their symptoms and improve well-being. However, there is little evidence

of moderation analysis within the MBI literature; a recent systematic review that included 18 studies that examined mediators in MBIs with people with either comorbid psychological and physical health problems, or psychological conditions, did not report on any moderating variables (Alsubaie et al, 2016). Yet traditional mindfulness courses are cognitively, emotionally and sometimes physically, arduous for people with health conditions, and tailored, disease-specific interventions may improve outcomes and retain more participants. Mediation and moderation analyses explore the how and for whom interventions have an effect – and this exploratory study of pilot trial data will examine the implications of those analyses.

2.2.1 Research questions

1. Do the putative mediators (acceptance, decentering, self-compassion, mindfulness skills and intolerance of uncertainty change significantly at mid intervention (4-weeks), post intervention (8-weeks) and follow-up (20 weeks) for the mindfulness and the waiting list control groups and are the changes in these putative mediators associated with changes in treatment effect?
2. Can the changes in the putative mediators at the end of the treatment predict change in distress at final follow-up (i.e. change in mediator precedes change in distress) or is change in mediators and anxiety and depression concurrent?
3. Are there sub-sets of people with PD for whom the mindfulness intervention may be more effective?

3 METHODS

3.1 Design

The present study aimed to explore putative mediators of the relationship between a mindfulness intervention and changes to levels of distress in people with Parkinson's disease. The mediators included decentering, acceptance, self-compassion, mindfulness skills and intolerance of uncertainty based on the analysis of past literature on MBIs. Possible moderators of the main and indirect effects of trial arm on psychological outcome were also explored, and included time since diagnosis, age of participant, gender, mood medication use and self-report levels of disability at baseline.

Ethics approval was granted by the psychology committee, City, University of London, before the start of the study (ethics reference number PSYETH (S/F) 15/16 112).

3.1.1 Participants

Recruitment of participants was through advertisements placed in spring 2016 on the Parkinson's UK and the Michael J. Fox Foundation websites.

Inclusion criteria required a PD diagnosis by a neurologist or geriatrician (according to UK PD Brain Bank Criteria (Hughes, Ben-shlomo, Daniel, & Lees, 1992; Gibb & Lees, 1988); having home internet access; being able to communicate fluently in English; and to report having been on a stable dose of PD medication or mood medication for at least a month.

Participants were excluded after the initial telephone contact with the trial coordinator if they had severe cognitive impairments, indicated by a score of 20 or lower in a Telephone Interview for Cognitive Status instrument (modified version, TICS-M (Brandt, Spencer, & Feldstein, 1993)) or if they had a severe hearing impairment which would make participation difficult. Participants who had serious psychiatric conditions (e.g. psychosis) or who had current drug and or alcohol

abuse, were also excluded. People who were participating in psychological therapy, or who had previously participated in formal mindfulness training, or who currently practiced meditation, were also excluded, to avoid any contaminating effects of past experiences.

3.1.2 Procedures

Information about the trial, both in written (postal) and verbal form, was shared and discussed with the participants, who were invited to consult with friends and family, and the trial researchers if required, before signing the consent form.

Baseline measures were obtained before randomisation via online questionnaires, and further online measures were taken from both groups at 4 weeks (mid intervention), 8 weeks (end of intervention), and 20 weeks (follow-up).

3.1.3 Randomisation

Each participant was randomly allocated to a single treatment group (mindfulness-based intervention (MBI) group *versus* waiting list control (WLC) group) by using a computer-generated randomly permuted blocks scheme. The randomisation scheme was generated using the randomization.com website (<http://www.randomization.com>). Since this project aimed to recruit 60 participants with fixed balanced groups of 10 participants for each treatment group (MBI *versus* WLC), 60 participants were randomised to 6 blocks of 10 participants. This plan was generated using the following parameters: 10 participants per block, 6 blocks and MBI and WLC as the treatment labels. The seed to reproduce this plan is 19033. This randomisation scheme allowed for keeping the groups in similar sizes, ensuring that the number of participants on each treatment group was roughly equal at any time during the trial.

Because there was a very positive response to the call for participants, an extra 20 participants were later recruited for the study following the same randomisation plan as described above, bringing the total number of participants to 78 (MBI n =

38, WLC n = 40). To generate this randomisation plan, the number of participants entered per block was 10 and the number of blocks entered was 2 using the treatment labels MBI and WLC. The seed to reproduce this plan is 15391.

3.1.4 Intervention

The MBI consisted of 8 one-hour-long sessions on a weekly basis, delivered by videoconference (via Skype) to groups of 5 participants. The same facilitator, AB, who ran all the groups, had experience of delivering such courses for people with long-term neurological conditions. Participants were given support in setting up Skype and the group sessions were arranged for a mutually convenient time and day of the week.

Further details of the intervention protocol are reported elsewhere (Bogosian, Hurt, Vasconcelos e Sa, Hindle, McCracken & Cubi-Molla, 2017).

3.2 MEASURES

All participants were invited to complete online questionnaires measuring self-reported psychosocial outcomes and putative process or mechanisms of mindfulness measures. All questionnaires were completed at baseline, 4 weeks, 8 weeks and 20 weeks (T1, T2, T3, T4), apart from the demographics questionnaire and the Parkinson's Activities of Daily Living Scale (PADLS) that were only completed at T1. Included measures were selected to evaluate mechanisms that had already been shown to be mediators in similar intervention studies with chronic illness participants (eg: Bogosian et al, 2016), or were theorised to measure constructs relevant to people with Parkinson's disease and which may be part of any causal chain between a mindfulness intervention and improved levels of distress, as discussed in introduction.

Where appropriate, Cronbach's alpha was calculated to assess internal consistency in the measures (following reversal of appropriate items per scale), with 0.70 and above considered adequate, and below 0.70 considered questionable (DeVellis,

2012). Scales with fewer items will have a lower Cronbach's alpha, and alphas that are over 0.95 could indicate redundant and overlapping scale items (Cronbach, 1951; Tavakol & Dennick, 2011). If the baseline Cronbach alpha score was below 0.70, removal of questionnaire items was examined to see if there was any impact on the consistency score (Appendix B1).

3.2.1 Baseline self-report disability

Parkinson's Disease Activities of Daily Living Scale (PADLS) (Hobson, Edwards, & Meara, 2001)

A very brief (1 minute approximately), self-report, five-item scale that assesses patients' perceptions of how difficult they are finding activities of daily living in the previous month whilst living with PD, was completed at baseline only. It has been used in this study to evaluate homogeneity in the groups' perceptions of disability and as a predictor of treatment outcome. This scale gives an indication of disease severity level and can be used as a proxy for total motor and non-motor symptom burden (Hobson et al, 2001; Jonasson, Hagell, Hariz, Iwarsson, & Nilsson, 2017). Participants are asked to tick one box that best describes how their Parkinson's disease has affected their day-to-day activities in the last month with five options ranging from no difficulties to extreme difficulties with day-to-day life. Ticking number 3, "moderate difficulties with day-to-day activities", also includes the description: *"your Parkinson's disease is interfering with your daily activities. It is increasingly difficult to do simple activities without some help such as rising from a chair, washing, dressing, shopping, housework. You may have some difficulties walking and may require assistance. Difficulties with recreational activities or the ability to drive a car. The medication is now less effective"*. The PADLS has been shown to correlate with clinical ratings of disease severity ($r=0.68$) and disease duration ($r=0.39$) (Hobson, 2001). As this is a single item scale (with five possible answers), Cronbach's alpha cannot be calculated.

3.2.2 Primary outcome measure

Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983)

A fourteen-item self-report scale that measures anxiety and depression and is extensively used in both primary and secondary medical settings (Wilkinson & Barczak, 1988). Anxiety and depression can be rated separately, each measured by 7 items, and the HADS has been shown to be effective in assessing the severity of anxiety and depression (Herrman, 1997). One of four possible responses to each item gives a score from 0 to 3, with 0 as no impact and 3 indicating the most severe level. An example of a depression item is “5. *I have lost interest in my appearance, with possible answers – Definitely; I don’t take as much care as I should; I may not take quite as much care; I take just as much care as ever*”. The anxiety and depression subscales scores each range from 0-21 with higher scores indicated higher levels of anxiety or depression. A cut-off of 8 or more on each subscale indicates clinical levels and 11 is considered the cut-off for caseness (Crawford, Henry, Crombie, & Taylor, 2001; Snaith, 2003). Internal reliability for the anxiety and depression scales have been reported as good (Cronbach alphas were 0.83 and 0.82 respectively (Bjelland, Dahl, Haug & Neckelmann, 2002)). In the present study the Cronbach alpha for the anxiety scale was 0.83 and for the depression scale 0.76, within the acceptable range.

3.2.3 Putative process measures

Experiences Questionnaire (EQ) (Fresco, Moore, van Dulmen, Segal, Ma, Teasdale, & Williams, 2007)

The Experiences Questionnaire was designed to measure decentering – the ability to observe one’s thoughts and emotions as temporary, and as just thoughts and feelings, and not necessarily true (Safran & Segal, 1990). This skill is central to many of the facets of mindfulness, awareness and non-reactivity and is negatively correlated with the maintenance of depressive symptoms, including rumination (Watkins, Teasdale, & Williams, 2000). Twenty statements (e.g. “I remind myself that these thoughts aren’t facts”) are rated using a 5-point Likert scale of 1 “Never” to 5 “All the time”. Six of the items are reverse scored, and the possible range is from

20 to 100, higher scores representing better decentering ability. Initial validation reported a Cronbach alpha score of 0.90 (Fresco et al, 2007). The present study found a good level of reliability (Cronbach alpha =0.85).

Acceptance-Action Questionnaire (AAQ-II) (Bond, Hayes, Baer, Carpenter, Guenole, Orcutt, ... & Zettle, 2011)

This 10-item scale assesses acceptance, experiential avoidance and psychological inflexibility. Statements such as “2. *My painful experiences and memories make it difficult for me to live a life that I would value*” are scored with a 7-point Likert scale (1, “never true”; 7, “always true”). Seven of the items are reverse scored, the possible range is 10 to 70, with higher scores indicating better levels of acceptance. This second version of the widely-used scale has been demonstrated to have more stable internal reliability (Cronbach alpha mean =0.84, Bond et al, 2011). In this present study the Cronbach alpha value was very good (0.90).

Self-Compassion Scale – Short Form (SCS-SF) (Raes, Pommier, Neff, & Van Gucht, 2011)

This 12-item self-report questionnaire evaluates the levels of trait self-compassion, defined by Neff (2003; 2015) as the way in which people respond emotionally to pain and failure, awareness of being part of human experience, and the way in which suffering is attended to. Responders are asked to use a 5-point Likert scale where 1 is “almost never” and 5 is “almost always” to rate statements such as “2. *I try to be understanding and patient towards those aspects of my personality I don’t like*”. Scores range from 12 to 60, with higher scores indicating better levels of self-compassion. Internal reliability of the short-form of the scale has been shown to be good (Cronbach alpha = 0.86 (Raes et al, 2011) and in this present study the Cronbach alpha score was an acceptable 0.89.

Self-compassion was also demonstrated to be a better predictor of improvement in symptoms than mindfulness levels in a study (N=505, people with anxiety and depression) comparing the Mindful Awareness Attention Scale (MAAS) to the Self-compassion Scale (Neff, 2003a), indicating that there is overlap between these two

scales and also that measuring mindfulness with a single scale is problematic (Van Dam, Shepperd, Forsyth, & Earleywine, 2011).

Philadelphia Mindfulness Scale (PHLMS) (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008)

Present-moment awareness and acceptance, which the authors describe as the two most integral key components of mindfulness, are measured in a 20-item scale using a five-point Likert scale (1 “Never”, 5 “Very Often”). Even-numbered statements are reverse-scored to produce the acceptance sub-scale, for instance, 2. “*I try to distract myself when I feel unpleasant emotions*”. The awareness sub-scale comprises the odd numbered items such as “11 *When someone asks how I am feeling, I can identify my emotions easily*”. The range of scores is from 20 to 100, with a higher total indicating higher awareness and acceptance levels. Good reliability has been demonstrated at 0.86 in student samples (Cardaciotto et al, 2008), however in this present study, the reliability at baseline was below the acceptable level (0.70, Cronbach, 1951), with a Cronbach alpha at 0.61. Removing items would not have improved the alpha level to an acceptable level, so the reliability of the scale at 4 weeks (mid-trial), eight weeks (end of trial) and 20 weeks (follow-up) were calculated, and Cronbach’s alphas was found to be 0.69, 0.74 and 0.77 respectively. The mean Cronbach alpha over the four time points was 0.70, and therefore within the acceptable level.

Previous research had reported mindfulness skills as a similar construct to decentering, as both are theorised to influence non-reactivity (Carmody, 2009), but Hoge et al (2015) has differentiated them – identifying mindfulness as enhanced awareness with non-judgemental attitude, while clarifying decentering as a stance of psychological distance.

Intolerance of Uncertainty Scale-Short Version (IUS-12) (Carleton, Norton, & Asmundson, 2007)

This scale measures the tendency to find the possibility of a negative event happening unacceptable, a psychological state which has been associated with worry and anxiety. This short form of the original 27-item Intolerance of

Uncertainty Scale (Freeston, Rheume, Letarte, Dugas & Ladouceur, 1994) has 12 items that are rated by a five-point Likert scale (1 is “not at all characteristic of me”, 5 is “entirely characteristic of me”) and contains statements such as “7. *When I am uncertain I can’t function very well*”. No items are reverse scored, the scores range is 12 to 60, and a higher score indicates higher intolerance of uncertainty. Good reliability has been described – with a Cronbach alpha of 0.91 (Carleton et al, 2007a) and replicated in the present study (Cronbach alpha 0.89). Two subscales have been proposed: the prospective IU which is described as the desire for predictability and active engagement in seeking certainty, and the inhibitory IU which is the paralysis of cognition and lack of action when faced with uncertainty (Birrell et al, 2011), however, in this present exploratory study, the whole scale has been used.

3.3 Statistical Analyses

All analyses were undertaken in IBM SPSS Statistics Version 23.0. The PROCESS plug-in for SPSS (Release 2.16.3) was used to run the mediation and moderation analyses.

3.4 Descriptive statistics

3.4.1 Sample size

As this is a pilot trial, aiming to assess the feasibility of a full-size RCT, it is assumed that the trial will not have sufficient power to formally test for efficacy of the intervention (Eldridge, Chan, Campbell, Bond, Hopewell, Thabane, & Lancaster, 2016), despite exceeding the traditional pilot sample size of $n=30$ (Browne, 1995).

3.4.2 Missing data analyses

To check for any systematic differences between the missing values and the observed values, Little’s test of Missing Completely at Random (MCAR, Little, 1988) was undertaken and was found to be significant for the entire data set across time frames (Chi-square=346.91, DF=289, $p=0.011$) meaning that the assumption that all

the missingness in this study was completely at random cannot be supported. It is likely that the participants' non-motor symptoms (e.g. depression, fatigue) may have contributed to non-completion of all the questionnaires or to dropping-out of the trial. However, after running t-tests, no significant ($p < 0.05$) relationship was found between missingness in those variables with a minimum 5% missing, and gender, ethnicity, marital status, years since diagnosis, baseline disability, or baseline anxiety and depression. The reason for missingness may be related to unobserved participant characteristics (Missing Not at Random, MNAR) or more probably Missing at Random (MAR) where the presence of the data is conditional on an observed patient characteristic (Tabachnik & Fidell, 2007). The results of any of the analyses should therefore be interpreted with caution.

Some data were missing at baseline: participants were prompted if they omitted to answer any of the online questionnaire items, but they were not prevented from continuing without answering. Two items in the Exposure Questionnaire at T1 were omitted by two participants (0.0006% of the baseline data set). In the full data set, another 21 items within scales were missing. Items missing within questionnaires can be assumed to be MCAR, as the participant has probably skipped forward.

Three participants (two of whom dropped out by T2) omitted some of the questionnaires at baseline which totalled 2% of the entire baseline data set. Over the four measurement occasions, 29.49% of cases had missing values, with a total loss of 13.76% of data (see Table 3).

Table 3. Missing data

Item Level	21 items	0.07% of data base
Scale Level	4 entire scales	0.23% of data base
Time Point Level	42 time points	13.46% of data base

The groups differed in the amount of total missing scales (Table 4) with a far greater number of people in the intervention group missing scales or whole time points (6.6 times greater than in the control group).

SPSS defaults to using listwise deletion where there is missing data, which reduces the number of participants' observations included in the analyses and thus reduces the power of the study. Eliminating the cases that have missing data also contravenes the intention-to-treat principle (White and Thompson, 2005).

Table 4. Missing scales by time point and group		
Time	Control group	MBI group
T1	7 missing	1 missing
T2	8 missing	26 missing
T3	6 missing	29 missing
T4	6 regained	43 missing
Total missing scales	15	99

Listwise deletion is the most inefficient way of conducting analysis, especially in small samples with a large percent of missing data (Rubin, Witkiewitz, Andre, & Reilly, 2007). The popular missing-indicator method (using a dummy variable where there is a missing value) is often used to comply with the principle of intention-to-treat but has been shown to introduce bias even if the missing data is MCAR (Donders, van der Heijden, Stijnen, & Moons, 2006).

The last observation carried forward (LOCF) method, assumes that values are MCAR – when there may well be reasons for dropping out, such as disease severity or cognitive or emotional burden and it has been shown to create unnecessary risk of bias, in particular with trials involving people with chronic progressive disorders (Molnar, Hutton, & Fergusson, 2008).

Maximum Likelihood (ML) and Multiple Imputation (MI) are preferred methods but are unsuitable for small samples (ML) or too complex to be accessible to most researchers (MI) (Rubin et al, 2007), and mean substitution or regression-based methods are recommended.

In the present study, if there were missing values at item level, and more than 80% of that scale was complete, the mean of the completed items was calculated and imputed for the missing items. Where less than 80% of the questionnaire items were completed, or entire scales or time-points were missing, no data imputation was made (Allison, 2002).

3.4.3 Normality and outliers

Distribution of questionnaire scores were examined using histograms, normal Q-Q plots and by the Shapiro-Wilk test for normality (a significant value ($p < \text{or equal to } 0.05$) indicates a deviation from normality). All of the variables were found to be acceptable in distribution.

Outliers were identified by box-plots, then the cases examined in the data set, to see if the scores were within questionnaire ranges. The 5% trimmed mean was compared to the mean, and lastly, z scores were calculated to see if any were over 3.29 (Tabachnik & Fidell 2006). Homogeneity of variance can be assumed as Levene's test was not significant for any of the variables at any of the time points. All of the outliers were retained, and no data trimming or transformation was undertaken.

3.4.4 Intention-to-treat analysis

This randomised pilot trial was conducted within an intention-to-treat (ITT) approach, as recommended in the Consolidated Standards of Reporting Trials (CONSORT) guidelines, whereby every participant who is randomised to a trial arm is included in the analyses, even when non-compliant, or if they contributed incomplete data or dropped-out. By not excluding cases of non-compliance, the estimated treatment effect is generally more conservative but also more reflective of real-life clinical delivery. However, because the statistical analysis of this study examines data from an underpowered pilot trial, and is exploratory, those participants with missing data have been lost. A future fully-powered randomised controlled trial would be able to compensate for the inevitable missing data in

studies involving human participants with chronic diseases, by using sophisticated imputation methods.

3.4.5 Significance level

A minimum significance level of $p < 0.05$ was used. Significance levels in an underpowered pilot study are not as interpretable as trends or effect sizes in measuring differences between trial arm groups, and confidence intervals are preferred in estimating effects (Eldridge et al, 2016; Lee, Whitehead, Jacques, & Julious, 2014).

3.4.6 Comparison between trial arms at baseline

Normally distributed continuous variables were examined with independent samples t-tests, to assess baseline differences between the intervention and the control group (see Table 5).

3.4.7 Primary outcome variables

Anxiety and depression levels at baseline were examined for differences between the groups. The HADS can be interpreted as normal at ≤ 7 , between 8 and 10 as suggestive of a disorder, and 11 or higher (maximum 21) as being probable “caseness” of clinical anxiety or depression (Snaith, 2003). Almost three quarters of the total sample had anxiety levels below 11, and 80.8% of the total sample had levels of depression below the level of caseness.

Because of the small number of participants falling into the severe range, the intervention and control groups’ distress levels were compared by forming two sets of severity levels in both anxiety and depression.

Normal and mild anxiety levels were combined to form “low anxiety” and moderate and severe levels combined to form “high anxiety”. A chi-square test for independence indicated no significant association between the groups and baseline

low anxiety levels and high anxiety levels ($\chi^2(2, n=78) = 1.025, p=0.599$; Cramer's $V=0.115$ which is a small effect (Appendix B2).

Normal and mild, and moderate and severe depression levels were also combined in the same way to form "low depression" and "high depression" levels. A chi-square test for independence showed no significant association between the groups and the proportion of low and high levels of depression ($\chi^2(2, n=78) = 1.632, p=0.442$; Cramer's $V = 0.145$, small effect (Appendix B3).

3.4.8 Attendance

A hierarchical regression was used to assess if MBI participants' attendance at sessions (maximum 8) was predicted by baseline disability, and by baseline anxiety and depression. Preliminary analyses checked that assumptions of normality, linearity, multicollinearity and homoscedasticity had not been violated, through acceptable Normal P-P Plots, residuals and Tolerance Values.

Baseline disability levels (measured by PADLS, Parkinson's Activities of Daily Living Scale (Hobson et al, 2001), and mean baseline anxiety and depression scores (measured by the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983) were introduced to the regression at stage 1 and stage 2 respectively.

Table 5. Demographics and clinical characteristics of participants

Variable	Mindfulness (n=40 except ethnicity n=39)	Waiting list (n=38)	Statistical test			
			Stats,	df	p	ES
Gender, female (n, %)	17(44%)	22(56%)	$\chi^2 = 1.283$	(1, n=78)	p=.26	$\phi = -.15$
Age, in years (M, SD)	60.30(10.30)	62.74(8.81)	t = 1.12	(76)	p=.266	$\eta = .02$
Living status – with spouse/partner (n, %)	30(78.9)	30(75)			p=0.825 ^a	
Education, College or higher (n, %)	36(95)	34(85)			p=0.264 ^a	
Ethnicity, White (n, %)	38(97.4)	37(97.4)			p=1.00 ^a	
Years since diagnosis (M, SD)	5.47(3.95)	6.33(4.08)	U=663, z=-.97		p=.333	$\eta = .11$
Use of anti- anxiety/depression medication (Yes, %)	12(30)	12(31)	$\chi^2 = .00$	(1, n=78)	p=1.0	$\phi = -.02$
PADLS disease severity (n, %)					p=0.826 ^a	
- no difficulties	6(15)	5(13.2)				
- mild difficulties	26(65)	22(57)				
- moderate	6(15)	9(23.7)				
- high level	2(5)	2(5.3)				
- extreme	0	0				

^aFisher's exact probability test as the expected frequency assumption was violated

3.4.9 Associations between outcome measures, putative mediators and moderators

Pearson product-moment correlation analysis was undertaken to examine if there were any patterns of association between the two outcome measures, the five candidate mediators and the five potential moderating variables, at each of the four time points. Analysis of the whole sample, followed by analysis of the two groups, were compared for any differences in associations which may indicate an intervention effect. Correlations at each time point were then examined to determine any change over time.

Standard regression analysis of the potential mediating variables as predictors of anxiety and depression at baseline were conducted to examine what unique variance they each contributed to total outcome variance, while controlling for the other variables.

3.5 Inferential statistics

3.5.1 Effect of time

Although trial effectiveness is not a main aim of this present study, examining when outcome scores changed over time may indicate which processes of mindfulness occur before others, thus establishing mediation. As this study is underpowered, any statistical results should be treated with caution.

A 2x4 mixed ANOVA was conducted to test whether there was a main effect for group (the between-subjects factor, MBI or WL) or main effect of time (the within-subjects factor, T1, T2, T3, T4). This also examined whether time interacts with trial arm. These analyses were computed twice, once for anxiety and once for depression.

3.5.2 MEDIATION Analysis

A mediator is a third, or intervening, variable in the causal chain between an independent variable and the outcome.

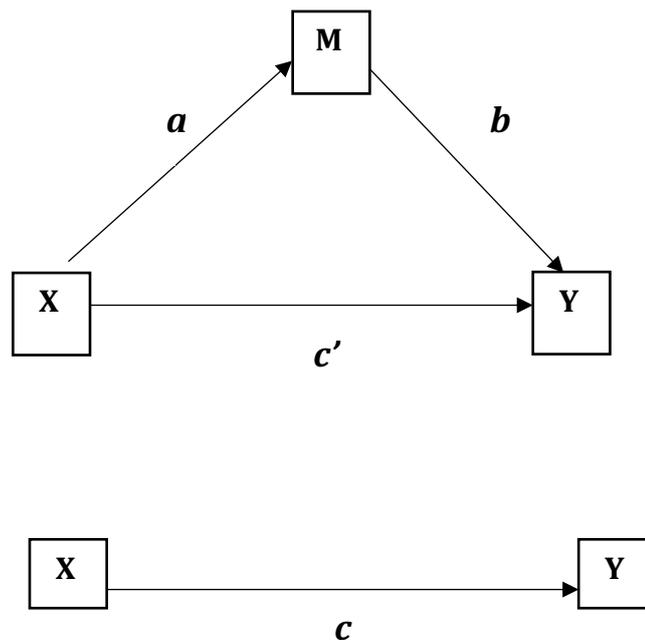
As the main research aim of this study is to explore possible mediators and mechanisms of change in levels of anxiety and depression during and following a mindfulness intervention, exploratory analyses were undertaken to examine if any of the proposed mediating variables' indirect effects on the outcome could be identified, thus suggesting that they are important elements in the causal chain.

3.5.3 Background to mediation analysis

Baron and Kenny's seminal paper (1986; Kenny, 1998) proposed four steps to establish mediation, through a series of regressions: firstly, the effect of the intervention variable on the outcome should be significant ($X \rightarrow Y$), secondly, the effect of the intervention variable the mediator should be significant ($X \rightarrow M$), thirdly, when the outcome variable is regressed on the intervention variable ($Y \rightarrow X$), the significance of c' is reduced when the effect on M is controlled for (Fourth step) (see Figure 4)

However, the method has been criticised because of it stipulates that there must be evidence of a statistically significant relationship between the trial arm (X) and the outcome (Y), between X and the putative mediator (M), and between M and Y when X is controlled for, thus ignoring any possible suppression effect (where the direct and indirect effects are opposite) (Elmsley, Dunn, & White, 2010; Windgassen, Goldsmith, Moss-Morris, & Chalder, 2016) or un-modelled interactions which may compromise the direct effect (Hayes, 2009; Fairchild & McDaniel, 2017)

Figure 4. A simple mediation model. X represents the independent variable (trial arm), Y the dependent variable (anxiety, depression), M the mediator variable (e.g. acceptance, decentering, self-compassion, mindfulness skills and intolerance of uncertainty). a represents the direct effect of X on M. b represents the direct effect of M on Y. c' represents the direct effect of X on Y. c represents the total effect of X on Y ($a+b+c'$).



Further criticisms include not directly measuring pathway b , between M and Y, bias from not including confounding variables, and lower power in detecting mediation than other methods (Hayes, 2009; Preacher & Hayes, 2008). The traditional Sobel test for significance is less powerful and assumes normal distribution, while ab is usually not normally distributed (Hayes and Sharkow, 2013), thus bootstrap

confidence intervals which support a claim of indirect effect if it does not straddle 0, are preferred.

Inferring mediation is now acknowledged to be far more complex than the Baron & Kenny method (Bullock, Green, & Ha, 2010), and examining all putative indirect paths simultaneously is recommended rather than a series of simple mediation models, when theory suggests that there are multiple mediators, to maximise the correspondence between theory and the mathematical model, and to compare the size of indirect effects through different mediators (Hayes & Rockwood, 2017).

3.5.4 Mediation analysis using Ordinary Least Squares Regression

One of the preferred modern methods of analysing mechanisms of change is PROCESS, a macro developed for use with SPSS (Hayes, 2013). It is a conditional process modelling programme that uses an ordinary least-squares-based path analytical framework. PROCESS conducts a series of multiple regression analyses to estimate the total (the relationship of X to Y, c), direct (c') and indirect effect (ab). The indirect effect is the product of the path coefficient a ($X \rightarrow M$) and the path coefficient b ($M \rightarrow Y$) (Hayes, 2013) (Figure 4). Rejection of the null hypothesis that the indirect effect is zero (or the confidence intervals don't include zero) supports the claim that there is a mediation effect of X on Y through M. Significance of a and b , or even c is not essential when inferring mediation - Hayes and Rockwood recommend that inference about an indirect effect of X on Y should be based on ab rather than individual paths.

Hayes (2013) also recommends that unstandardised variables should be used, and that centering to the mean is not required if the aim of the analysis is to examine mediation and not compare direct effects.

3.5.5 Mediation analyses in this present study

The current model (Figure 5) estimates the mindfulness processes that may mediate the relationship between the trial arm (X) and levels of anxiety and depression (Y). Two separate analyses were undertaken for each outcome, using data from 2

different time points. The effect of a mindfulness therapy group (MBI) relative to a wait list control group (WL) on anxiety and depression levels, at both end of therapy (T3, 8 weeks), and at 20-week follow-up (T4). Participants were randomly assigned to MBI or WL, coded 1 and 0 respectively, in a variable named trial arm (X). Putative mediator variables were, M1: levels of decentering, M2: acceptance, M3: self-compassion, M4: mindfulness skills, and M5: intolerance of uncertainty, selected on the basis of evidence of mediator roles in previous mindfulness studies. Higher scores indicate better outcome for all mediator variables except for intolerance of uncertainty, and for primary outcomes anxiety and depression levels, for which higher scores represented greater distress. Baseline measures of outcomes (Y) and mediators (Ms) were also included in the model as covariates to control for pre-existing group differences.

Bootstrap confidence intervals (bias-corrected) for the indirect effect were constructed in PROCESS by randomly resampling 10,000 cases from the data with replacement, where n is the original sample size. Bootstrapping uses listwise deletion (as does PROCESS) so missing data is not analysed. If the confidence interval straddles zero, the claim that mediation is present is not supported (Shrout & Bolger, 2002).

3.5.6 Multiple mediation

Temporal ordering of the mediation model

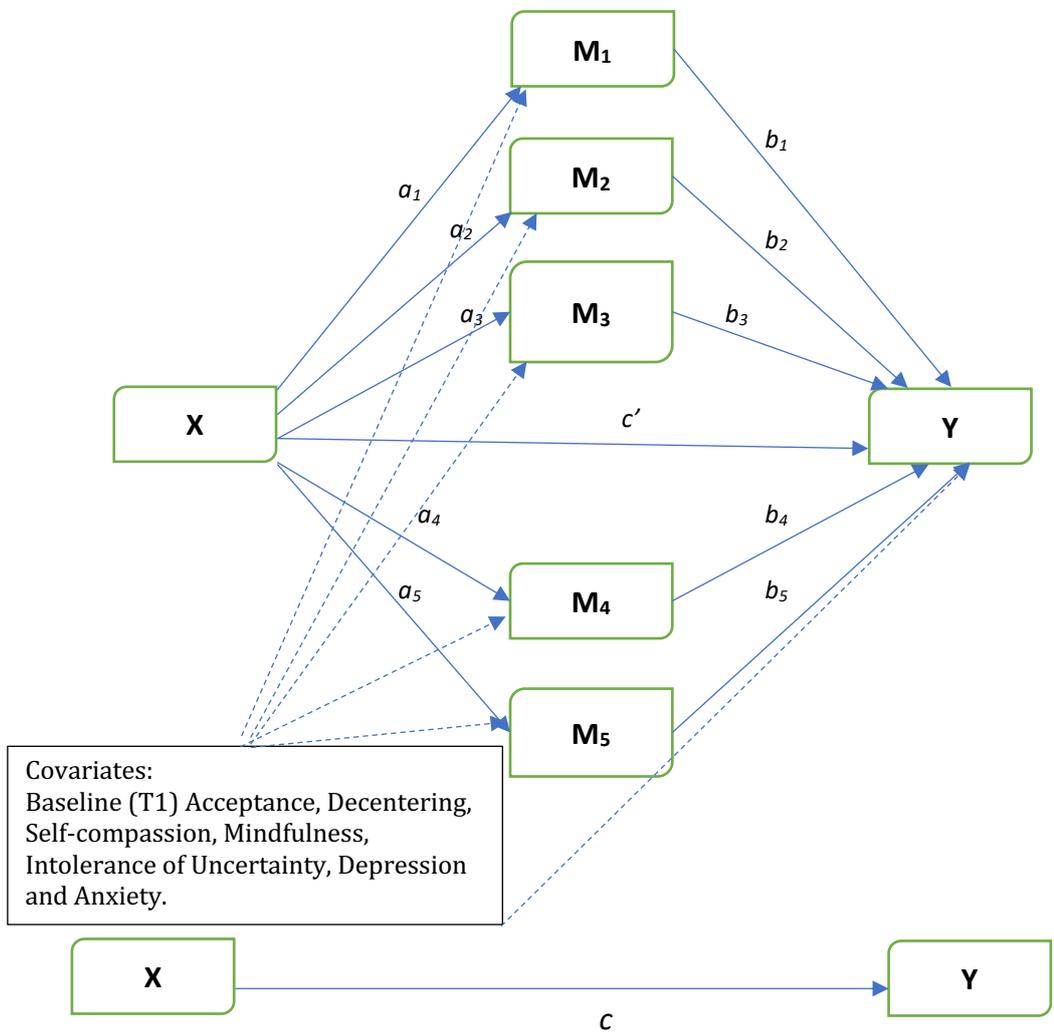
Mediator variables measured at 4 weeks (T2) and 8 weeks (T3) were examined with outcome measures taken at T3 and T4 (20-week follow-up) in order to explore any temporal ordering, thus strengthening any chain of causality claim, and to compare sizes of indirect effects of each mediator (Cole & Maxwell, 2003; Kazdin, 2007; Windgassen et al, 2016).

Power

Power to detect mediation and moderation effects depends on the effect sizes of the *a* and *b* parameters in the model, and the total n, however, multiple mediator models

have been demonstrated to require a minimum of $n=377$ (Fritz & MacKinnon, 2007). This present exploratory study of an underpowered pilot trial cannot confidently detect any mediation effect but can only highlight potential relationships among variables that may be interesting to pursue in a future fully-powered trial.

Figure 5. *Parallel multiple mediator model*, showing 5 potential mediators (acceptance, decentering, self-compassion, mindfulness skills and intolerance of uncertainty ($M_1 - M_5$)), direct effect c' , indirect effect a_1b_1 etc., total effect c .



Procedure for mediation analyses

Two separate parallel mediation analyses were undertaken for each outcome variable. The first model estimated the indirect effect of the trial arm via the mediator variables at T2 on the outcome variables at T3, whilst controlling for baseline outcome variable, and baseline mediator variables. The second analysis examined mediator variables at T3, and outcome variables at T4, again controlling for baseline. In both cases, time-lagging the mediator variables to the outcome variables as the indirect effect should occur earlier than the direct effect (Kazdin, 2007).

Data loss

The analyses using PROCESS eliminate cases with missing data listwise, and in this present study there was a loss of between 18-20 cases out of a total of 78 (23-25%), further reducing power.

3.6 MODERATION analysis

3.6.1 Methodological rationale

The strength of the effect of the trial arm on anxiety and depression levels may be dependent on moderator variables, such as age, gender, baseline disability, medication and time since diagnosis. The choice of moderating variables was influenced by both previous mindfulness literature (Kuyken et al, 2010; Arch & Ayers, 2013; Nyklíček, van Son, Pop, Denollet, & Pouwer, 2016; Bogosian et al, 2016), and exploratory hypothesis, that people with a deteriorating disease that is more prevalent with age and that has impact on cognitive functioning, may react differently according to their age, time since diagnosis and baseline disability levels.

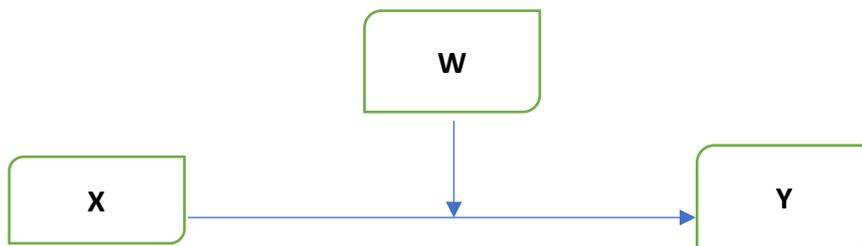
To explore the moderating effects in more depth, the Johnson-Neyman technique (Johnson & Neyman, 1936; Hayes & Matthes, 2009) defines the significant regions of the moderator (only if non-dichotomous) where the trial arm was significantly related to the outcome, for instance, certain age groups may respond differently to

the intervention (Hayes & Rockwood, 2017). As an example, mean age may not show any overall amplification or weakening effect on the relationship between trial arm and depression, but there may be differences in how younger or older ages moderate that relationship.

3.6.2 Simple moderation

In this study, a simple moderator model (PROCESS template Model 1, Figure 6) analysis was applied to see if the strength and direction of the relationships of trial arm to levels of anxiety and depression at both T3 and T4, were dependent on age, gender, baseline disability, medication and time since diagnosis, and if any levels of these moderators were significant. Baseline anxiety and depression were included as covariates.

Figure 6. Simple moderation model - W represents the moderator (i.e. age), X is the trial arm, and Y represents the outcome variable (anxiety or depression at T3 and T4).



Each possible moderator was entered in single analyses of the relationships between the trial arm (control or MBI) and each primary outcome measure taken at T3 and at T4 (anxiety or depression).

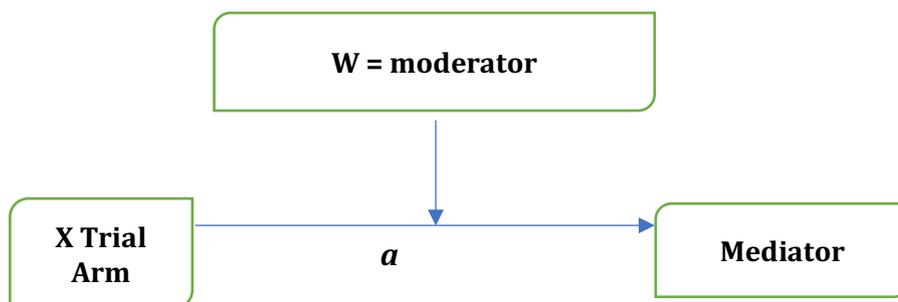
Significant moderation is indicated by bias-corrected bootstrap confidence intervals, and the Johnson-Neyman technique identifies the regions of significance in the moderator variable.

3.6.3 Moderated mediation

The mediational mechanism may be different for different subgroups who may respond to aspects of mindfulness in different ways, for instance, age may moderate how well a person develops acceptance, or self-reported baseline disability could influence the strength of the relationship between the intervention and self-compassion. Results from such analyses, may lead to greater understanding of the barriers to therapeutic change in subsets of people with PD.

Simple models in PROCESS (template model 1) analysed any moderation by age, gender, baseline disability, medication and time since diagnosis, individually, of the indirect effect – the relationships between trial arm and the putative mediator variables (T3 and T4).

Figure 7. Moderated mediation model, where the indirect effect of $X \rightarrow M$ (trial arm on mediator variable, path a) moderated by (or conditional on) another variable (W , moderator variable).



The moderated mediation, or conditional effect, of X (trial arm) on the mediator variable (either acceptance, decentering, self-compassion, mindfulness skills or intolerance of uncertainty) is calculated by PROCESS; again, using bias-corrected bootstrap confidence intervals (10,000, 95%) to support the effect, and with regions of significance identified through the Johnson-Neyman technique.

4 RESULTS

Ninety-seven people were assessed for eligibility, thirteen of whom were excluded because they did not meet the inclusion criteria, and six who dropped out before or during baseline measurement. Therefore 78 participants were randomly assigned to either the mindfulness-based intervention (MBI) group (n=40) or the wait-list (WL) control group (n=38) (Figure 8).

4.1 Missing Data

Baseline questionnaires had been completed online before participants were informed of which group they had been randomised to. One participant in the MBI group failed to complete the Philadelphia Mindfulness Scale (PHLMS) at baseline and then dropped out of the trial, and one of the WL group failed to complete baseline Acceptance and Action Questionnaire (AAQ), Experiences Questionnaire (decentering) (EQ), Philadelphia Mindfulness Scale (PHLMS), and Intolerance of Uncertainty Scale (IUS), but completed measures at all three subsequent time points. Another WL participant missed baseline PHLMS, AAQ, EQ and dropped out of the study.

Nine participants in the MBI who dropped out of the study (22.5%) gave a variety of reasons: two stated that they had too many work commitments, one was too ill to begin the course and one too ill to continue, one had a bereavement before the start of the course, one declared they did not have time, another that they did not like Skype and another that they did not like mindfulness after taking part in two sessions. A further participant did not state a reason for dropping-out after three sessions. In the present study it can be shown that despite dropping out from the intervention, participants were encouraged to complete the outcome and process questionnaires within their treatment arm, and 55% of the MBI group who dropped out contributed data to at least two of the four time points. In particular, two of the participants who did drop out completed the mid-course (4 weeks) questionnaires, two participants were able to complete the measures on three occasions and one on all four. Their data therefore was included in the analyses.

4.1.1 Missingness

T tests were run to see if missingness in any of the variables with more than 5% missing values was related to gender, ethnicity, marital status, years since diagnosis, medication or baseline disability. No significant relationships were found. As shown in Table 1, both groups were well-matched in terms of demographic and disease severity characteristics.

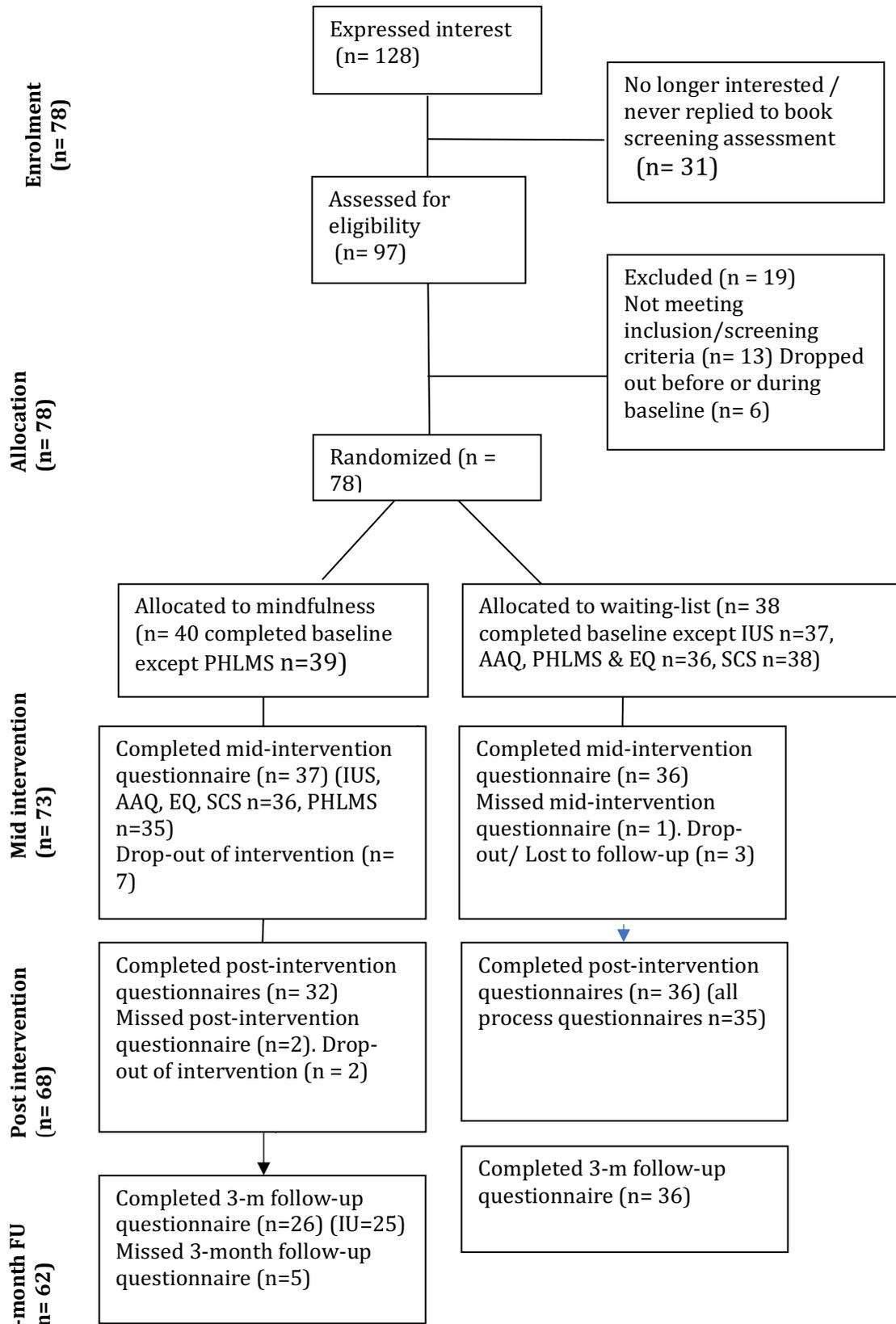
6.1.2 Attendance

Out of the 27 MBI participants who attended more than 50% of the eight sessions, 33% attended all sessions and another 26% attended 7 sessions (Table 6).

Table 6. Participants' attendance at MBI sessions

MBI participants (total n=40)		% of total n	Drop-outs
No of MBI participants attending 8 sessions	9	22.50	-
No of MBI participants attending 7 sessions	7	17.50	-
No of MBI participants attending 6 sessions	8	20	-
No of MBI participants attending 5 sessions	2	5	-
No of MBI participants attending 4 sessions	3	7.5	-
No. of MBI participants attending 3 sessions	3	7.5	2
No. of MBI participants attending 2 sessions	4	10	3
No. of MBI participants attending 1 session	1	2.5	1
No. of MBI participants attending 0 sessions	3	7.5	3

Figure 8. CONSORT flowchart of MindPD trial



PHLMS: Philadelphia Mindfulness Scale; IUS: Intolerance of Uncertainty; AAQ II: Acceptance-Action Questionnaire; EQ: Experiences Questionnaire (decentering); SCS: Self-Compassion Scale.

6.1.3 Self-reported levels of disability, baseline anxiety and depression, and attendance at MBI sessions

To determine if the number of sessions attended could be predicted by the level of participant self-report disability, a hierarchical regression analysis of baseline disability levels (Stage 1)), and mean baseline anxiety and depression scores (Stage 2) on number of sessions attended was undertaken (see Table 7).

There was a negative relationship between the level of disability at baseline (higher score in disability equalling worse status) and the number of sessions attended by MBI participants ($F(1,38)=4.85$, $p=0.03$), but there was no significant relationship ($F(3,36)=1.79$, $p=0.167$) between mood levels and number of sessions attended.

Table 7. Linear model of predictors of number of sessions

	<i>b (CI, SE)</i>	<i>SE B</i>	β	<i>p</i>
Step 1				
Constant	7.54 (5.71, 8.93)	0.95		<0.001
PADLS*	-1.15 (-1.93, 0.02)	0.44	-.336	0.034
Step 2				
Constant	7.65 (5.59, 9.00)	1.06		<0.001
PADLS	-1.25 (-2.54, 0.06)	0.59	-.336	0.049
Baseline Anxiety	-0.53 (-1.99, 1.31)	0.71	-.129	0.45
Baseline Depression	0.74 (-1.30, 2.74)	1.0	.156	0.45

Note. $R^2=0.13$ for Step 1($p=0.03$); $\Delta R^2=$ ($p=0.016$) Step 2($p=0.715$)

*PADLS=Parkinson's Disease Activities of Daily Living Scale (Hobson et al, 2001) 95% bias corrected and accelerated confidence intervals reported in parentheses. Confidence intervals and standard errors based on 10,000 bootstrap samples

5.1.1 Change in outcomes and putative mediators

Descriptive statistics for the primary outcomes and for the candidate mediators at all four time points are reported in Table 8. Independent samples t-tests were conducted to compare the *baseline* primary outcome and *baseline* putative mediator scores for both groups.

There were no significant differences in baseline variables: the magnitude of the differences in the means were very small, apart from baseline depression scores that were higher for the mindfulness group ($\eta^2=0.2$, Cohen's $d=-0.25$, small effect), and self-compassion scores that were higher for the control group ($\eta^2=0.01$, Cohen's $d=0.22$, small effect).

All confidence intervals (95%) for the mean differences straddled zero, except for the mean differences in decentering at post-intervention and follow-up, and in mindfulness skills at post-intervention, indicating confidence in the differences between these two constructs at these time points.

To examine for temporal ordering of any change, the means of the primary outcomes (anxiety and depression) and of the five putative mediators (acceptance, decentering, self-compassion, mindfulness skills, and intolerance of uncertainty) were plotted over the four time periods to examine if any of the mediators showed change before the primary outcomes, indicating an indirect effect. Visual examination of graphs showing change over the four time points (see Figures 9 and 10) suggested T3 to be the point of greatest difference between the trial arms in all the putative mediators and depression scores, whilst the other dependent variable, anxiety, continued to diverge at T4. The moderator variables showed changes in positive directions in the MBI group, from baseline to T3, but little change from T3 to follow-up (T4).

Table 8: descriptive statistics for primary outcomes and putative mediators

		Control			Mindfulness			Mean difference	Confidence Intervals	Effect Size Cohen's d	Statistical test
		n	mean	SD	n	mean	SD				
Anxiety	baseline	38	1.15	0.54	40	1.19	0.60	0.04	-.299, .214	-0.07	t (76)=-.33, p=0.742, $\eta^2=.001$
	mid-intervention	36	0.99	0.60	37	0.95	0.62	-0.04	-.246, .315	-0.06	
	post-intervention follow-up	36	0.93	0.58	32	0.89	0.49	-0.04	-.227, .299	-0.07	
Depression	baseline	38	0.85	0.46	40	0.98	0.51	0.13	-.346, .092	0.25	t (76)=-1.16, p=.252, $\eta^2=.02$
	mid-intervention	36	0.87	0.50	37	0.87	0.55	0	-.249, .245	0	
	post-intervention follow-up	36	0.86	0.51	32	0.73	0.42	-.013	-.096, .358	-0.28	
Acceptance	baseline	36	4.78	0.94	40	4.82	1.14	0.04	-.527, .437	0.04	t (74)=.186, p=.853, $\eta^2=0.001$
	mid-intervention	36	4.83	1.01	36	5.11	0.95	0.28	-.747, .174	0.27	
	post-intervention follow-up	35	4.98	0.96	32	5.28	0.82	0.30	-.744, .135	0.34	
Decentering	Baseline	36	2.96	0.46	40	2.96	0.51	0	-.224, .221	0	t (74)=-.12, p=.991, $\eta^2=0.0001$
	mid-intervention	36	3.12	0.39	36	3.26	0.42	0.13	-.334, .047	0.36	
	post-intervention follow-up	35	3.10	0.43	32	3.34	0.33	0.24	-.440, -.059	0.65	
	follow-up	36	3.09	0.35	26	3.29	0.43	0.20	-.405, -.006	0.54	

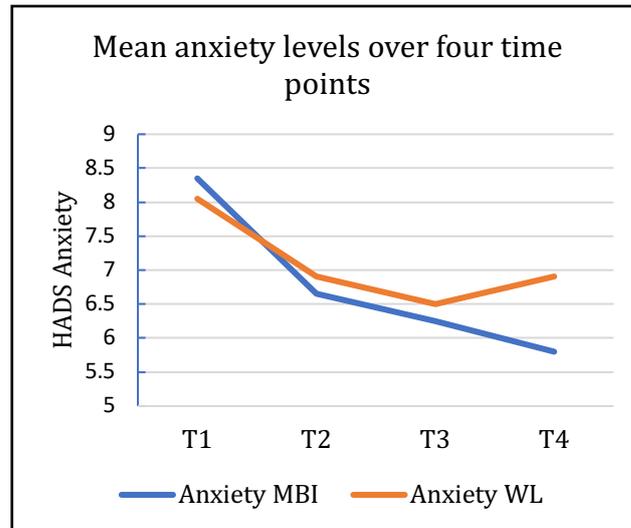
Self-compassion	Baseline	38	3.25	0.85	40	3.08	0.73	-0.17	-.185, .527	-0.22	t (76)=.955, p=.343, η ² =0.01
	mid-intervention	36	3.35	0.89	36	3.44	0.77	0.09	-.487, .297	0.12	
	post-intervention	35	3.39	0.80	32	3.49	0.68	0.10	-.603, .278	0.32	
	follow-up	36	3.31	0.92	26	3.47	0.76	0.16	-.603, .278	0.40	
Mindfulness skills	Baseline	36	3.24	0.38	39	3.17	0.32	-0.07	-.095, .227	-0.19	t (73)=0.817, p.416, η ² =0.007
	mid-intervention	36	3.29	0.42	35	3.28	0.34	-0.01	-.174, .186	-0.02	
	post-intervention	35	3.20	0.40	32	3.40	0.39	0.20	-.390, -.006	0.51	
	follow-up	36	3.23	0.42	26	3.37	0.42	0.14	-.362, .069	0.36	
Intolerance of uncertainty	Baseline	37	2.29	0.73	40	2.44	0.93	0.15	-.501, .207	0.18	t (75)=-.828, p=.411, η ² =0.009
	mid-intervention	36	2.11	0.73	36	2.20	0.68	0.09	-.418, .242	0.13	
	post-intervention	35	2.08	0.65	32	2.04	0.52	-0.04	-.250, .329	-0.06	
	follow-up	36	2.12	0.69	25	2.12	0.50	0	-.321, .324	0	

5.1.2 Effect sizes

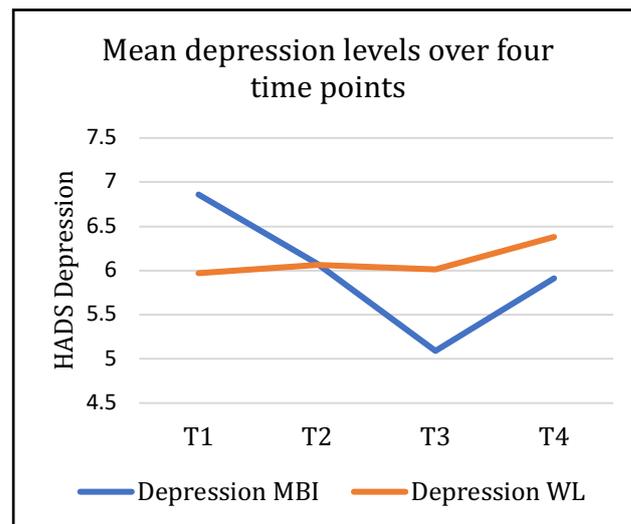
At T2, mid-point of the intervention, only acceptance ($d=.27$) and decentering ($d=.36$) had small effect sizes (Cohen, 1988), indicating that these potential mediators were showing changes before the outcome measures of anxiety and depression, suggesting an indirect effect. At T3, the end of the intervention, depression showed a small effect size ($d=-.28$) as did acceptance ($d=.34$) and self-compassion ($d=.32$), but not anxiety. Moderate effect sizes were shown in decentering ($d=.65$) and mindfulness skills ($d=.51$). Only decentering continued to have a moderate effect ($d=.54$) at follow-up, while anxiety ($d=-.29$), acceptance ($d=.42$), self-compassion ($d=.40$) and mindfulness skills ($d=.36$) were all in the small effect range. Intolerance of uncertainty had no reportable effects ($d>.20$) at any of the time points.

Figure 9. Mean primary outcomes and mediators over four time points.

(a)



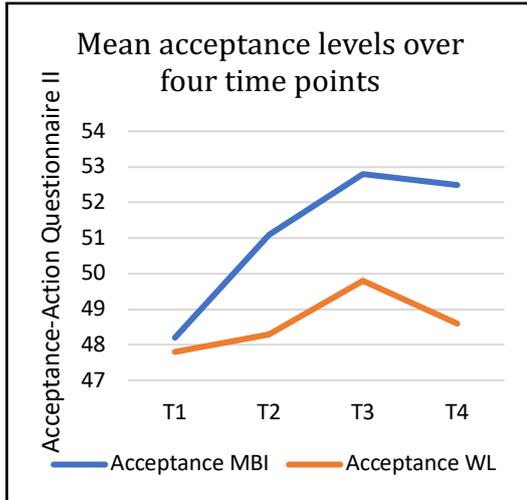
(b)



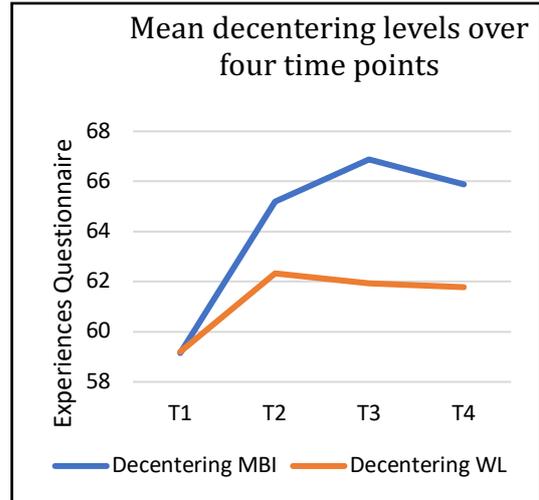
T1: Baseline; T2: 4 weeks, mid-intervention; T3: 8 weeks, end of intervention; T4: 20 weeks, follow-up.

(a) Hospital Anxiety and Depression Scale (HADS) anxiety and (b) HADS depression (range 0-21, normal range 0-7). Mean mediator scores over four time points (c) acceptance, (d) decentering, (e) self-compassion, (f) mindfulness skills, (g) intolerance of uncertainty.

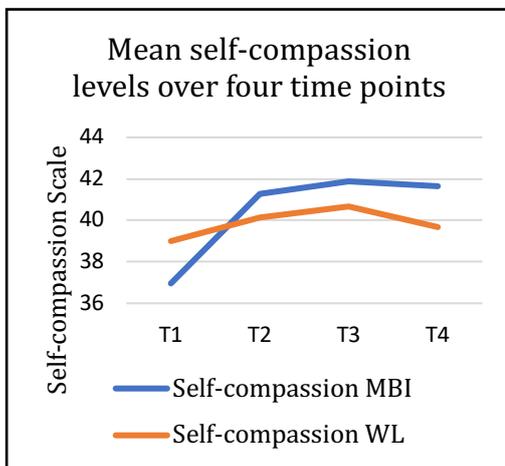
(c)



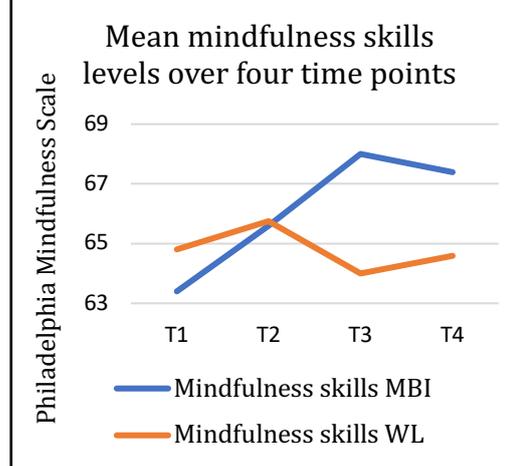
(d)



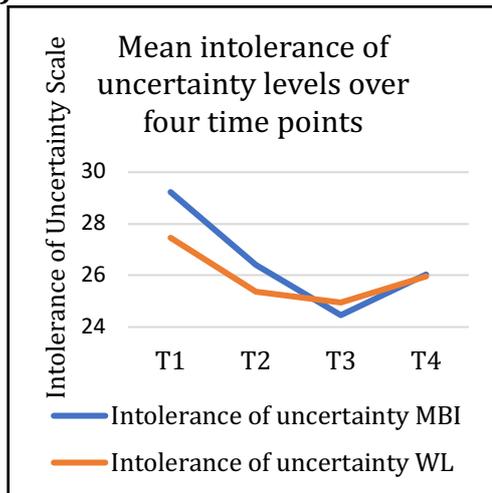
(e)



(f)



(g)



Scale ranges:

(c) Acceptance-Action Questionnaire II: 7-70.

(d) Experiences Questionnaire: 20-100.

(e) Self-compassion Scale: range 12-60.

(f) Philadelphia Mindfulness Scale: 20-100

(g) Intolerance of Uncertainty Scale – Short Form: 12-60

5.2 CORRELATION ANALYSES

5.2.1 Total sample

To examine associations between the variables, bivariate correlations were calculated between all the outcome measures (anxiety and depression), the candidate mediators (acceptance, decentering, self-compassion, mindfulness skills and intolerance of uncertainty) and the five potential moderator variables (age, gender, years since diagnosis, mood medication and self-report disability) on the full sample, at each of the four time points (see Tables 9 (T1 and T2) and 10 (T3 and T4)).

Correlation strength between variables was interpreted as small if $r = .10$ to $.29$, medium if $r = .30$ to $.49$, and large if $r = .50$ to 1.00 (Cohen, 1988; Cohen, 1992). These relate to R^2 values of 1% to 8%, 9% to 24%, 25% to 100% of variance explained and are colour-coded in the tables (9 and 10 for total sample correlations, and for trial arm correlations in Appendix B4, 5, 6 and 7 as small, medium, and large).

Anxiety and depression scores were positively and strongly correlated with each other at each of the four time points, and at strong to medium strength with intolerance of uncertainty; strongly and negatively with acceptance; medium strength and negatively with decentering and strongly with self-compassion. Anxiety was positively and moderately correlated with self-reported baseline disability levels, at T1, T2 and T3, but not at T4.

Mindfulness skills were only negatively and of medium strength related with depression at T1. At T2, mindfulness skills' correlation strength was medium with acceptance, decentering, self-compassion and strong with intolerance of uncertainty. At T3, correlations were medium with depression, acceptance, self-compassion and intolerance of uncertainty, while strong with decentering. At T4 mindfulness skills correlated in the medium strength range with all the other mediators and with anxiety and was strongly correlated to depression.

Intolerance of uncertainty strongly correlated to anxiety, depression, acceptance, decentering and self-compassion at T1, with only small strength correlation with mindfulness skills. However, at every time point the strength of the relationships between intolerance of uncertainty and anxiety, depression, and the other mediators (except with mindfulness skills, which strengthened) became weaker, until at T4 only acceptance was strongly correlated with all others being in the medium range. There was a medium strength relationship between intolerance of uncertainty and baseline levels of disability at all time points.

Gender did not correlate at medium or strong strength with any variable except with anxiety at T3. Age of participant had a medium strength association only with anxiety and self-compassion at T2.

Years since diagnosis was only correlated with medium strength with depression. Mood medication correlated at medium strength only with levels of depression, mindfulness skills and years since diagnosis at T4.

Self-reported disability at baseline, measured by the PADLS, was strongly and positively correlated with years since diagnosis. At T1, self-reported disability correlated strongly with depression, and at medium strength with anxiety, self-compassion, and intolerance of uncertainty. At T2 and T3 acceptance, self-compassion and intolerance of uncertainty remained in the medium range, with anxiety and mood medication at T3. At T4 depression was in the medium range, and anxiety, acceptance and decentering only in the small effect range.

5.2.2 Correlations within trial arm groups

Correlations were also calculated for each trial arm, to examine if any of the patterns shown in the total sample correlations differed between the groups (Appendix B4, 5, 6 and 7).

At T3, the completion of the 8-week course, the intervention group's levels of anxiety and depression, were no longer strongly correlated with levels of

acceptance, decentering and self-compassion in contrast to the wait list group's correlations. At T4, 12 weeks later, the strength of correlation between anxiety and depression and the mediator variables in the MBI group had returned to medium/strong.

Mindfulness skills in the MBI group were significantly correlated to anxiety and depression by T4 but not in the wait list control group. Mindfulness skills were strongly associated with acceptance, decentering and self-compassion at T2 and T4 in the MBI group, but not in the waiting list group, (at T3 both groups showed strong correlations between mindfulness skills and decentering).

Self-reported disability at baseline was strongly correlated with depression scores at T4 for the MBI group but only correlated at medium strength for the waitlist group.

5.2.2.1 Multicollinearity

The inter-correlation between the putative mediators and the outcome variables was not excessively high ($r > .90$), Tolerance values and Variance inflation factors were at acceptable levels, so multicollinearity can be discounted .

Table 9 - Bivariate correlations – associations between outcomes, putative mediators and possible moderators -

Whole sample – T1	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety	(.83)	34%	49%	27%	35%	4%	40%	1%	6%	<1%	<1%	12%
2. Depression	.58**	(.76)	26%	16%	33%	11%	29%	2%	<1%	8%	6%	30%
3. Acceptance	-.70**	-.51**	(.90)	58%	53%	8%	44%	<1%	4%	<1%	<1%	7%
4. Decentering	-.52**	-.40**	.76**	(.85)	52%	5%	38%	<1%	4%	<1%	<1%	4%
5. Self-compassion	-.59**	-.57**	.73**	.72**	(.89)	4%	36%	<1%	7%	<1%	<1%	10%
6. Mindfulness Skills	-.19	-.33**	.28*	.23*	.20	(.61)	4%	2%	<1%	1%	<1%	<1%
7. Intol. of Uncertainty	.63**	.54**	-.66**	-.62*	-.60**	-.21	(.89)	1%	3%	3%	<1%	22%
8. Gender	.11	-.14	.08	-.06	.04	.14	.12	-	3%	5%	5%	<1%
9. Age	-.24*	-.05	.21	.19	.26*	-.003	-.18	.16	-	6%	<1%	<1%
10. Years since diagnosis	.03	.29*	.007	-.03	.05	.11	.17	.22*	.25*	-	4%	31%
11. Mood medication	.07	.25*	-.04	.01	-.06	.05	-.04	-.22	.09	.20	-	6%
12. Self-report disability	.35**	.55**	-.26*	-.21	-.32**	-.06	.47**	.04	.04	.56**	.24*	
n=	78	78	76	76	78	75	77	78	78	78	78	
Whole sample – T2	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety	(.81)	46%	35%	23%	35%	2%	30%	5%	9%	4%	3%	2%
2. Depression	.68**	(.86)	33%	26%	35%	4%	22%	5%	3%	16%	7%	49%
3. Acceptance	-.59**	-.57**	(.89)	52%	56%	20%	36%	1%	2%	2%	3%	13%
4. Decentering	-.48**	-.51**	.72**	(.78)	56%	19%	24%	3%	5%	<1%	<1%	6%
5. Self-compassion	-.59**	-.59**	.75*	.75**	(.90)	12%	27%	<1%	10%	1%	<1%	16%
6. Mindfulness Skills	-.13	-.19	.45*	.43**	.34**	(.69)	6%	1%	<1%	<1%	2%	<1%
7. Intol. of Uncertainty	.55**	.47**	-.60**	-.49**	-.52**	-.25*	(.89)	1%	1%	4%	1%	13%
8. Gender	.23	-.04	-.10	-.17	-.03	.12	.10	-	3%	5%	5%	<1%
9. Age	-.30**	-.17	.14	.22	.31**	.08	-.12	.16	-	6%	<1%	<1%
10. Years since diagnosis	.19	-.34**	-.14	-.07	-.12	-.003	.21	.22*	.25*	-	4%	31%
11. Mood medication	.17	.26*	-.16	.04	-.08	-.13	.10	-.22	.09	.20	-	6%
12. Self-report disability	.44**	.67**	-.36**	-.24*	-.40**	-.05	.36**	.04	.04	.56**	.24*	
n=	73	73	72	72	72	71	72	78	78	78	78	

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). Note: Cronbach alphas are provided in parentheses on the diagonal. R² reported as a percentage, indicating variance explained. R² values of 1% to 8%: **small**; 9% to 24%: **medium**; 25% to 100%: **large**

Table 10 - Bivariate correlations

Whole sample - T3	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety	(.75)	27%	14%	17%	15%	7%	20%	13%	2%	<1%	<1%	13%
2. Depression	.52**	(.85)	21%	19%	26%	13%	24%	<1%	<1%	8%	6%	37%
3. Acceptance	-.38**	-.46**	(.88)	53%	49%	24%	31%	<1%	3%	<1%	<1%	10%
4. Decentering	-.41**	-.43**	.73**	(.79)	48%	35%	25%	1%	<1%	4%	1%	13%
5. Self-compassion	-.39**	-.51**	.70**	.69**	(.87)	14%	21%	<1%	3%	<1%	<1%	16%
6. Mindfulness Skills	-.27*	-.36**	.49**	.59**	.38**	(.74)	12%	<1%	<1%	<1%	4%	4%
7. Intol. of Uncertainty	.45**	.49**	-.56**	-.50**	-.46**	-.35**	(.86)	<1%	<1%	5%	<1%	19%
8. Gender	.36**	.07	.04	-.1	-.03	.04	.03	-	3%	5%	5%	<1%
9. Age	-.13	.02	.18	-.09	.17	-.07	-.07	.16	-	6%	<1%	<1%
10. Years since diagnosis	.10	.28*	-.07	-.19	-.09	-.06	.22	.22*	.25*	-	4%	31%
11. Mood medication	.08	.25*	.03	-.10	-.06	-.20	.06	-.22	.09	.20	-	6%
12. Self-report disability	.36**	.61**	-.32**	-.36**	-.40**	-.19	.43**	.04	.04	.56**	.24*	
n=	68	68	67	67	67	67	67	78	78	78	78	
Whole sample - T4	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety	(.80)	44%	24%	20%	35%	14%	14%	8%	2%	<1%	7%	5%
2. Depression	.66**	(.85)	14%	21%	20%	35%	14%	2%	<1%	6%	11%	18%
3. Acceptance	-.49**	-.37**	(.91)	44%	45%	17%	42%	<1%	2%	<1%	1%	7%
4. Decentering	-.45**	-.46**	.66**	(.79)	45%	17%	18%	<1%	<1%	2%	4%	7%
5. Self-compassion	-.59**	-.63**	.67**	.67**	(.92)	14%	22%	<1%	3%	<1%	4%	14%
6. Mindfulness Skills	-.37**	-.30**	.41**	.41**	.37**	(0.77)	9%	<1%	<1%	<1%	8%	<1%
7. Intol. of Uncertainty	.38**	.35**	-.65**	-.42**	-.47**	-.30*	(.85)	<1%	<1%	2%	3%	18%
8. Gender	.28*	.14	.06	-.09	-.09	.07	-.02	-	3%	5%	5%	<1%
9. Age	-.14	.03	.14	.05	.17	-.02	.03	.16	-	6%	<1%	<1%
10. Years since diagnosis	-.002	.24	.04	-.19	-.09	.05	.14	.22*	.25*	-	4%	31%
11. Mood medication	.16	.33**	-.11	-.21	-.20	-.29*	.16	-.22	.09	.20	-	6%
12. Self-report disability	.22	.42**	-.26*	-.27*	-.38**	-.07	.42**	.04	.04	.56**	.24*	
n=	62	62	62	62	62	62	61	78	78	78	78	

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). Note: Cronbach alphas are provided in parentheses on the diagonal. R² reported as a percentage, indicating variance explained. R² values of 1% to 8%: **small**; 9% to 24%: **medium**; 25% to 100%: **large**.

5.2.3 Contribution of putative mediators to variability in baseline primary outcome measures

Standard multiple regressions were used to assess the ability of the mediator variables and the dependent variables to predict levels of anxiety and levels of depression at baseline and to examine what unique variance is contributed by each of these predictor variables to the total variance of anxiety and depression levels.

Anxiety

This model explains 55% of the variance in levels of anxiety at baseline (adjusted $R^2=.55$); acceptance made the most significant unique contribution to the prediction of anxiety after controlling for the variance explained by all the other variables in the model ($\beta = -.49$, $p=.001$, semi-partial correlation co-efficient=-.271 giving a unique contribution by acceptance of 7.6%), followed by depression scores ($\beta=.27$, $p=.012$, semi-partial correlation co-efficient=.199, giving a unique contribution by depression of 3%). None of the other mediator variables' contributions were significant (see Table 11).

Table 11. Linear model of predictors of **anxiety** levels at Baseline

	<i>b</i> [LLCI, ULCI]	SE <i>B</i>	β	<i>p</i>
Constant	1.19 [-.13, 2.51]	.66		.076
M Depression T1	.32 [.04, .56]	.12	.25	.022
M Acceptance T1	-.26 [-.42, -.13]	.07	-.49	.001
M Decentering T1	.11 [-.23, .47]	.18	.10	.465
M Self-compassion T1	-.03 [-.23, .18]	.11	.05	.738
M Mindfulness skills T1	.11 [-.15, .37]	.13	.06	.466
M Intol. of uncertainty T1	.16 [-.001, .35]	.09	.22	.055

Note: adjusted $R^2 = .55$, $p<.001$; 95% bias corrected and accelerated confidence intervals reported in parentheses. CI and SE based on 1000 bootstrap samples.

Depression

This model explained 45% (adjusted $R^2=.45$) of the variance in depression, with self-compassion making a statistically significant unique contribution of 6% ($\beta=-.40$, $p<.01$ semi-partial correlation co-efficient $=-.248$). Anxiety contributed 4%, ($\beta=.30$, $p<.05$, semi-partial correlation co-efficient $=.202$) and mindfulness skills 3.8% ($\beta=-.21$, $p<.05$, semi-partial correlation co-efficient $=-.197$), when all the other variables were controlled for. None of the other variables' contributions were statistically significant (see Table 12).

Table 12. Linear model of predictors of **depression** levels at baseline

	<i>b</i> [LLCI, ULCI]	SE <i>B</i>	β	<i>p</i>
Constant	1.26 [.014, 2.50]	.62		.072
M Anxiety T1	.26 [.04, .48]	.11	.30	.022
M Acceptance T1	.02 [-.13, .18]	.08	.05	.760
M Decentering T1	.20 [-.09, .50]	.15	.20	.173
M Self-compassion T1	-.25 [-.42, -.08]	.09	-.40	.005
M Mindfulness skills T1	-.29 [-.54, -.04]	.13	-.21	.025
M Intol. of uncertainty T1	.14 [-.01, .30]	.08	.23	.07

Note: adjusted $R^2 = .45$, $p<.001$; , with 95% bias corrected and accelerated confidence intervals reported in parentheses. CI and SE based on 1000 bootstrap samples.

5.2.4 Examining the Effect of Time

Although trial effectiveness is not a main aim for this present study, examining how outcome scores changed over time may indicate when change occurred.

A 2x4 mixed ANOVA was conducted to test whether there was a main effect for group (the between-subjects factor, MBI or WL) or main effect of time (the within-

subjects factor: T1, T2, T3, T4). This also examined whether time interacts with trial arm. These analyses were computed twice, once for anxiety and once for depression.

Normal distributions were checked through histograms and box-plots, and the 5% trimmed means of any identified outliers were within acceptable limits. Linearity was examined through scatterplots. Mauchly's test of Sphericity was not significant, so it can be assumed that the variance of the differences between all possible pairs of within-subject condition (in this case, time) is equal. Levene's Test was non-significant thus the assumption of homogeneity of variances was not violated, and as Box's M was not significant, homogeneity of intercorrelations can be assumed (Tabachnick & Fidell, 2013).

Anxiety

There was no significant interaction between trial arm and time, Wilks' Lambda=0.94, $F(3, 55)=1.05$, $p=0.38$, partial eta squared=0.54 (Wilks' Lambda is equivalent to the interaction effect).

There was a substantial and significant main effect for time, Wilks' Lambda=0.65, $F(3, 55)=9.79$, $p<0.001$, partial eta squared=0.35, the MBI group showing a reduction in mean anxiety scores over all time periods except at T3 (see Table 13).

Table 13. Mean anxiety scores for the WL and MBI groups across four time periods						
	Wait List Control			Mindfulness Based Intervention		
Time	n	M	SD	n	M	SD
T1 - Baseline	34	1.16	0.56	25	1.10	0.56
T2 - 4 weeks	34	0.98	0.60	25	0.90	0.61
T3 - 8 weeks	34	0.93	0.60	25	0.93	0.50
T4 - 20 weeks	34	1.01	0.59	25	0.82	0.52

The main effect comparing the two trial arms was not significant, $F(1, 57)=0.36$, $p=0.55$, partial eta squared=0.006 (partial eta squared guidelines (Cohen 1988) is .01=small effect, .06=moderate effect, .14=large effect).

Post-hoc analysis with a Bonferroni adjustment revealed that anxiety levels were significantly decreased from pre-intervention to 4 weeks (T2) ($M=0.19$, 95% CI[0.08-0.31], $p<.001$), and from pre-intervention to 8 weeks (T3) ($M=0.20$, 95% CI[0.08, 0.32], $p<.001$), and from pre-intervention to 20 weeks (T4) ($M=0.22$, 95% CI[0.07, 0.36], $p<.001$). There were no significant differences between the other time levels (see Figure 9 (a)).

Depression:

There was no significant interaction between trial arm and time, Wilks' Lambda=0.87, $F(3, 55)=2.64$, $p=0.06$, partial eta squared=0.13.

There was a substantial main effect for time, Wilks' Lambda=0.84, $F(3, 55)=3.54$, $p=0.02$, partial eta squared=0.16, with the MBI group showing a reduction in mean depression scores across the four time periods (see table 14).

Table 14. Mean depression scores for the WL and MBI groups across four time periods						
	Wait List Control			Mindfulness Based Intervention		
Time	n	M	SD	n	M	SD
T1 - Baseline	34	0.85	0.48	25	0.99	0.50
T2 - 4 weeks	34	0.85	0.51	25	0.93	0.53
T3 - 8 weeks	34	0.83	0.50	25	0.79	0.44
T4 - 20 weeks	34	0.93	0.52	25	0.86	0.54

The main effect comparing the two trial arms was not significant, $F(1, 57)=0.06$, $p=0.79$, partial eta squared=0.001.

Post hoc analysis with a Bonferroni adjustment revealed that depression levels were statistically significantly decreased between T1 (pre-intervention) and T3 (8 weeks) ($M=0.11$, 95% CI [0.00-0.22], $p=0.049$). Levels of depression were not significantly decreased between T1 and T2, $M=0.03$, 95% CI[-0.10-0.16], $p=1.000$, or between T1 and T4 $M=0.03$, 95% CI[-0.12-0.18] (see Figure 9 (b)).

6 MECHANISMS OF CHANGE

6.1 Mediation Analysis

Mediation analysis was undertaken with the PROCESS macro to explore if the relationships between the dependent variable, trial arm (X: intervention or control), and the primary outcomes, anxiety and depression (Y), are influenced through the putative mediators, or process variables (M), (see Figure 4 from methods chapter, showing path $X \rightarrow M$ (a), $M \rightarrow Y$ (b), direct effect of $X \rightarrow Y$ (c')).

The first analysis examined both outcome variables at T4 (20 weeks' follow up) with mediator variables at T3 (8 weeks – end of intervention), controlling for T1 (baseline) outcome and mediator variables. A second analysis of outcome variables at T3 with mediator variables at T2 (4 weeks, mid-point of intervention) was also carried out (Appendices B8, B9, B10 and B11).

6.1.1 Anxiety

Anxiety levels at follow up (T4: 20 weeks) predicted by mediator levels at end of intervention (T3: 8 weeks) (Figure 10 below; Appendix B8)

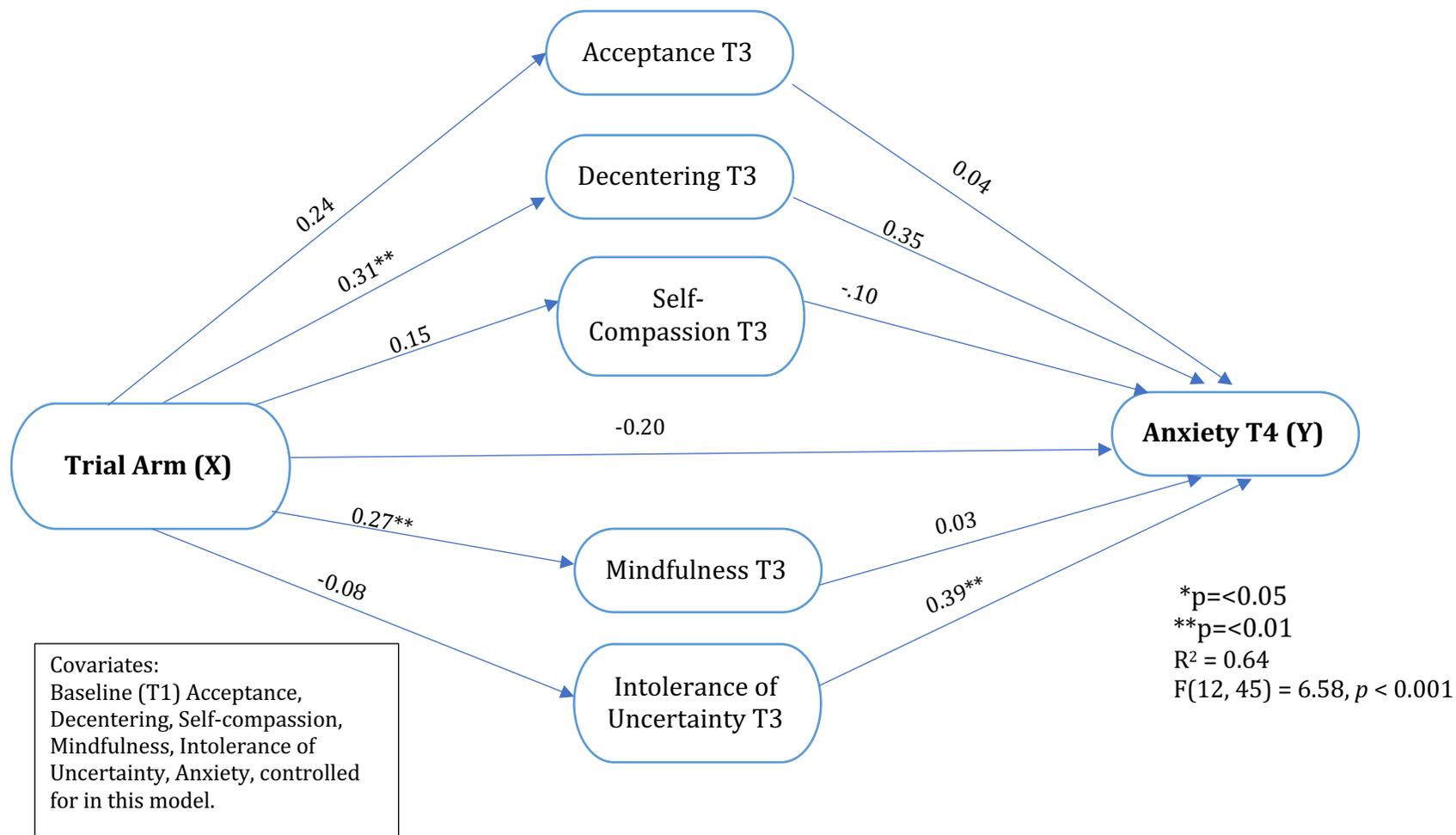
Results from a regression analysis including T3 mediators and T4 anxiety levels indicated that trial arm was a significant predictor of levels of decentering ($a=.31$, $SE=.07$, $p<0.001$, $CI=.16, .46$) and mindfulness skills ($a=.27$, $SE=.07$, $p=.0005$, $CI=.12, .41$).

However, the only mediator variable that predicted anxiety levels at T4 was intolerance of uncertainty at T3 ($b=.39$, $SE=.14$, $p=.007$, $CI=.11, .66$). No other

mediators showed significant indirect effects of trial arm on anxiety levels. There was no significant direct effect of trial arm on anxiety levels ($c'=.20$, $SE=.14$, $p=.14$, $CI=-.47, .07$).

Approximately 64% of the variance in levels of anxiety at T4 is explained by both the mediator variables at T3 and the trial arm.

Figure 10. Model of putative parallel mediation of acceptance, decentering, self-compassion, mindfulness and intolerance of uncertainty (all at T3) on levels of **ANXIETY** at T4.



Anxiety levels at end of intervention (T3: 8 weeks) predicted by mediator levels at mid intervention (T2: 4 weeks) (Figure 11 below; Appendix B9)

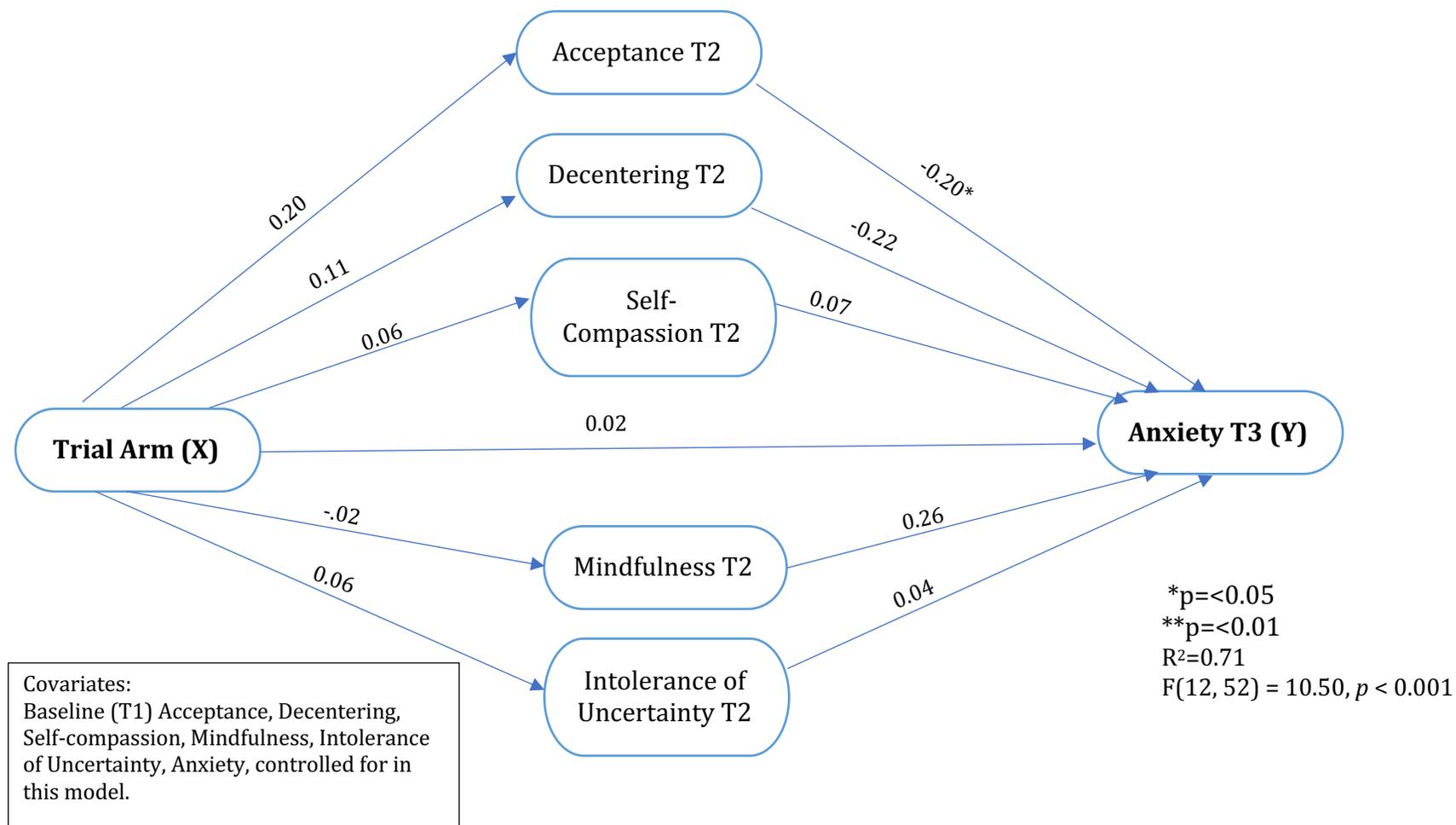
Results from a regression analysis including T2 mediators and T3 anxiety levels indicated that trial arm was not a significant predictor of any of the mediating variables. Levels of acceptance at T2 predicted levels of anxiety at T3 ($b=.20$, $SE=.09$, $p=.035$, $CI=-.38, -.01$). There was no significant direct effect of trial arm on anxiety levels ($c'=.02$, $SE=.09$, $p=.83$, $CI=-.16, .20$).

Approximately 66% of the variance in levels of anxiety at T3 is explained by both the mediator variables at T2 and the trial arm.

Mediation effects of relationship of trial arm on anxiety levels (see Table 15):

At the end of the intervention (T3), the total effect of mindfulness training on anxiety levels was $-.0414$, ($SE=.0873$, $CI=-.2161, .1334$), meaning that being in the intervention group lead to lower levels of anxiety, although the 95% bootstrap confidence interval straddles zero so the result cannot be said to be definitely different from zero. The direct effect (path c') was $.0186$ ($SE=.0879$, $CI=-.1579, .1950$), but again the confidence intervals straddle zero. None of the specific indirect effects of the mediators (measured at mid-point in the intervention) were significant, but as the total effect was greater than the direct effect it can be assumed that there was no inconsistent mediation (or evidence of suppression in the indirect effects, Mackinnon, Fairchild, & Fritz, 2007). By follow-up, there appears to an inconsistent mediation effect: the total effect of trial arm on anxiety was $-.1220$ ($SE=.117$, $CI=-.3462, .1023$) and direct effect $-.2013$, ($SE=.1347$, $CI=-.4725, .0699$). The individual indirect effects of the mediating variables showed that acceptance, decentering, mindfulness skills no longer had negative signs, but positive, resulting in a total indirect effect of $.0794$ ($SE=.1005$, $CI=-.1006, .3034$), indicating that the mediators at T3 did not predict a reduction in anxiety levels at follow-up.

Figure 11. Model of putative parallel mediation of acceptance, decentering, self-compassion, mindfulness and intolerance of uncertainty (all at T2) on levels of **ANXIETY** at T3.



6.1.2 Depression

Depression levels at follow up (T4: 20 weeks) predicted by mediator levels at end of intervention T3: 8 weeks)((Figure 12 below; Appendix B10)

Results from the regression analysis including T3 mediators and T4 depression levels indicated that trial arm was a significant predictor of levels of decentering ($a=.31$, $SE=.07$, $p<0.01$, $CI=.16, .46$) and mindfulness skills ($a=.29$, $SE=.07$, $p<.001$, $CI=.14, .43$). Intolerance of uncertainty and self-compassion at T3 predicted levels of depression at T4 ($b=.29$, $SE=.13$, $p<.05$, $CI=.02, .56$; $b=.27$, $SE=.13$, $p<.05$, $CI=-.53, -.004$). There was no significant direct effect of trial arm on levels of depression ($c'=.21$, $SE=.13$, $p=.1313$, $CI=-.47, 0.64$).

Approximately 55% of the variance in levels of depression at T4 is explained by both the mediator variables at T3 and the trial arm.

Depression levels at follow up (T3: 8 weeks) predicted by mediator levels at mid-point of intervention T2: 4 weeks)((Figure 13 below; Appendix B11)

Results from the regression analysis including T2 mediators and T3 depression levels indicated that trial arm was not a significant predictor of levels of any of the mediator variables at 4 weeks, and none of the mediator variables significantly predicted depression levels at T3.

However, there was a significant total effect of trial arm on levels of depression at T3 ($c=-.1977$, $SE=.07$, $p=.0091$, $CI=-.34, -.05$) with participants in the mindfulness group experiencing a small reduction in anxiety levels.

Approximately 73% of the variance in levels of depression at T3 is explained by both the mediator values and the trial arm.

Figure 12. Model of putative parallel mediation of acceptance, decentering, self-compassion, mindfulness and intolerance of uncertainty (all at T3) on levels of **DEPRESSION** at T4

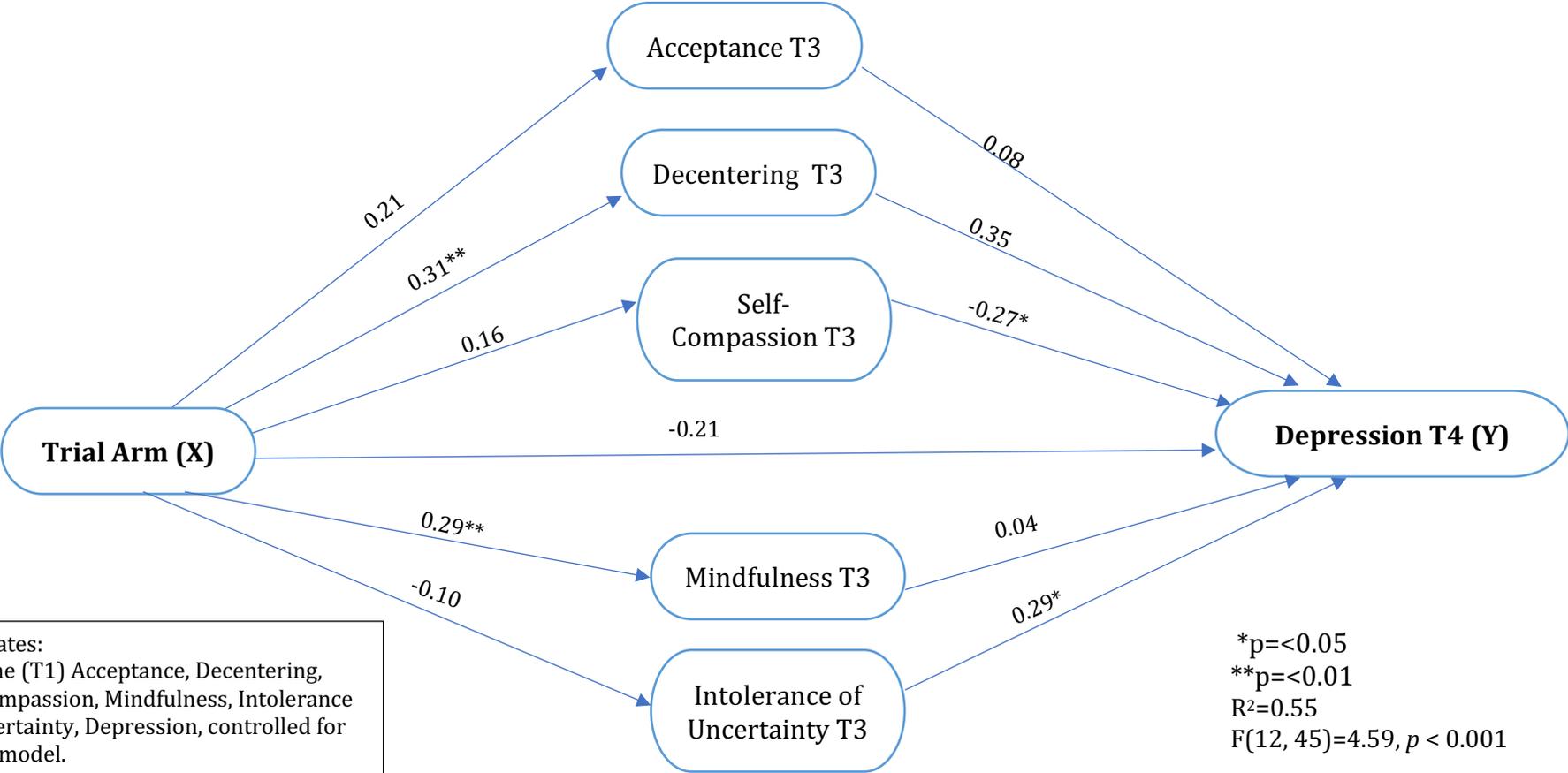
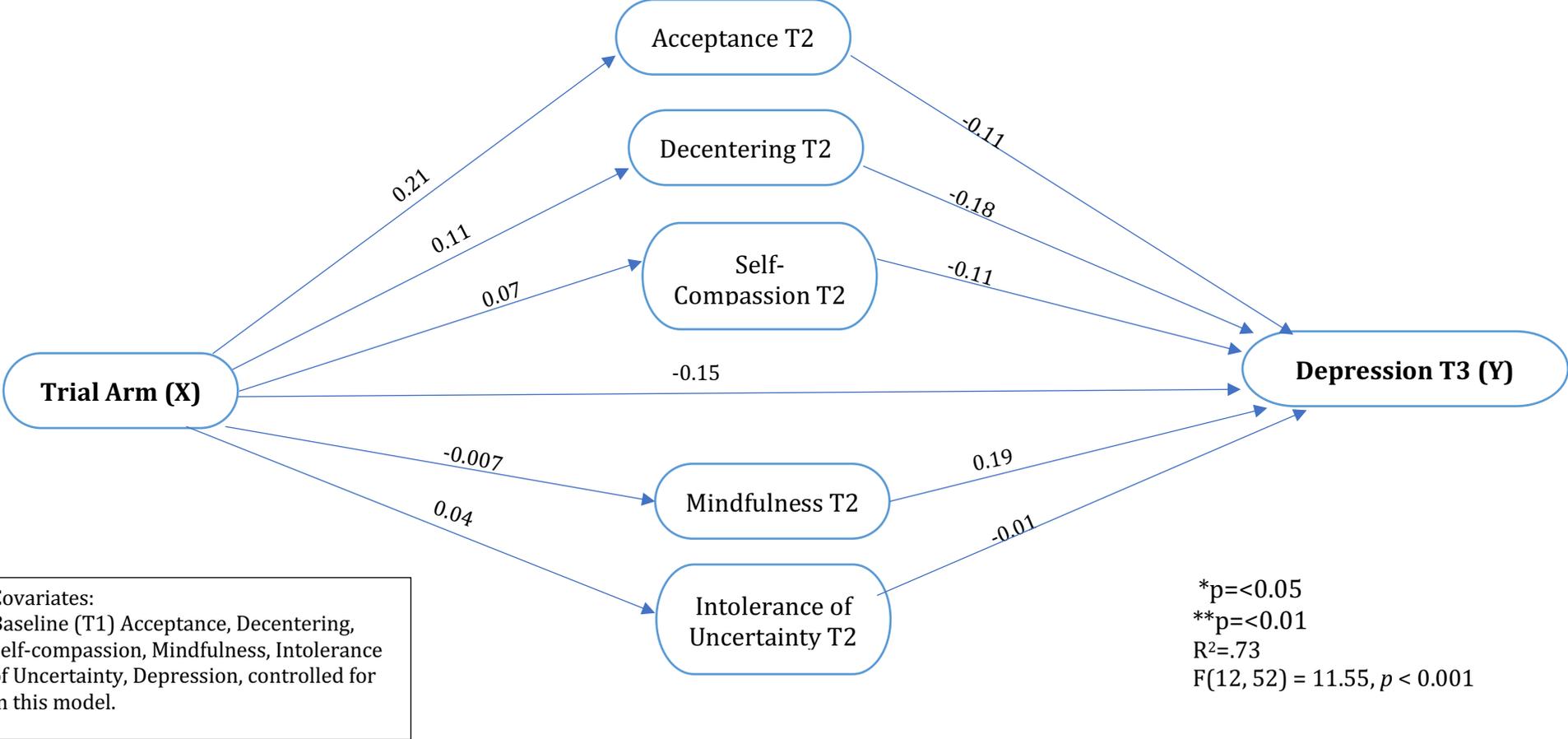


Figure 13. Model of putative parallel mediation of acceptance, decentering, self-compassion, mindfulness and intolerance of uncertainty (all at T2) on levels of **DEPRESSION** at T3



Mediation effects in relationship between trial arm on depression levels (see Table 15):

At the end of the intervention (T3), the total effect of trial arm on depression levels was significant (supported by the bootstrap confidence intervals, with 95% confidence) and was equal to $-.1997$ (SE=.0733, CI=-.3444, $-.0510$). The direct effect of trial arm on depression was smaller ($-.1457$, SE=.0730, CI=-.2922, $.0008$) and very close to significance. All the indirect effects of the individual mediators (measured at T2) were negative, indicating that (apart from intolerance of uncertainty) they contributed to reducing levels of depression, but none of these effects were supported by the confidence levels. The total indirect effect of the trial arm on depression was $-.0520$ (SE=.0477, CI $-.1561$, $.0319$).

At follow-up, neither the total effect ($-.1404$, SE=.1093, CI=.3600, $.0792$) or the direct effect of the trial arm on levels of depression ($-.2056$, SE=.1338, CI=-.4751, $.0638$) had confidence intervals entirely above or below zero. The direct effect is again larger than the total effect indicating some suppression effect. The total indirect effect ($.0652$, SE=.0949, CI=-.1249, $.2515$) indicated that the combined mediators no longer contributed to the reduction in depression levels. Only self-compassion showed a non-significant but negative effect.

The total variance explained in both anxiety and depression at T4 by the mediation models, including the time-lagged mediators at T3, shows that there is a reduction compared to the models of anxiety and depression at T3 with mediators at T2, indicating that there is unaccounted mediation either from missing mediators, overlapping mediators, suppression between mediators or that moderation of the mediators has had an increased effect. It may also be an effect of reduced power as the sample size included at the later stages of the mediation analysis reduced (T3 n=65, T4 n=58).

Table 15. Total, direct and indirect effects of trial arm on anxiety and depression.

	Anxiety T3 (LLCI, ULCI)	Anxiety T4 (LLCI, ULCI)	Depression T3 (LLCI, ULCI)	Depression T4 (LLCI, ULCI)
Total effect	-0.0414 -0.2161, .1334	-0.1220* -0.3462, .1023	-0.1977 -0.3444, -0.0510	-0.1404* -0.3600, .0792
Direct effect	-0.0186 -0.1579, .1950	-0.2013 -0.4725, 0.699	-0.1457 -0.2922, .0008	-0.2056 -0.4751, .0638
Total indirect effect	-0.0600 -0.1943, .0254	.0794 -0.1006, .3034	-0.0520 -0.1561, .0319	.0652 -0.1249, .2515
Indirect effect of acceptance	-0.0389 -0.1816, 0.142	.0092 -0.0330, .1073	-0.0223 -0.1210, .0073	.0175 -0.0193, .1375
Indirect effect of decentering	-0.0234 -0.1479, .0154	.1060 -0.0658, .3492	-0.0206 -0.1284, .0166	.1068 -0.0667, .3229
Indirect effect of self-compassion	.0041 -0.0201, .0872	-0.0151 -0.1623, .0242	-0.0072 -0.0911, .0135	-0.0418 -0.2179, .0243
Indirect effect of mindfulness skills	-0.0038 -0.0727, .0327	.0085 -0.1179, .1226	-0.0014 -0.0548, .0315	.0118 -0.1450, .1533
Indirect effect of intolerance of uncertainty	.0020 -0.0238, .0542	-0.0292 -0.1586, .0551	-0.0005 -0.0347, .0249	-0.0291 -0.1672, .0194

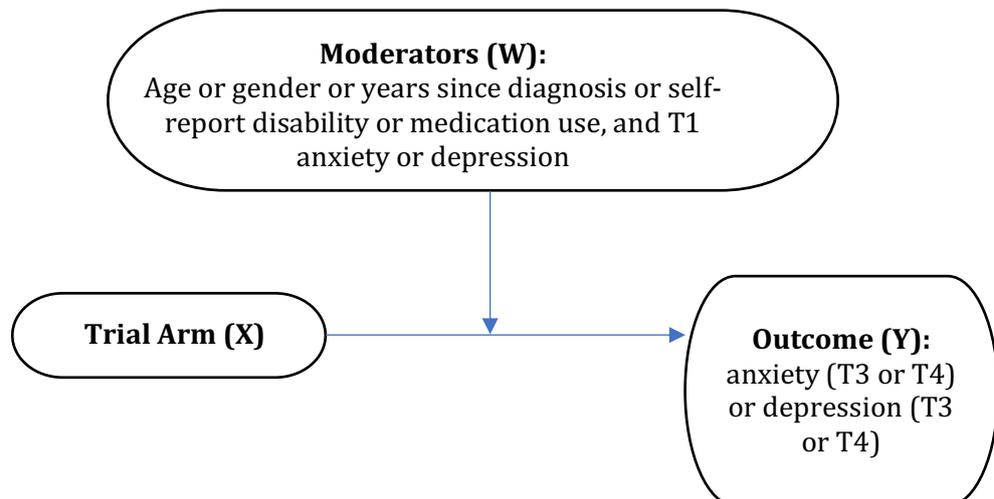
Note: mediators measured at T preceding outcome T. *inconsistent mediation, where total effect smaller than direct effects

6.2 MODERATION ANALYSIS

The strength and direction of the relationship between the trial arm (X) and the outcomes (Y, anxiety and depression) was examined for moderation effects by clinical factors, including participant age, gender, years since diagnosis, self-report baseline disability and psychogenic medication use in individual analyses (Figure 14).

Both outcomes at T3 and T4 were analysed with baseline anxiety and depression included as covariates.

Figure 14. Simple model of moderation of the effect of trial arm on levels of anxiety and depression

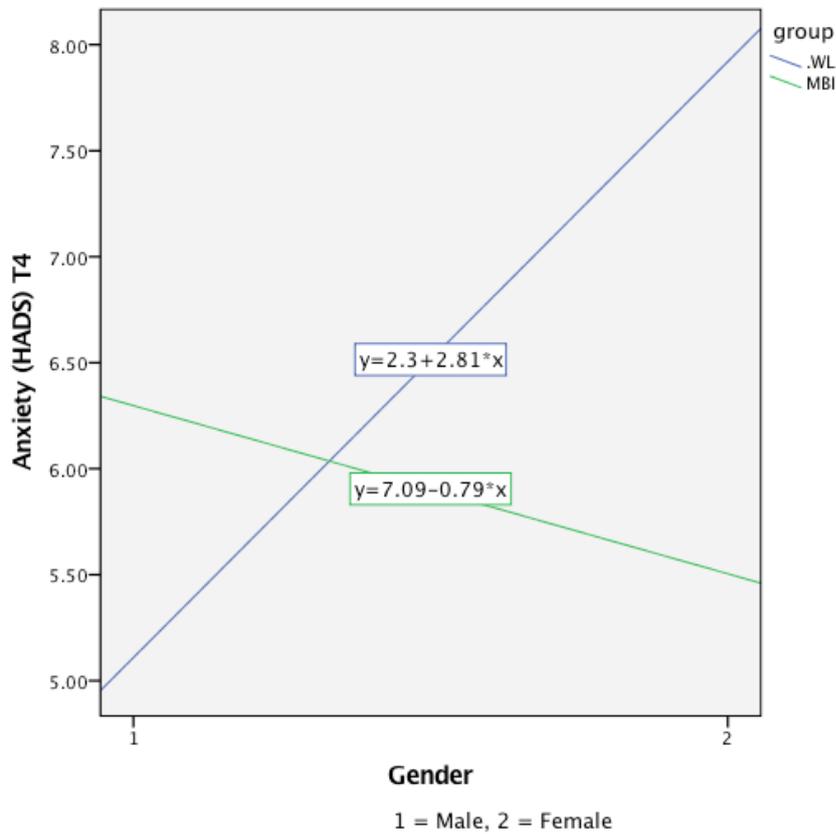


Anxiety T4

The only significant moderator of anxiety (T4, at follow-up) was gender ($b = -3.61$, $SE = 1.29$, $t = -2.78$, $p = .0074$, $CI = -6.204, -1.006$; R^2 change = .0509, $F_{1,57} = 7.7149$, $p = .0074$). When the MBI participant was female, the relationship between the trial arm and levels of anxiety was negative and statistically significant ($b = -2.42$, $SE = .13$, $t = -2.71$, $p = .009$, $CI = -4.2055, -.62$), indicating that females randomised to the intervention group had lower levels of anxiety than females randomised to the waiting list. When the MBI participant was male, the

relationship between the trial arm and levels of anxiety was positive, but non-significant ($b=1.18$, $SE=.14$, $t=1.26$, $p=.212$, $CI=-.6966, 3.07$) (Figure 15).

Figure 15. Moderating effect of gender on levels of anxiety



Anxiety T3

There was no moderating effect of gender on the relationship between the trial arm and anxiety immediately following the intervention (T3). Age, years since diagnosis, baseline disability and medication use did not moderate the direct effect.

Depression T4 & T3

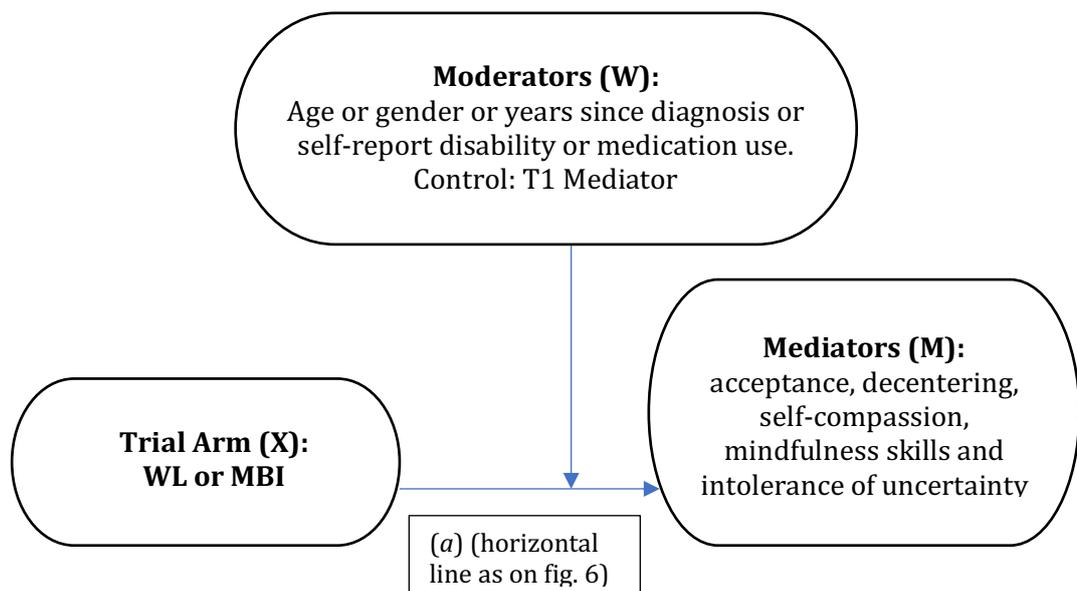
No statistically significant interaction effects were found for any of the proposed clinical moderators between the trial arm and depression at T4 or T3.

6.3 Moderated Mediation

This occurs when the relationship between trial arm and moderator is moderated by, or the strength of that relationship is conditional on, another variable (W).

In this study, the putative mediators (acceptance, decentering, self-compassion, mindfulness skills and intolerance of uncertainty at T3 and T4) were singly entered into a simple conditional model in PROCESS (template model 1, Hayes, 2013) as the dependent variable (Y) and the relationship with each possible moderator (age, gender, years since diagnosis, baseline disability and medication use) was tested for significance by bias-corrected bootstrap confidence intervals.

Figure 16. *A simple model of moderated mediation*



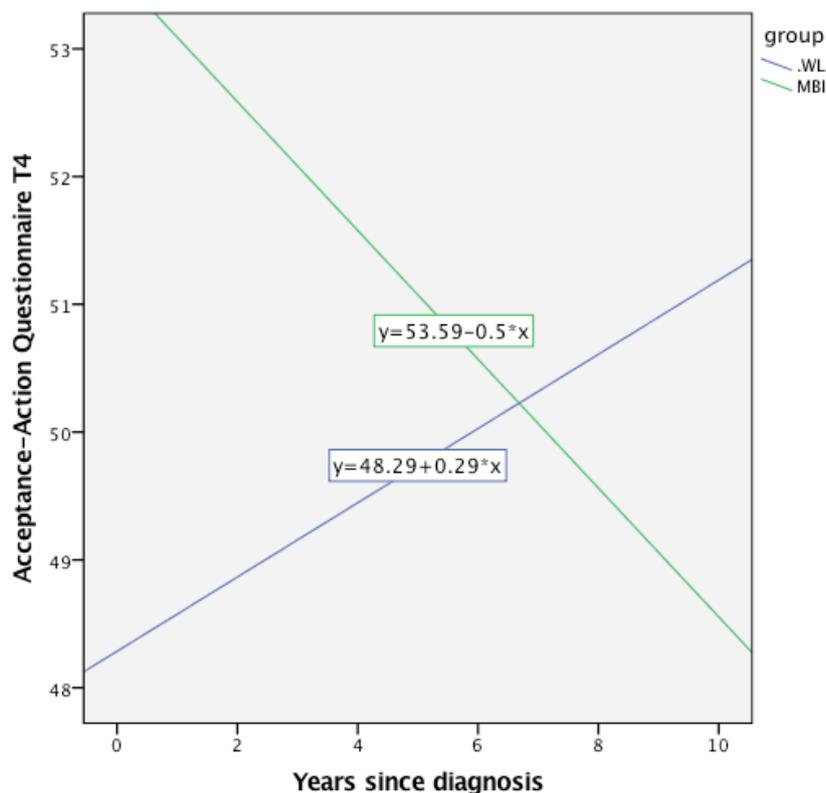
Years since diagnosis moderating acceptance T3 and T4

Years since diagnosis moderated the relationship between trial arm and levels of acceptance at T4 ($a=-.79$, $SE=.38$, $t=-2.11$, $p=.0397$, $CI=-1.55, -.039$; R^2 change=0.02, $F_{1,56}=4.431$, $p=.0397$)(Figure 17). This suggests that as years since

diagnosis change by one unit, in the MBI group, the overall effect on levels in acceptance differs by a coefficient of $-.79$.

Probing the interaction with the Johnson-Neyman (JN) technique indicated that there was a significant and positive effect of trial arm on acceptance levels when MBI participants' time since diagnosis was less than 1.8 years ($a=3.85$, $SE=1.92$, $t=2.003$, $p=0.05$, $CI=.00, 7.70$), meaning that acceptance levels in a participant randomised to the intervention arm were higher if the participant had been diagnosed within 1.8 years (8.2% of participants). Participants diagnosed within 6 months had an effect size of 4.911, ($SE=2.29$, $t=2.14$, $p=0.039$, $CI .3090 - 9.51$). There was also a negative effect if the diagnosis was more than 7.1 years, but this was not statistically significant.

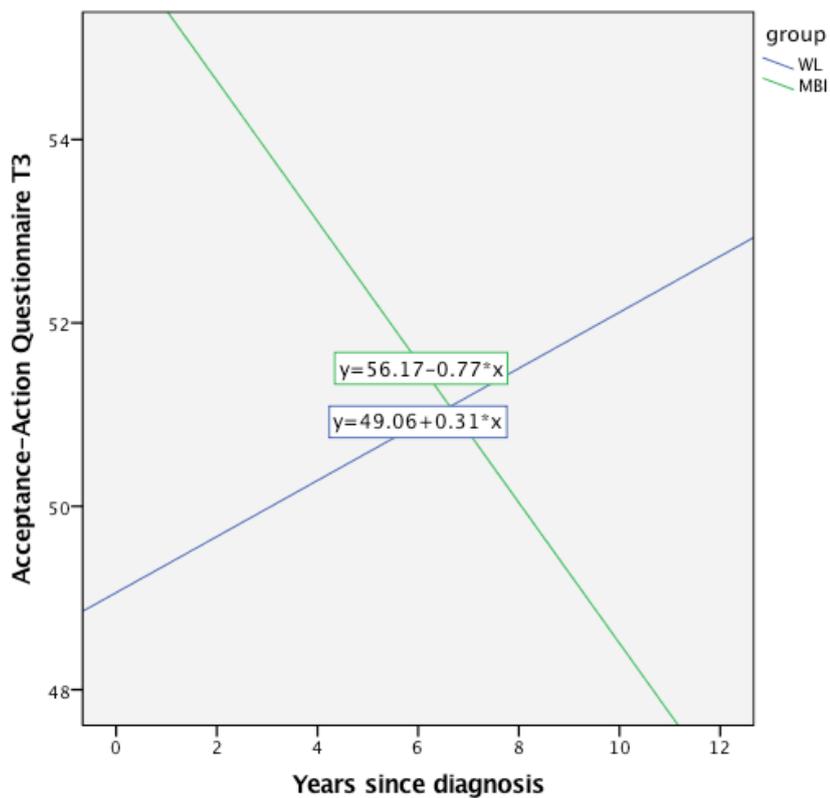
Figure 17. Moderating effect of years since diagnosis on acceptance at T4



Years since diagnosis also moderated acceptance at T3, ($a=-1.07$, $SE=.40$, $t=-2.65$, $p=.0102$, $CI=-1.88, -.26$; R^2 change=0.06, $F_{1,61}=7.04$, $p=.0102$)(Figure 18).

The significant values identified by JN suggest that immediately after the MBI, people in the intervention group who were within 2.69 years of diagnosis had a significant and positive relationship with levels of acceptance ($a=4.23$, $SE=2.12$, $t=1.99$, $p=.05$, $CI=.00, 8.45$; 24% of the sample). However, for people in the MBI who had been diagnosed more than 12.5 years, there was a significant and negative relationship with levels of acceptance ($a=-6.37$, $SE=3.19$, $t=-1.99$, $p=.05$, $CI=-12.75, 0.00$; 10.6% of the sample).

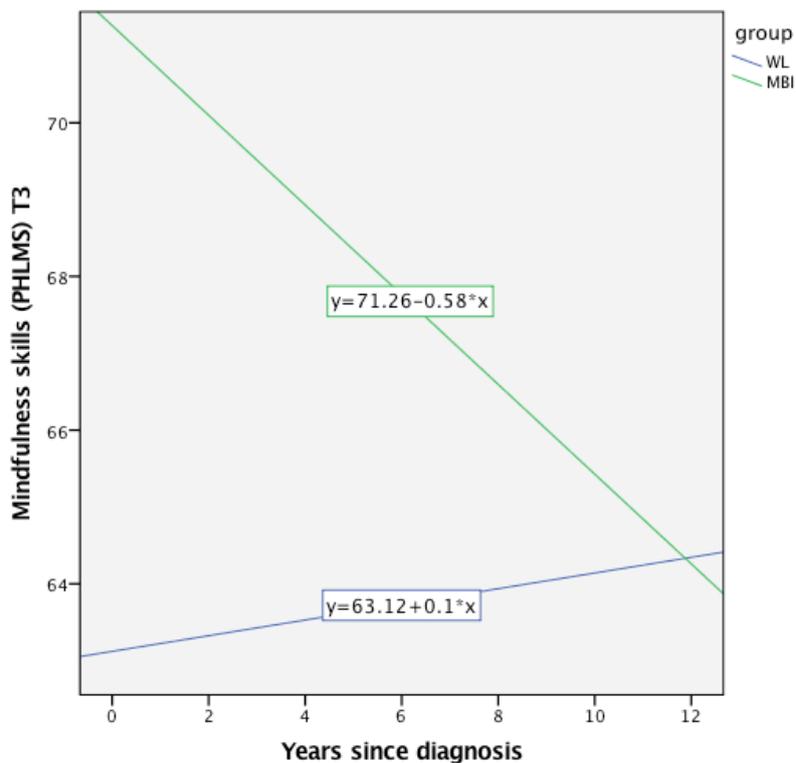
Figure 18. Moderating effect of years since diagnosis on acceptance T3



Years since diagnosis and mindfulness skills T3

Years since diagnosis significantly moderated the relationship between the trial arm and mindfulness skills at T3 ($a=-.6857$, $SE=.34$, $t=-2.02$, $p=.0482$, $CI=-1.365$, $-.0057$; R^2 change=0.03, $F_{1,61}=4.07$, $p=.0482$) (figure 19). Probing the interaction, the significant region was for people in the MBI diagnosed within 7.5 years, who benefitted from greater mindfulness skills ($a=2.99$, $SE=1.50$, $t=1.99$, $p<.05$, $CI=.00$, 5.99 ; 67% of the sample).

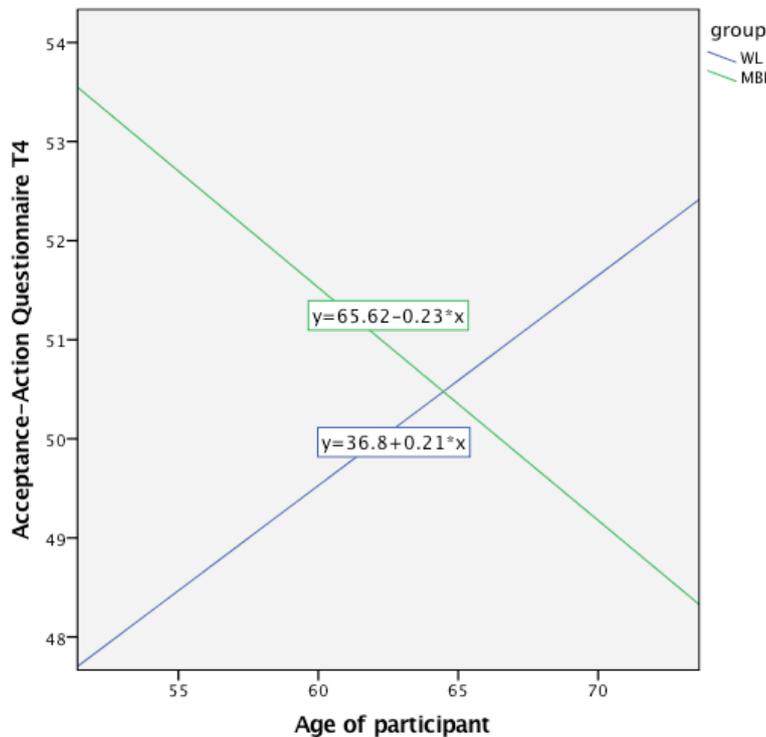
Figure 19. Moderating effect of years since diagnosis on mindfulness skills T3



Age of participant and acceptance T4

Age significantly moderated the relationship of trial arm and acceptance at T4 ($a=-.45$, $SE=.16$, $t=-2.80$, $p=.0071$, $CI=-.7772$, $-.1268$; R^2 change=0.04, $F_{1,56}=7.82$, $p=.0071$) (Figure 20). For people in the MBI who were younger than 57.7 years, there was a significant and positive effect of age of participant on levels of acceptance ($a=3.01$, $SE=1.50$, $t=2.00$, $p=.05$, $CI=.0000$, 6.01). This accounted for 26% of the sample.

Figure 20. Moderating effect of age on acceptance at T4



Other moderation effects

There were no significant moderation effects of disability levels, gender or medication use on any of the relationships between trial arm and acceptance, decentering, self-compassion, mindfulness skills and intolerance of uncertainty.

7 DISCUSSION

This paper set out to explore if acceptance, decentring, self-compassion, mindfulness skills and intolerance of uncertainty levels changed during the intervention and at follow-up, and if these changes were associated with changes in treatment effect on anxiety and depression. The temporal order of change was examined to see if any putative mediator change preceded change in psychological outcome measures, and the association between changes was analysed. Analysis using the PROCESS plug-in examined whether there was any significant mediation of the effects of the intervention on levels of anxiety and depression. Potential process pathways were also examined for any moderation of the direct or indirect effects, to see if any subsets of the sample benefitted more.

7.1 PRIMARY FINDINGS

The findings revealed that levels of all the mediator variables in people randomised to the intervention changed in a positive health outcome direction. Immediately following the 8-week course, the MBI group had statistically significant improvements in levels of depression, decentring and mindfulness skills. All other outcomes showed greater improvement in the intervention arm than in the wait list, but the differences were not statistically significant.

Being in the intervention group significantly predicted higher levels of decentring and mindfulness skills, but these putative mediators did not then significantly predict the outcomes anxiety or depression. However, lower levels of intolerance of uncertainty, and higher levels of acceptance in the MBI did predict lower anxiety levels, and lower intolerance of uncertainty and higher self-compassion predicted lower levels of depression. No complete mediation path (*ab*) was significant, but all the included candidate mediators were significant in at least one area of each of the causal paths at one of the time points for one of the outcome variables, indicating that they have some influence over either the mediator or the psychological outcome following the intervention.

There were also suggestions of suppression effects in the multiple mediator models that examined the effect of the intervention on anxiety and depression levels at follow-up (T4), by mediators measured at week eight (T3).

Even though there were no significant differences in levels of anxiety between men and women at baseline, at the 3-month follow-up (T4) anxiety levels were moderated by gender, with females having lower scores; however, gender did not moderate levels of depression at either point. People who were more recently diagnosis and who were younger, showed greater increase in their levels of acceptance at the end of the intervention.

This pilot study was exploratory, and in accordance with CONSORT recommendations, does not aim to report significant trial efficacy but to examine areas of uncertainty in a future trial. This study set out to explore if relationships between the intervention and the psychological outcomes were mediated by constructs that are theorised to contribute to process or mechanisms of therapeutic change, and also to examine if any of these relationships were conditional on moderating clinical variables (Thabane et al, 2010; Leon, Davis, & Kraemer, 2011; Eldridge et al, 2016).

Shapiro's theoretical model of mindfulness (2006, Figure 1) includes decentering, values clarification, self-regulation, cognitive flexibility and exposure as psychological constructs, which broadly compare to the instruments used in this paper which evaluate decentering, self-compassion, mindfulness skills, acceptance and intolerance of uncertainty.

Intolerance of uncertainty (IU) has been introduced as a novel putative mediator in mindfulness training and PD; IU has previously been demonstrated to have a role in transdiagnostic psychological disorders (McEvoy & Mahoney, 2010; Vander Haegen & Etienne, 2016), and to be responsive to CBT (Talkovsky & Norton, 2016), to be associated with panic disorders (Carleton, Duranceau et

al, 2014), and to be predictive of anxiety in people with PD (Brown & Fernie, 2014).

Robust design is important even in a pilot study to ensure that process mechanisms can be identified (Kazdin, 2007; Gu, Strauss, Bond, & Cavanagh, 2015; van der Velden et al, 2015) and this study examined a self-selected sample randomised to either the MBI or a WL control. While WL groups are not comparable to active control groups, because they cannot control for the group placebo effects or positive treatment expectancies, active control groups also generate expectancies of change that equate to an intervention effect and which can also confound outcome (Kazdin, 2014).

Kazdin (2007, 2014) also recommends that in order to establish mediation change all the constructs should be measured not just pre- and post-intervention, but also during the intervention. This present study included a mid-intervention point as well as a follow-up time point of 20 weeks, eight weeks longer than a similar study (Bogosian et al, 2016).

Mediator variables represent constructs that are part of the mechanism or processes of change, so examining mediation is just a first step to understanding how change is effected (Kazdin, 2009; Windgassen et al, 2016). Demonstrating mediators and mechanisms of change requires evidence of strong associations between the intervention and the mediator and the mediator and the therapeutic change. In this pilot study, correlation analysis was used to establish that there were associations, in the expected directions, between the outcome variables and the putative mediator variables.

Analysis of the changes over time should also include time-lagging the mediator variable to the outcome variable, as significant change then indicates the direction of process, and strengthens the mediation and thus causal chain claim. This study found some expected relationships, for instance, that mindfulness skills were not significantly correlated to psychological outcomes until later on, as the naive participants underwent training. On the other hand, the

correlations between outcomes and mediator variables at T3 (8 weeks) were mostly non-significant for the intervention group yet were significant at T2 and T4. This may indicate that responses to questionnaires immediately following the end of an intense and supportive therapeutic period may be moderated by some emotional process that could be revealed through qualitative research undertaken concurrently and which will be reported elsewhere.

The effect of time on change in primary outcomes was examined, and anxiety levels were significantly lower at all levels when compared to baseline, but depression levels were only significantly lower at the end of the intervention. Effect sizes at each time point indicate that acceptance and decentering had an effect at T2 before both depression and anxiety, and self-compassion and mindfulness skills had a small effect at T3 before anxiety showed a small effect at T4 (Figure 9 a-g).

Kazdin (2014) describes the lack of evidence base for psychotherapeutic interventions in clinical practice, in particular the need for treatments that have reach, scalability, and affordability to meet the increasing demand for non-pharmaceutical interventions for people with chronic and degenerative disease. Because there is some evidence that certain broad characteristics in populations and core processes in mindfulness may explain how different patient groups have benefitted from an intervention, it has been described as a transdiagnostic treatment (Chiesa and Serreti, 2010; McEvoy and Mahoney, 2012). However, there is still much to discover about how the potential processes work, and which particular patients would benefit from treatment. Studies examining mechanisms in MBI studies in people with physical disease are limited: Alsubaie et al (2017) only found four mediation studies of mindfulness interventions for people with physical disease and mood disorders, three were in cancer populations and one in coronary heart disease patients. A review of 16 mediation studies in cancer populations found promising potential mediators in cognitions, self-efficacy and self-esteem (Stanton, Luecken, Mackinnon, &

Thompson, 2013). A later publication Bogosian et al (2016) examined possible mediation in a remote delivery MBI for people with multiple sclerosis.

7.2 Associations between variables

The whole sample bivariate correlations showed strong associations between all the variables purported to be mediators or outcomes, except for mindfulness skills at baseline, which, as would be expected from naïve participants embarking on mindfulness training, became more strongly and significantly correlated with time, and on examining the separate group correlations, this was clearly focused within the MBI group. Associations between the intervention and putative mediators, and the mediators and change variables were therefore demonstrated.

Furthermore, standard regression analysis explored the associations at baseline between mediator variables and either outcome, whilst controlling for the remaining variables, and demonstrated that the models explained 55% and 45% of the variance in levels of anxiety and depression respectively, both within moderate levels. Statistical significance was only achieved in one mediator variable (acceptance) in anxiety, and two in depression (self-compassion and mindfulness skills); baseline decentering, which by T3 is significantly increased in the MBI group, did not significantly predict baseline anxiety or depression, and this is reflected in subsequent mediation analysis.

Acceptance

This study has demonstrated that acceptance is likely to mediate the relationship between mindfulness training and anxiety and depression in people with PD, despite the non-significance of the multiple mediation study in all the pathways except when mid-intervention levels of acceptance were regressed on levels of anxiety at the end of the intervention (T4). Treatment effects were small, but increased at every time point, including follow-up, and before any effects were evident in the treatment outcomes. This steady growth

pattern replicates the change in acceptance levels found in an intensive Acceptance and Commitment Therapy (Hayes, Stroschal, & Wilson, 1999) intervention for chronic pain (which included substantial mindfulness training) (McCracken & Gutiérrez-Martínez, 2011). As previously mentioned, another remote delivery MBI for people with MS found little change in levels of acceptance until the 3-month follow-up, and supporting qualitative evidence described the participants' struggle in increasing their acceptance of the daily challenges of their chronic illness (Bogosian et al, 2016).

In this study, acceptance was shown to be conditional on the participant's age, with people in the intervention arm younger than 57.7 benefitting from higher levels of acceptance. Time since diagnosis also moderated whether trial arm would have an effect on acceptance, as midway during the intervention, MBI participants diagnosed within 2.7 years were more likely to have higher acceptance levels, and within 1.8 years at the end of the intervention. As age of patient and onset of PD are correlated (Pringsheim, Jette, Frolkis, & Steeves, 2014), it is unsurprising that they both moderate this mediator. Baseline levels of acceptance predicted baseline levels of anxiety, with a unique contribution of 7.6% to the variance, but baseline acceptance did not predict baseline depression.

These results contrast to community sample evidence that greater acceptance is associated with older age, and that acceptance mediates between age and negative affect (in particular, levels of anxiety and not sadness) and that older people in general report higher emotional well-being, (Shallcross, Ford, Floerke, & Mauss, 2013; Butler & Ciarrochi, 2007). The majority of participants in this present sample reported mild Parkinson's symptoms, were approximately 6 years since diagnosis, and were mostly in their early 60s, so it is somewhat surprising that this moderation analysis of the mediation effect of acceptance defined such a narrow window of positive change.

While a ceiling effect of acceptance in older people has been reported in mindfulness levels in a review by Geiger et al (2016), it is more likely that acceptance is a skill that requires practice, and that the daily challenges people with PD face increase with age and disease progression, including cognitive decline, may make some of the processes involved in mindfulness training more difficult, thus giving patients only a limited time opportunity in which to acquire these new skills.

Decentering

Acceptance has been shown to be closely linked to decentering (McCracken et al, 2014); without being able to decenter from frightening thoughts, there is no possibility of acceptance of that thought, and in turn, acceptance, by increasing engagement, enhances decentering. This present study found that acceptance and decentering were strongly correlated at all time points for both groups, but decentering showed a larger effect size at mid-point and end of treatment. Bogosian et al (2016) also found that decentering had the greatest change at follow-up and had greater (although still small) effect size than acceptance and self-compassion at post-intervention, and considered decentering the most likely mediator of change in distress in an MBI study of people with MS.

Decentering has been described as “the ability to step outside of one’s immediate experience, thereby changing the very nature of that experience” (Safran & Segal, 1990, p. 117). In a physical disease like PD, many frightening and persistent thoughts can dominate, influencing behaviour and psychosocial outcomes (Julien, Rimes & Brown, 2016). Certainly, some of the motor symptoms of PD can be dramatic and frightening and can lead to worries about the future that are realistic (Wright, Hurt, Gorniak, & Brown, 2015). Despite the theoretical and plausible central role of decentering as a mechanism in mindfulness interventions, it was not included as a construct in any of the studies examining mindfulness interventions for people with physical disease in a recent review (Alsubaie et al, 2017) and only Bogosian et al (2016) have been able to demonstrate that decentering may be an important mediator in

chronic progressive illness and thus an important target for therapeutic intervention.

Although Shapiro's model of mindfulness includes decentering as the meta-mediator between mindfulness and psychological outcomes, this present study examined a parallel model of mediation with all five mediators measured simultaneously. Graphs of means over the four time points (Figure 9) show that there was more change in decentering between baseline and mid-point than at any other time, and this was confirmed by effect size in descriptive statistics (Table 8), suggesting that changes in decentering levels did occur earlier than in other mediators or outcomes, adding to support that it is a meta-mediator. This sequential placement in the causal chain was challenged by Carmody et al (2009), who used some of the FFMQ to measure mindfulness and who found a strong correlation between mindfulness levels and decentering, and subsequently combined the two concepts. However, another student study supported two separate constructs, and demonstrated that decentering mediated between mindfulness levels and depressive symptoms (Gecht et al, 2014).

This present study has shown that decentering should be included in future studies as a plausible mediator: participants randomised to MBI did have increases in decentering at mid-point that, when regressed on end of treatment anxiety and depression levels, showed a mediating effect, although not statistically significantly, however, including decentering in a serial mediation model would examine any meta-mediation role.

Mindfulness Skills

Assessing levels of mindfulness skills through self-report measures is challenging as there are difficulties with shared semantic meaning in describing mindfulness, as well as social desirability bias (Grossman & Van Dam, 2011; Jensen, 2012) and this may contribute to why only 45% of MBIs included in a meta-analysis measured mindfulness levels (Khoury et al, 2013). However, there is evidence that mindfulness skills are an important link within the causal

chain: self-report mindfulness increased following an MBI (Visted, Vøllestad, Nielsen, & Nielsen, 2015), mindfulness skills have been demonstrated to be a mediating variable between the MBI and psychological outcomes (Baer et al, 2012; Bränström et al, 2010; Chiesa et al, 2014; Gu, Strauss, Crane, Barnhofer, Karl, Cavanagh, & Kuyken, 2016), and lower levels of mindfulness are associated with people high in GAD (Roemer et al, 2009). An MBI with people with PD and their carers found significant increases in mindfulness levels (using the FFMQ) for both types of participant, and the PD participants reported fewer symptoms of apathy and anxiety, as well as improvements in PD related quality of life (Cash, Ekouevi, Kilbourn, & Lageman, 2016). However, the “observe” construct from the FFMQ, which has been defined as noticing or attending to internal experiences and is a proxy for attention, was the only facet from this measure of mindfulness skills to significantly increase eight weeks following a small-scale trial MBI for people with PD.

In the present study mindfulness skills became more strongly correlated with anxiety and depression in the MBI group, and levels of mindfulness increased throughout the training, as expected, showing a medium strength effect size at the end of the intervention; however, by follow-up, there was a small reversal in trend, indicating that trait mindfulness may not be maintained without intervention.

While mindfulness levels have been shown to mediate the relationship between an MBI and both anxiety and depression (Vøllestad, Nielsen & Nielsen, 2012), this was not immediately evident in this present study, where at T2 mindfulness levels’ effects on T3 anxiety and depression were not beneficial, but implied increased psychopathology. By T4 (for outcomes), mindfulness levels were showing an increased positive effect from the trial arm, and the negative effect on T4 distress levels had decreased to very small levels. Baseline mindfulness skills did not predict baseline anxiety but did predict baseline depression, uniquely contributing 3.8% to the variance, however, the overall levels of anxiety and depression in this sample were not at case levels, and indeed were

very close to normal levels, meaning there could have been a floor effect, and this, as well as time-lagging, may have contributed to this unexpected mediation effect.

Other studies have also reported no mediation effect of mindfulness skills (for instance Labelle, Campbell, Faris, & Carlson (2015) in a cancer study): only two out of the four mediation analyses of the effects of mindfulness for physical illnesses identified in Alsubaie et al's (2017) review found that mindfulness levels mediated the effects of the MBI on stress, depression and anxiety and psychosocial adjustment in breast cancer and cardiology (Bränström et al, 2010; O'Doherty et al, 2015). Heterogeneity in mindfulness measures and concepts have been suggested to be factors in these inconsistent effects (Alsubaie et al, 2017), and this present study's inclusion of the rarely used Philadelphia Mindfulness Scale limits comparison with previous studies (Visted et al, 2015). The PHLMS also focuses on present moment awareness (and acceptance) and in this present study is intended to measure the self-regulation construct in Shapiro's model, and is a representation of emotional regulation.

Emotional regulation in people with PD has been an area of recent research growth (Sotgiu & Rusconi, 2013), and studies have demonstrated that some PD patients without dementia or depression have dysfunction in angry faces recognition and anger control, and that this is associated with disease duration (Ille et al, 2016). Alexithymia has also been significantly associated with disease stage in PD patients, including a difficulty in externally oriented thinking (Bogdanova & Cronin-Golomb, 2013). These difficulties with emotional regulation, which increase with disease progression, may contribute to explaining the present study's findings of moderation of the mediation path between trial arm and mindfulness skills by years since diagnosis. Mindfulness skills, as measured by the PHLMS, are theorised to include awareness in the present moment, conducted non-judgementally, which must include being able to regulate emotions associated with distressing experiences or cognitions, thus an increase in mindfulness skills would lead to enhanced emotion regulation

(Hayes & Feldman, 2004). If emotional processing is compromised, it follows that augmenting mindfulness skills, which include being non-judgemental, and regulating the emotional response, are also compromised.

Assessing whether taking part in an MBI increases specific mindfulness skills and whether certain skills were more accessible to people with Parkinson's, would enable improved future intervention design. However, this seems unlikely without consensus on mindfulness concepts, and measures, and the development of interventions that combine more accessible and palatable neuro-functional imaging with self-report findings as suggested by Kazdin (2011). The challenge of defining mindfulness levels, in all its complexity, has been aptly described as "the integration of Western evidence-based psychological tradition with a Buddhist phenomenological orientation" (Chiesa, 2012).

Self-compassion

While mindfulness skills and self-compassion have been shown to be highly correlated, with self-compassion to be the stronger predictor of psychological health (Chiesa et al, 2010; Van Dam et al, 2010), in this present study, mindfulness levels only became strongly correlated with self-compassion in the MBI group as the intervention ended, and the correlation strength continued at follow-up, and both self-compassion and mindfulness skills were predictive of depression at baseline but not predictive of anxiety. This contrasts with findings from Hoge et al (2013) who found that both mindfulness and self-compassion were associated with generalised anxiety disorder and concluded that higher self-compassion indicates better acceptance of limitations imposed by the disorder.

This present mediation analysis showed that self-compassion at T2 and T3 predicted lower levels of depression at T3 and T4, and only predicted lower levels of anxiety at T4. As in Bogosian's et al (2016) study of MS patients, levels of self-compassion continued to increase throughout the intervention and at

follow-up, showing a small effect, reflecting the slow development of self-compassion. Mediation analysis demonstrated that the indirect effect of self-compassion at the end of the intervention was the only mediator to have an effect in a positive direction, that is in predicting reduced depression and anxiety at follow-up, however, the confidence intervals for these effects straddled zero. While this study was followed up at 20 weeks, self-compassion has been found to continue to be a significant mediator (along with mindfulness levels) between an MBI and depressive symptomology at 15 months (Kuyken et al, 2015), raising the possibility of even greater effect when follow-ups are extended.

Older people are more likely to have developed self-compassion and this may buffer against adverse events (Neff, 2009) and self-compassion has been shown to moderate the relationship between physical health and subjective well-being in older adults, and high self-compassion to be associated with better adjustment to disability (Allen & Leary, 2010) in a cross-sectional study of older people with self-compassion moderating the relationship between overall health and depression. However, the older people in those studies were not reported to have chronic disease, which may explain why, in this present research, in a sample of older people living with PD, age did not moderate the relationship of trial arm and self-compassion.

Higher levels of self-compassion are also associated with lower stress and more engagement in health promoting behaviours, which in turn had a positive effect on physical health (Homan & Sirois, 2017). Further evidence of the role of self-compassion in adjustment to chronic illness has been demonstrated in women with IBS or arthritis, those with higher self-compassion were found to have more adaptive coping styles (Sirois, Molnar, & Hirsch, 2015). A similar association was found in people with HIV and higher self-compassion, who were more willing to adopt safer health practices and reported less shame (Brion, Leary & Drabkin, 2014).

High levels of shame and perceptions of stigma are prevalent in people with PD, with both motor symptoms and non-motor symptoms causing embarrassment and social isolation (Nijhoff, 1995; Simpson, Macmillan, & Reeve, 2013), thus developing self-compassion could increase positive adaptation, and could enhance quality of life and reduce distress.

While there is a lack of statistical significance in the test of mediation by self-compassion reported here, there is evidence of a positive trend in self-compassion slowly developing and maintaining stability after the end of the intervention, making self-compassion a compelling construct within the mindfulness intervention process. However, the dearth of evidence that self-compassion is a significant mediator in MBIs (Gu et al, 2015) has led to recommendations that different roles should be explored for this construct, and it has been suggested as a moderating variable (Homan, 2016), who found that self-compassion moderated between self-report health and depression. Another possible mechanism of self-compassion may be that it has a direct effect on psychological outcomes; in a study of the effect of self-compassion in people with multiple sclerosis on health-related quality of life, the effect was both direct and also indirect through resilience levels (Nery, Hurwit, Yun, & Ebbeck, 2018).

Intolerance of Uncertainty

In health settings, the IU construct broadly describes how people cope with not knowing what the future holds, whether in diagnosis, symptomology, treatment, disability, social environment, and even mortality. Technological advances and mass media have increased treatment choices and access to information, while at the same time the patient faces a growing burden of decision-making. Uncertainty has been shown to provoke greater anxiety and fear and decision-avoidance and is conceptualised as a dispositional fear of the unknown (Dugas, Gagnon, Ladouceur, & Freeston, 1998; Buhr & Dugas, 2006; Carleton, 2012; Carleton 2016). In line with IU's relationship with distress intolerance, Carlson (2012) suggests that exposure to, or increasing tolerance to, symptoms or feelings that are avoided because of the uncomfortable feelings they provoke,

could be a mechanism of change that could be targeted in interventions. It has been suggested that increased mindfulness, through interventions, reduces the perceived threat of physical symptoms of anxiety, and that this relationship is mediated by reductions in intolerance of uncertainty (Kraemer et al, 2016). Many of the motor and non-motor symptoms of PD are transitory, yet very frightening, including freezing of gait and hallucinations, and being able to target and reduce the impact of the perception of these symptoms would reduce patients' distress.

Most studies examining the role of IU have been conducted on non-clinical populations, or with participants with anxiety and depression disorder. Following a chronic illness diagnosis, patients experience disruption to certainty and control, which may be moderated by coherent information, accurate prognosis, and effective talking therapy (Grupe & Nitschke, 2013). Uncertainty pervades all of the experience of living with PD, both for the patient and for family members. Ravenek, Rudman, Jenkins, & Spaulding (2017) qualitatively examined 39 people with young-onset PD and found two areas where uncertainty was problematic: the change in identity caused by having the disease, and the uncertainty of charting disease progression and therefore life goals.

Intolerance of uncertainty has been shown to be a transdiagnostic feature across both anxiety and depression (McEvoy & Mahoney, 2011; Carleton et al, 2012; Kertz et al, 2015) as well as a transdiagnostic risk factor maintaining anxiety and depression (Vander Haegen & Etienne, 2016). In people with PD, IU along with activities of daily living, positive beliefs about worry, metacognitions about uncontrollability, and lack of cognitive confidence were predictive of anxiety (Brown & Fernie, 2014).

The treatment effect on IU in this present study was small and positive at mid-intervention, meaning that being in the intervention group led to worse intolerance, but very slightly negative at post-intervention and negligible at follow-up, thus no effect by trial arm can be claimed. However, this present

study also suggests that IU is associated with and predictive of both anxiety and depression: a linear multiple regression revealed that when all other variables were controlled for, IU at T1 narrowly missed being a statistically significant predictor of both baseline anxiety and baseline depression, and IU measured at T3 significantly predicted both anxiety and depression at follow-up, but as there was little effect on IU levels by trial arm, mediation by IU cannot be assumed.

This present study has also demonstrated a relationship between mindfulness skills and intolerance of uncertainty; correlations showed associations that were weak and not significant at T1, but which increased in strength, in particular in the MBI group, until moderate and significant at T4, suggesting that acquiring mindfulness skills may increase tolerance of uncertainty. A mediation study that measured the exposure element of Shapiro's model with the Distress Tolerance Scale (Simons & Gaher, 2005), found significant mediation between mindfulness facets and anxiety, depression and stress (Brown, Bravo, Roos et al, 2015). These authors also reported that non-judgement of inner experience was the facet of the FFMQ that was most closely associated with exposure, and this adds support to the inclusion of IU in this present study, as the construct representing exposure, as non-judgement of whether a situation is threatening or not could also be interpreted as tolerating an unknown future.

However, the role of IU in psychopathology models remains unclear: mediation analyses have shown that IU mediates the effects of distress intolerance and worry in an undergraduate sample (Kertz et al, 2015), but IU has also been identified as a moderator of the relationship between catastrophic health appraisals and health anxiety outcomes in a student sample (Fergus & Valentiner, 2011), and in a PD sample, metacognitions concerning uncontrollability and danger were predictive of off-period distress after controlling for disease parameters, IU and predictability, suggesting that IU may be a moderator of the cognitive response rather than a mediator (Brown & Fernie, 2015).

Never the less, levels of intolerance of uncertainty have been shown to be adaptable: a CBT intervention for people with panic disorder, generalised anxiety disorder and social anxiety disorder, and a third of whom had secondary depressive disorder, demonstrated that all diagnostic groups showed lower IU following treatment, and greater reduction in IU was associated with greater treatment gains (Talkovsky & Norton, 2016). A recent review of tolerance measures recommends that there is a need to operationalise uncertainty as a more umbrella construct than ambiguity – as a metacognitive state of conscious awareness of ignorance, with ambiguity as a subordinate phenomenon and a feature of information (Hillen, Gutheil, Stout, Smets, & Han, 2017). These authors have recommended that uncertainty tolerance measures are specified for particular populations to encompass the complexity of healthcare, and to be person-specific, however there has yet to be any new metrics advanced, let alone any for neurological conditions like PD.

While this study has only shown a very small effect of trial arm on IU levels at T3, and there is no treatment effect at T4, the role of IU as a mediator between mindfulness interventions and psychological outcomes cannot be supported – however, this study has demonstrated that IU plays some role in reducing both anxiety and depression levels in people with PD, and that it is associated with trait mindfulness. IU remains a plausible and potentially important factor in distress in people with PD.

7.3 Study limitations

The self-selected sample included in this present study had low levels of baseline distress, with most participants being below case level (HADS ≥ 11) at leaving little scope for significant improvement. A moderating effect of baseline depression levels on the treatment effect of an MBI on levels of anxiety has been demonstrated in a study of people with anxiety disorder, with those with significant levels of baseline depression benefitted more from a mindfulness intervention than from a comparator CBT intervention, while the reverse was true for people with low levels of baseline depression (Arch & Ayers, 2013).

Recruiting future participants in future trials with clinical levels of anxiety and depression would improve ecological validity and would increase the possibility of significant results.

7.4 Future considerations

It is interesting to note that the direct effect of the trial arm on anxiety at T3 was very slightly positive but not statistically significant ($c'=.02$, $SE=.09$, $p=.83$, $CI=-.16, .20$), while the total effect of the trial arm on anxiety levels showed change in the expected direction ($c=-.04$, $SE=.09$, $p=.64$, $CI=-.22, .13$), suggesting that the reduction in anxiety levels were fully mediated by the moderating variables (T2), and on closer inspection of the indirect effects, these were acceptance, decentering, and mindfulness levels (although none of the confidence intervals straddled zero), but not self-compassion or intolerance of uncertainty. These five mediators, however, showed a reverse pattern at T4 for both anxiety and depression, with only self-compassion and intolerance of uncertainty contributing to reducing levels of the outcomes. It may be inferred that without active, organised mindfulness intervention, any improvements in distress levels may not be maintained by acceptance, decentering and mindfulness skills, and that self-compassion and intolerance of uncertainty continue to develop and influence distress. Any qualitative data collected as this present study was conducted, as well as practice diaries, could contribute to understanding why these changes occurred between end of intervention and follow-up.

Self-compassion may be a promising target construct for interventions: an eight-week intervention, Mindful Self-Compassion, similar to MBIs but with greater emphasis on developing self-compassion, found a large effect post-intervention in self-compassion (measured by SCS) ($d=1.67$) which was associated with reductions in anxiety, depression and stress. Significantly, levels of self-compassion remained high at 6 months and 1-year follow-ups (Neff & Germer, 2013). As the results of the present study indicate that self-compassion was slow to cultivate, but that, unlike three other constructs, it

continued to contribute to reducing distress at the 20-week time-point, it may play an important role in effective treatment in people with PD. Further longitudinal trials examining the role of intolerance of uncertainty in mindfulness-based interventions are also warranted, as this too may demonstrate greater stability following intervention than acceptance, decentering and mindfulness skills.

Future large-scale studies may aim to recruit participants who may be more responsive to this intervention. While in this study, moderation of the direct effect by gender was demonstrated, and women in the intervention group benefitted very slightly more from the intervention, replicating an effect found in an MBI study including people with diabetes (Nyklicek, van Son, Pop, Denollet, & Pouwer, 2016) and students (Rojiani et al, 2017), there is no suggestion that men should be excluded from further interventions. However, moderation of the mediators themselves indicate that there may be specific subsets within this sample who are more likely to develop acceptance and mindfulness skills. Positive changes to acceptance were shown to be conditional on participants in the intervention arm being under 57.7 years old, and also conditional on participants being within 2.7 years of diagnosis, and people who had been diagnosed over 12.5 years before were significantly less likely to acquire higher acceptance. Improvements in mindfulness skills were also conditional on how long the participant in the intervention had been diagnosed, with under 7.5 years being the optimal period.

There is evidence that both age and time since diagnosis correlate with decline in cognitive functioning in people with PD (Pedersen et al, 2017), in particular with decline in executive functioning which is not always evident in daily functioning (Papagno & Trojano, 2017; Kudlicka, Clare & Hindle, 2012; Miller, Neargarder, Risi & Cronin-Golomb, 2013). PD mild cognitive impairment (PD-MCI)(Litvan et al, 2012) has been suggested to affect up to 57% of people with PD within 3-5 years of diagnosis (Williams-Gray, Foltynie, Brayne, Robbins, & Barker, 2007). In our sample, over half the participants had been diagnosed for

over five years (54%), and only 33% were under 60, with 19% over 70. Undertaking mindfulness training requires commitment, time and is cognitively challenging (Segal et al, 2002) and in particular, it has been suggested that changing metacognitions can be particularly challenging for some people with PD (Brown & Fernie, 2014). Identifying MCI prior to intervention should include measures of executive functioning and speed of processing, which are lacking in the screen used in this present study (TICS-M, Brandt et al, 1988) (Crooks, Petitti, & Buckwalter, 2006). A telephone version of the Montreal Cognitive Assessment (MoCA) (Pendlebury, Welch, Cuthbertson, Mariz, Mehta, & Rothwell, 2013) has been developed, and the original test has been endorsed in PD populations (Dalrymple-Alford, 2010) as sensitive to PD-MCI. Improved screening would increase the likelihood of participants showing greater treatment effects, but may also contribute to better trial retention, as the participant may also be able to engage better with the standard MBI course.

It should also be noted however, that MBIs have been found to improve cognitive function in older people (Smoski, McClintock & Keeling, 2016) and in people with PD (Cash et al, 2015; Dissanayaka et al, 2016; Paris et al, 2011), and there is brain imaging evidence to support increased grey matter following interventions (Pickut et al, 2013). Stricter screening for cognitive impairment may also exclude some people who may benefit from participation.

Engagement with MBIs for people with PD may also depend on their perceptions of how much their condition affects their activities of daily living. While self-report baseline disability levels did not moderate either the direct or indirect effects of the trial arm on levels of anxiety and depression, participants who reported worse levels of disability at baseline were found to attend fewer sessions in this MBI, and, some of their data was then lost to the analysis. Understanding what barriers people with PD have in engaging with MBIs is important, whether they be the motor-symptoms themselves, cognitive and emotional processing challenges because of age and disease progression, in

order to ensure that more PD patients who can benefit from a non-pharmacological treatment are able to access training at the right time.

8 CONCLUSION

This exploratory study of data selected from a randomised, controlled pilot trial of an MBCT intervention for people with PD, has shown that evaluations of the mechanisms of mindfulness interventions in this population should include acceptance, decentering, self-compassion. These constructs have been demonstrated to be responsive to the MBCT intervention, to be associated with the psychological outcomes, and simple analyses suggest that they may be plausible mediating variables between the MBI and the outcomes, although no statistically significant mediation effects were observed. There was a medium-sized treatment effect on mindfulness skills at the end of the trial, however, mediation analysis only showed a very small indirect effects, the role of mindfulness skills in the causal chain remains unclear. Also, intolerance of uncertainty demonstrated only a very small treatment effect at the end of the intervention, but did show an association with mindfulness levels and the psychological outcomes, and remains a plausible target for interventions aiming at reducing distress in people with PD. However, further exploration of the mediation and moderation paths through Structural Equation Modelling in a future full-size trial would increase understanding of these complex relationships to enable tailored interventions for different health populations, including people with PD.

This study has also examined the moderation of the effect of trial arm on outcomes and found that the trial arm's direct effect on anxiety levels was moderated by gender – women randomised to the intervention reported lower levels of anxiety. The trial arm's effect on acceptance levels was moderated by time since diagnosis and also by the age of the participant, with younger, newly diagnosed people with PD having greater gains in acceptance. Alongside this,

people in the intervention arm who had more recently been diagnosed were also more likely to have higher levels of mindfulness skills. These results indicate that an MBI may be more effective in the early stages of PD, and that cognitive decline, a feature of both aging and disease progression, may play a part in participants' ability to benefit from and indeed to participate in and complete, this type of therapy.

This study has contributed towards understanding how people with PD may benefit from a mindfulness intervention but has only examined a small part of the collected data which, when all qualitative and quantitative analyses are synthesised, will provide deeper insight into how this form of therapy may improve non-motor symptoms in Parkinson's disease.

26511 words

REFERENCES

- Allen, A. B., & Leary, M. R. (2010). Self-Compassion, stress, and coping. *Social and Personality Psychology Compass*, 4(2), 107-118.
- Allison, P. D. (2002). Missing data: Quantitative applications in the social sciences. *British Journal of Mathematical and Statistical Psychology*, 55(1), 193-196.
- Alsubaie, M., Abbott, R., Dunn, B., Dickens, C., Keil, T. F., Henley, W., & Kuyken, W. (2017). Mechanisms of action in mindfulness-based cognitive therapy (MBCT) and mindfulness-based stress reduction (MBSR) in people with physical and/or psychological conditions: A systematic review. *Clinical psychology review*, 55, 74-91.
- Arch, J. J., & Ayers, C. R. (2013). Which treatment worked better for whom? Moderators of group cognitive behavioral therapy versus adapted mindfulness based stress reduction for anxiety disorders. *Behaviour Research and Therapy*, 51(8), 434-442.
- Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical psychology: Science and practice*, 10(2), 125-143.
- Baer, R. A., Carmody, J., & Hunsinger, M. (2012). Weekly change in mindfulness and perceived stress in a mindfulness-based stress reduction program. *Journal of Clinical Psychology*, 68(7), 755-765.
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13(1), 27-45.

- Barone, P., Antonini, A., Colosimo, C., Marconi, R., Morgante, L., Avarello, T. P., ... & Cicarelli, G. (2009). The PRIAMO study: a multicenter assessment of nonmotor symptoms and their impact on quality of life in Parkinson's disease. *Movement Disorders*, *24*(11), 1641-1649.
- Bebane, S., Flower, H. D., & Maltby, J. (2015). Re-refining the measurement of distress intolerance. *Personality and Individual Differences*, *85*, 159-164.
- Birrell, J., Meares, K., Wilkinson, A., & Freeston, M. (2011). Toward a definition of intolerance of uncertainty: A review of factor analytical studies of the Intolerance of Uncertainty Scale. *Clinical psychology review*, *31*(7), 1198-1208.
- Bjelland, I., Dahl, A. A., Haug, T. T., & Neckelmann, D. (2002). The validity of the Hospital Anxiety and Depression Scale: an updated literature review. *Journal of psychosomatic research*, *52*(2), 69-77.
- Bloem, B. R., de Vries, N. M., & Ebersbach, G. (2015). Nonpharmacological treatments for patients with Parkinson's disease. *Movement Disorders*, *30*(11), 1504-1520.
- Bogdanova, Y., & Cronin-Golomb, A. (2013). Alexithymia and apathy in Parkinson's disease: neurocognitive correlates. *Behavioural neurology*, *27*(4), 535-545.
- Bogosian, A., Chadwick, P., Windgassen, S., Norton, S., McCrone, P., Mosweu, I., ... & Moss-Morris, R. (2015). Distress improves after mindfulness training for progressive MS: A pilot randomised trial. *Multiple Sclerosis Journal*, *21*(9), 1184-1194.
- Bogosian, A., Hughes, A., Norton, S., Silber, E., & Moss-Morris, R. (2016). Potential treatment mechanisms in a mindfulness-based intervention for people with progressive multiple sclerosis. *British journal of health psychology*, *21*(4), 859-880.
- Bogosian, A., Hurt, C. S., e Sa, D. V., Hindle, J. V., McCracken, L., & Cubi-Molla, P. (2017). Distant delivery of a mindfulness-based intervention for people with Parkinson's disease: the study protocol of a randomised pilot trial. *Pilot and feasibility studies*, *3*(1), 4.
- Bohlmeijer, E., Prenger, R., Taal, E., & Cuijpers, P. (2010). The effects of mindfulness-based stress reduction therapy on mental health of adults with a chronic medical disease: a meta-analysis. *Journal of psychosomatic research*, *68*(6), 539-544.
- Bomasang-Layno, E., Fadlon, I., Murray, A. N., & Himelhoch, S. (2015). Antidepressive treatments for Parkinson's disease: A systematic review and meta-analysis. *Parkinsonism & related disorders*, *21*(8), 833-842.
- Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., ... & Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire-II: A revised measure of psychological inflexibility and experiential avoidance. *Behavior therapy*, *42*(4), 676-688.
- Boswell, J. F., Thompson-Hollands, J., Farchione, T. J., & Barlow, D. H. (2013). Intolerance of uncertainty: A common factor in the treatment of emotional disorders. *Journal of clinical psychology*, *69*(6), 630-645.
- Brandt, J., Spencer, M., & Folstein, M. (1988). The telephone interview for cognitive status. *Neuropsychiatry Neuropsychol Behav Neurol*, *1*(2), 111-117.

- Bränström, R., Kvillemo, P., Brandberg, Y., & Moskowitz, J. T. (2010). Self-report mindfulness as a mediator of psychological well-being in a stress reduction intervention for cancer patients—A randomized study. *Annals of behavioral medicine, 39*(2), 151-161.
- Brion, J. M., Leary, M. R., & Drabkin, A. S. (2014). Self-compassion and reactions to serious illness: The case of HIV. *Journal of health psychology, 19*(2), 218-229.
- Brown, R. G., MacCarthy, B., Gotham, A. M., Der, G. J., & Marsden, C. D. (1988). Depression and disability in Parkinson's disease: a follow-up of 132 cases. *Psychological medicine, 18*(1), 49-55.
- Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological inquiry, 18*(4), 211-237.
- Brown, D. B., Bravo, A. J., Roos, C. R., & Pearson, M. R. (2015). Five facets of mindfulness and psychological health: Evaluating a psychological model of the mechanisms of mindfulness. *Mindfulness, 6*(5), 1021-1032.
- Brown, R. G., & Fernie, B. A. (2015). Metacognitions, anxiety, and distress related to motor fluctuations in Parkinson's disease. *Journal of psychosomatic research, 78*(2), 143-148.
- Browne, R. H. (1995). On the use of a pilot sample for sample size determination. *Statistics in medicine, 14*(17), 1933-1940.
- Buhr, K., & Dugas, M. J. (2002). The intolerance of uncertainty scale: Psychometric properties of the English version. *Behaviour research and therapy, 40*(8), 931-945.
- Bullock, J. G., Green, D. P., & Ha, S. E. (2010). Yes, but what's the mechanism?(don't expect an easy answer). *Journal of personality and social psychology, 98*(4), 550.
- Burn, D. J., Landau, S., Hindle, J. V., Samuel, M., Wilson, K. C., Hurt, C. S., ... & PROMS-PD Study Group. (2012). Parkinson's disease motor subtypes and mood. *Movement Disorders, 27*(3), 379-386.
- Butler, J., & Ciarrochi, J. (2007). Psychological acceptance and quality of life in the elderly. *Quality of life Research, 16*(4), 607-615.
- Cardaciotto, L., Herbert, J. D., Forman, E. M., Moitra, E., & Farrow, V. (2008). The assessment of present-moment awareness and acceptance: The Philadelphia Mindfulness Scale. *Assessment, 15*(2), 204-223.
- Carleton, R. N., Norton, M. P. J., & Asmundson, G. J. (2007). Fearing the unknown: A short version of the Intolerance of Uncertainty Scale. *Journal of anxiety disorders, 21*(1), 105-117.
- Carleton, R. N., Sharpe, D., & Asmundson, G. J. (2007). Anxiety sensitivity and intolerance of uncertainty: Requisites of the fundamental fears?. *Behaviour research and therapy, 45*(10), 2307-2316.
- Carleton, R. N. (2012). The intolerance of uncertainty construct in the context of anxiety disorders: Theoretical and practical perspectives. *Expert Review of Neurotherapeutics, 12*(8), 937-947.
- Carleton, R. N., Duranceau, S., Freeston, M. H., Boelen, P. A., McCabe, R. E., & Antony, M. M. (2014). "But it might be a heart attack": Intolerance of uncertainty and panic disorder symptoms. *Journal of anxiety disorders, 28*(5), 463-470.

- Carleton, R. N. (2016). Into the unknown: A review and synthesis of contemporary models involving uncertainty. *Journal of anxiety disorders*, 39, 30-43.
- Carlson, L. E. (2012). Mindfulness-based interventions for physical conditions: a narrative review evaluating levels of evidence. *ISRN psychiatry*, 2012.
- Carmody, J., Baer, R. A., Lykins, E., & Olendzki, N. (2009). An empirical study of the mechanisms of mindfulness in a mindfulness-based stress reduction program. *Journal of clinical psychology*, 65(6), 613-626.
- Cash, T. V., Ekouevi, V. S., Kilbourn, C., & Lageman, S. K. (2016). Pilot study of a mindfulness-based group intervention for individuals with Parkinson's disease and their caregivers. *Mindfulness*, 7(2), 361-371.
- Challis, D., Hughes, J., Berzins, K., Reilly, S., Abell, J., & Stewart, K. (2010). Self-care and case management in long-term conditions: the effective management of critical interfaces. *Report for the National Institute for Health Research Service Delivery and Organisation (NIHR SDO) Programme*.
- Chaudhuri, K. R., Odin, P., Antonini, A., & Martinez-Martin, P. (2011). Parkinson's disease: the non-motor issues. *Parkinsonism & related disorders*, 17(10), 717-723.
- Chiesa, A., & Serretti, A. (2010). A systematic review of neurobiological and clinical features of mindfulness meditations. *Psychological medicine*, 40(8), 1239-1252.
- Chiesa, A., Anselmi, R., & Serretti, A. (2014). Psychological mechanisms of mindfulness-based interventions: what do we know?. *Holistic nursing practice*, 28(2), 124-148.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* 2nd edn.
- Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: questions and tips in the use of structural equation modeling. *Journal of abnormal psychology*, 112(4), 558.
- Connolly, B. S., & Lang, A. E. (2014). Pharmacological treatment of Parkinson disease: a review. *Jama*, 311(16), 1670-1683.
- Coulter, A., Roberts, S., & Dixon, A. (2013). Delivering better services for people with long-term conditions. *Building the house of care. London: The King's Fund*, 1-28.
- Crawford, J. R., Henry, J. D., Crombie, C., & Taylor, E. P. (2001). Normative data for the HADS from a large non-clinical sample. *British Journal of Clinical Psychology*, 40(4), 429-434.
- Creswell, J. D., & Lindsay, E. K. (2014). How does mindfulness training affect health? A mindfulness stress buffering account. *Current Directions in Psychological Science*, 23(6), 401-407.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *psychometrika*, 16(3), 297-334.
- Crooks, V. C., Petitti, D. B., Robins, S. B., & Buckwalter, J. G. (2006). Cognitive domains associated with performance on the Telephone Interview for Cognitive Status—Modified. *American Journal of Alzheimer's Disease & Other Dementias*, 21(1), 45-53.

- Dalrymple-Alford, J. C., MacAskill, M. R., Nakas, C. T., Livingston, L., Graham, C., Crucian, G. P., ... & Porter, R. J. (2010). The MoCA well-suited screen for cognitive impairment in Parkinson disease. *Neurology*, *75*(19), 1717-1725.
- Deane, K. H., Flaherty, H., Daley, D. J., Pascoe, R., Penhale, B., Clarke, C. E., ... & Storey, S. (2014). Priority setting partnership to identify the top 10 research priorities for the management of Parkinson's disease. *BMJ open*, *4*(12), e006434.
- De Lau, L. M., & Breteler, M. M. (2006). Epidemiology of Parkinson's disease. *The Lancet Neurology*, *5*(6), 525-535.
- De Ridder, D., Geenen, R., Kuijjer, R., & van Middendorp, H. (2008). Psychological adjustment to chronic disease. *The Lancet*, *372*(9634), 246-255
- DeVellis, R. F. (2016). *Scale development: Theory and applications* (Vol. 26). Sage publications.
- Dissanayaka, N. N., O'Sullivan, J. D., Pachana, N. A., Marsh, R., Silburn, P. A., White, E. X., ... & Byrne, G. J. (2016). Disease-specific anxiety symptomatology in Parkinson's disease. *International psychogeriatrics*, *28*(7), 1153-1163.
- Dobkin, R. D., Menza, M., Allen, L. A., Gara, M. A., Mark, M. H., Tiu, J., ... & Friedman, J. (2011). Cognitive-behavioral therapy for depression in Parkinson's disease: a randomized, controlled trial. *American Journal of Psychiatry*, *168*(10), 1066-1074.
- Dobkin, P. L. (2008). Mindfulness-based stress reduction: what processes are at work?. *Complementary therapies in clinical practice*, *14*(1), 8-16.
- Donders, A. R. T., Van Der Heijden, G. J., Stijnen, T., & Moons, K. G. (2006). A gentle introduction to imputation of missing values. *Journal of clinical epidemiology*, *59*(10), 1087-1091.
- Dugas, M. J., Gagnon, F., Ladouceur, R., & Freeston, M. H. (1998). Generalized anxiety disorder: A preliminary test of a conceptual model. *Behaviour research and therapy*, *36*(2), 215-226.
- Dugas, M. J., Gosselin, P., & Ladouceur, R. (2001). Intolerance of uncertainty and worry: Investigating specificity in a nonclinical sample. *Cognitive therapy and Research*, *25*(5), 551-558.
- Eldridge, S. M., Chan, C. L., Campbell, M. J., Bond, C. M., Hopewell, S., Thabane, L., & Lancaster, G. A. (2016). CONSORT 2010 statement: extension to randomised pilot and feasibility trials. *Pilot and feasibility studies*, *2*(1), 64.
- Elmsley, R., Dunn, G., & White, I. R. (2010). Mediation and moderation of treatment effects in randomised controlled trials of complex interventions. *Statistical Methods in Medical Research*, *19*(3), 237-270. DOI: [10.1177/0962280209105014](https://doi.org/10.1177/0962280209105014)
- England, N. H. S. (2013). Transforming participation in health and care. *London: NHS England*.
- Fairchild, A. J., & McDaniel, H. L. (2017). Best (but oft-forgotten) practices: mediation analysis. *The American journal of clinical nutrition*, *105*(6), 1259-1271.

- Feldman, G., Greeson, J., & Senville, J. (2010). Differential effects of mindful breathing, progressive muscle relaxation, and loving-kindness meditation on decentering and negative reactions to repetitive thoughts. *Behaviour research and therapy*, 48(10), 1002-1011.
- Feldman, C., & Kuyken, W. (2011). Compassion in the landscape of suffering. *Contemporary Buddhism*, 12(01), 143-155.
- Fergus, T. A., & Valentiner, D. P. (2011). Intolerance of uncertainty moderates the relationship between catastrophic health appraisals and health anxiety. *Cognitive Therapy and Research*, 35(6), 560-565.
- Fisak, B., & Von Lehe, A. C. (2012). The relation between the five facets of mindfulness and worry in a non-clinical sample. *Mindfulness*, 3(1), 15-21.
- Fitzpatrick, L., Simpson, J., & Smith, A. (2010). A qualitative analysis of mindfulness-based cognitive therapy (MBCT) in Parkinson's disease. *Psychology and Psychotherapy: Theory, Research and Practice*, 83(2), 179-192.
- Franquesa, A., Cebolla, A., García-Campayo, J., Demarzo, M., Elices, M., Pascual, J. C., & Soler, J. (2017). Meditation Practice Is Associated with a Values-Oriented Life: the Mediating Role of Decentering and Mindfulness. *Mindfulness*, 8(5), 1259-1268.
- Freeston, M. H., Rhéaume, J., Letarte, H., Dugas, M. J., & Ladouceur, R. (1994). Why do people worry?. *Personality and individual differences*, 17(6), 791-802.
- Fresco, D. M., Moore, M. T., van Dulmen, M. H., Segal, Z. V., Ma, S. H., Teasdale, J. D., & Williams, J. M. G. (2007). Initial psychometric properties of the experiences questionnaire: validation of a self-report measure of decentering. *Behavior therapy*, 38(3), 234-246.
- Frisina, P. G., Borod, J. C., Foldi, N. S., & Tenenbaum, H. R. (2008). Depression in Parkinson's disease: health risks, etiology, and treatment options. *Neuropsychiatric disease and treatment*.
- Fritz, M. S., & MacKinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological science*, 18(3), 233-239.
- Gecht, J., Kessel, R., Forkmann, T., Gauggel, S., Druke, B., Scherer, A., & Mainz, V. (2014). A mediation model of mindfulness and decentering: sequential psychological constructs or one and the same?. *BMC psychology*, 2(1), 18.
- Geiger, P. J., Boggero, I. A., Brake, C. A., Caldera, C. A., Combs, H. L., Peters, J. R., & Baer, R. A. (2016). Mindfulness-based interventions for older adults: a review of the effects on physical and emotional well-being. *Mindfulness*, 7(2), 296-307.
- Goyal, M., Singh, S., Sibinga, E. M., Gould, N. F., Rowland-Seymour, A., Sharma, R., ... & Ranasinghe, P. D. (2014). Meditation programs for psychological stress and well-being: a systematic review and meta-analysis. *JAMA internal medicine*, 174(3), 357-368.
- Grossman, P., & Van Dam, N. T. (2011). Mindfulness, by any other name...: trials and tribulations of sati in western psychology and science. *Contemporary Buddhism*, 12(01), 219-239.

Grupe, D. W., & Nitschke, J. B. (2013). Uncertainty and anticipation in anxiety: an integrated neurobiological and psychological perspective. *Nature Reviews Neuroscience*, *14*(7), 488.

Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clinical psychology review*, *37*, 1-12.

Gu, J., Strauss, C., Crane, C., Barnhofer, T., Karl, A., Cavanagh, K., & Kuyken, W. (2016). Examining the factor structure of the 39-item and 15-item versions of the Five Facet Mindfulness Questionnaire before and after mindfulness-based cognitive therapy for people with recurrent depression. *Psychological assessment*, *28*(7), 791.

Harrison, A. M., McCracken, L. M., Bogosian, A., & Moss-Morris, R. (2015). Towards a better understanding of MS pain: a systematic review of potentially modifiable psychosocial factors. *Journal of psychosomatic research*, *78*(1), 12-24.

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication monographs*, *76*(4), 408-420.

Hayes, A. F., & Matthes, J. (2009). Computational procedures for probing interactions in OLS and logistic regression: SPSS and SAS implementations. *Behavior research methods*, *41*(3), 924-936.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.

Hayes, A. F., & Scharkow, M. (2013). The relative trustworthiness of inferential tests of the indirect effect in statistical mediation analysis: Does method really matter?. *Psychological science*, *24*(10), 1918-1927.

Hayes, A. F., & Rockwood, N. J. (2016). Regression-based statistical mediation and moderation analysis in clinical research: Observations, recommendations, and implementation. *Behaviour research and therapy*.

Hayes, A. M., & Feldman, G. (2004). Clarifying the construct of mindfulness in the context of emotion regulation and the process of change in therapy. *Clinical Psychology: science and practice*, *11*(3), 255-262.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy* (p. 6). New York: Guilford Press.

Hemmerle, A. M., Herman, J. P., & Seroogy, K. B. (2012). Stress, depression and Parkinson's disease. *Experimental neurology*, *233*(1), 79-86.

Herrmann, C. (1997). International experiences with the Hospital Anxiety and Depression Scale-a review of validation data and clinical results. *Journal of psychosomatic research*, *42*(1), 17-41.

Hillen, M. A., Guthel, C. M., Strout, T. D., Smets, E. M., & Han, P. K. (2017). Tolerance of uncertainty: Conceptual analysis, integrative model, and implications for healthcare. *Social Science & Medicine*, *180*, 62-75.

- Hinnell, C., Hurt, C. S., Landau, S., Brown, R. G., Samuel, M., & PROMS-PD Study Group. (2012). Nonmotor versus motor symptoms: how much do they matter to health status in Parkinson's disease?. *Movement Disorders, 27*(2), 236-241.
- Hobson, J. P., Edwards, N. I., & Meara, R. J. (2001). The Parkinson's Disease Activities of Daily Living Scale: a new simple and brief subjective measure of disability in Parkinson's disease. *Clinical Rehabilitation, 15*(3), 241-246.
- Hobson, P., & Meara, J. (2004). Risk and incidence of dementia in a cohort of older subjects with Parkinson's disease in the United Kingdom. *Movement Disorders, 19*(9), 1043-1049.
- Hoge, E. A., Bui, E., Goetter, E., Robinaugh, D. J., Ojserkis, R. A., Fresco, D. M., & Simon, N. M. (2015). Change in decentering mediates improvement in anxiety in mindfulness-based stress reduction for generalized anxiety disorder. *Cognitive Therapy and Research, 39*(2), 228-235.
- Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011). How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on psychological science, 6*(6), 537-559.
- Homan, K. J. (2016). Self-compassion and psychological well-being in older adults. *Journal of Adult Development, 23*(2), 111-119.
- Homan, K. J., & Sirois, F. M. (2017). Self-compassion and physical health: Exploring the roles of perceived stress and health-promoting behaviors. *Health Psychology Open, 4*(2), 2055102917729542.
- Hughes, A. J., Ben-Shlomo, Y., Daniel, S. E., & Lees, A. J. (1992). What features improve the accuracy of clinical diagnosis in Parkinson's disease A clinicopathologic study. *Neurology, 42*(6), 1142-1142.
- Hughes, T. A., Ross, H. F., Mindham, R. H. S., & Spokes, E. G. S. (2004). Mortality in Parkinson's disease and its association with dementia and depression. *Acta neurologica scandinavica, 110*(2), 118-123.
- Hurt, C. S., Landau, S., Burn, D. J., Hindle, J. V., Samuel, M., Wilson, K., & Brown, R. G. (2012). Cognition, coping, and outcome in Parkinson's disease. *International psychogeriatrics, 24*(10), 1656-1663.
- Hurt, C. S., Weinman, J., Lee, R., & Brown, R. G. (2012). The relationship of depression and disease stage to patient perceptions of Parkinson's disease. *Journal of Health Psychology, 17*(7), 1076-1088.
- Hurt, C. S., Burn, D. J., Hindle, J., Samuel, M., Wilson, K., & Brown, R. G. (2014). Thinking positively about chronic illness: An exploration of optimism, illness perceptions and well-being in patients with Parkinson's disease. *British Journal of Health Psychology, 19*(2), 363-379.
- Hurt, C. S., Rixon, L., Chaudhuri, K. R., Moss-Morris, R., Samuel, M., & Brown, R. G. (2016). Identifying barriers to help-seeking for non-motor symptoms in people with Parkinson's disease. *Journal of health psychology, 1359105316683239*.
- Ille, R., Wabnegger, A., Schwingenschuh, P., Katschnig-Winter, P., Kögl-Wallner, M., Wenzel, K., & Schienle, A. (2016). Intact emotion recognition and experience but dysfunctional

emotion regulation in idiopathic Parkinson's disease. *Journal of the neurological sciences*, 361, 72-78.

Jensen, D., Cohen, J. N., Mennin, D. S., Fresco, D. M., & Heimberg, R. G. (2016). Clarifying the unique associations among intolerance of uncertainty, anxiety, and depression. *Cognitive behaviour therapy*, 45(6), 431-444.

Jha, A. P., Krompinger, J., & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective, & Behavioral Neuroscience*, 7(2), 109-119.

Jonasson, S. B., Hagell, P., Hariz, G. M., Iwarsson, S., & Nilsson, M. H. (2017). Psychometric evaluation of the Parkinson's disease Activities of Daily Living Scale. *Parkinson's Disease*, 2017.

Johnson, C., & Wade, T. (2017). Which aspects of mindfulness are important to include in adolescent interventions? *Early Intervention in Psychiatry*. 2017;1-11. <https://doi.org/10.1111/eip.12490>

Johnson, P. O., & Neyman, J. (1936). Tests of certain linear hypotheses and their application to some educational problems. *Statistical research memoirs*.

Julien, C. L., Rimes, K. A., & Brown, R. G. (2016). Rumination and behavioural factors in Parkinson's disease depression. *Journal of psychosomatic research*, 82, 48-53.

Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General hospital psychiatry*, 4(1), 33-47.

Kabat-Zinn, J. (1990). Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness. New York: Delacorte.

Kazdin, A. E. (2007). Mediators and mechanisms of change in psychotherapy research. *Annu. Rev. Clin. Psychol.*, 3, 1-27.

Kazdin, A. E., & Blase, S. L. (2011). Rebooting psychotherapy research and practice to reduce the burden of mental illness. *Perspectives on psychological science*, 6(1), 21-37.

Kertz, S. J., Stevens, K. T., McHugh, R. K., & Björgvinsson, T. (2015). Distress intolerance and worry: the mediating role of cognitive variables. *Anxiety, Stress, & Coping*, 28(4), 408-424.

Kessler, D., & Liddy, C. (2017). Self-management support programs for persons with Parkinson's disease: An integrative review. *Patient education and counseling*, 100(10), 1787-1795.

Khoury, B., Lecomte, T., Fortin, G., Masse, M., Therien, P., Bouchard, V., ... & Hofmann, S. G. (2013). Mindfulness-based therapy: a comprehensive meta-analysis. *Clinical psychology review*, 33(6), 763-771.

Khoo, T. K., Yarnall, A. J., Duncan, G. W., Coleman, S., O'Brien, J. T., Brooks, D. J., ... & Burn, D. J. (2013). The spectrum of nonmotor symptoms in early Parkinson disease. *Neurology*, 80(3), 276-281.

Kraemer, K. M., O'Bryan, E. M., & McLeish, A. C. (2016). Intolerance of Uncertainty as a Mediator of the Relationship between Mindfulness and Health Anxiety. *Mindfulness*, 7(4), 859-865.

- Krishnan, S., Prasad, S., Pisharady, K. K., Sarma, G., Sarma, S. P., & Kishore, A. (2016). The decade after subthalamic stimulation in advanced Parkinson's disease: A balancing act. *Neurology India*, *64*(1), 81.
- Kudlicka, A., Clare, L., & Hindle, J. V. (2011). Executive functions in Parkinson's disease: Systematic review and meta-analysis. *Movement disorders*, *26*(13), 2305-2315.
- Kuyken, W., Byford, S., Taylor, R. S., Watkins, E., Holden, E., White, K., ... & Teasdale, J. D. (2008). Mindfulness-based cognitive therapy to prevent relapse in recurrent depression. *Journal of consulting and clinical psychology*, *76*(6), 966.
- Kuyken, W., Watkins, E., Holden, E., White, K., Taylor, R. S., Byford, S., ... & Dalgleish, T. (2010). How does mindfulness-based cognitive therapy work?. *Behaviour research and therapy*, *48*(11), 1105-1112.
- Labelle, L. E., Campbell, T. S., Faris, P., & Carlson, L. E. (2015). Mediators of Mindfulness-Based Stress Reduction (MBSR): Assessing the timing and sequence of change in cancer patients. *Journal of clinical psychology*, *71*(1), 21-40.
- Landau, S., Harris, V., Burn, D. J., Hindle, J. V., Hurt, C. S., Samuel, M., ... & Brown, R. G. (2016). Anxiety and anxious-depression in Parkinson's disease over a 4-year period: a latent transition analysis. *Psychological medicine*, *46*(3), 657-667.
- Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., ... & Devins, G. (2006). The Toronto mindfulness scale: Development and validation. *Journal of clinical psychology*, *62*(12), 1445-1467.
- Ledesma, D., & Kumano, H. (2009). Mindfulness-based stress reduction and cancer: a meta-analysis. *Psycho-Oncology*, *18*(6), 571-579.
- Lee, E. C., Whitehead, A. L., Jacques, R. M., & Julious, S. A. (2014). The statistical interpretation of pilot trials: should significance thresholds be reconsidered?. *BMC medical research methodology*, *14*(1), 41.
- Leon, A. C., Davis, L. L., & Kraemer, H. C. (2011). The role and interpretation of pilot studies in clinical research. *Journal of psychiatric research*, *45*(5), 626-629.
- Leventhal, H., Meyer, D., & Nerenz, D. (1980). The common sense representation of illness danger. *Contributions to medical psychology*, *2*, 7-30.
- Lieberman, A. (2006). Depression in Parkinson's disease—a review. *Acta Neurologica Scandinavica*, *113*(1), 1-8.
- Lindsay, E. K., & Creswell, J. D. (2015). Back to the basics: How attention monitoring and acceptance stimulate positive growth. *Psychological Inquiry*, *26*(4), 343-348.
- Lindsay, E. K., & Creswell, J. D. (2017). Mechanisms of mindfulness training: Monitor and Acceptance Theory (MAT). *Clinical Psychology Review*, *51*, 48-59.
- Little, R. J. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, *83*(404), 1198-1202.
- Ljótsson, B., Hedman, E., Lindfors, P., Hursti, T., Lindfors, N., Andersson, G., & Rück, C. (2011). Long-term follow-up of internet-delivered exposure and mindfulness based treatment for irritable bowel syndrome. *Behaviour Research and Therapy*, *49*(1), 58-61.

- Loucks, E. B., Schuman-Olivier, Z., Britton, W. B., Fresco, D. M., Desbordes, G., Brewer, J. A., & Fulwiler, C. (2015). Mindfulness and cardiovascular disease risk: state of the evidence, plausible mechanisms, and theoretical framework. *Current cardiology reports*, *17*(12), 112.
- Mahoney, A. E., & McEvoy, P. M. (2012). A transdiagnostic examination of intolerance of uncertainty across anxiety and depressive disorders. *Cognitive Behaviour Therapy*, *41*(3), 212-222.
- Maffoni, M., Giardini, A., Pierobon, A., Ferrazzoli, D., & Frazzitta, G. (2017). Stigma experienced by Parkinson's disease patients: a descriptive review of qualitative studies. *Parkinson's Disease*, 2017.
- Marras, C., & Chaudhuri, K. R. (2016). Nonmotor features of Parkinson's disease subtypes. *Movement Disorders*, *31*(8), 1095-1102.
- Martens, K. E., Hall, J. M., Gilat, M., Georgiades, M. J., Walton, C. C., & Lewis, S. J. G. (2016). Anxiety is associated with freezing of gait and attentional set-shifting in Parkinson's disease: a new perspective for early intervention. *Gait & posture*, *49*, 431-436.
- Martinez-Martin, P., Leentjens, A. F., de Pedro-Cuesta, J., Chaudhuri, K. R., Schrag, A. E., & Weintraub, D. (2016). Accuracy of screening instruments for detection of neuropsychiatric syndromes in Parkinson's disease. *Movement Disorders*, *31*(3), 270-279.
- Martinez-Ramirez, D., Giugni, J. C., Almeida, L., Walz, R., Ahmed, B., Chai, F. A., ... & Hess, C. W. (2016). Association between antidepressants and falls in Parkinson's disease. *Journal of neurology*, *263*(1), 76-82.
- McCracken, L. M. (1998). Learning to live with the pain: acceptance of pain predicts adjustment in persons with chronic pain. *Pain*, *74*(1), 21-27.
- McCracken, L. M., & Gutiérrez-Martínez, O. (2011). Processes of change in psychological flexibility in an interdisciplinary group-based treatment for chronic pain based on Acceptance and Commitment Therapy. *Behaviour research and therapy*, *49*(4), 267-274.
- McCracken, L. M., Barker, E., & Chilcot, J. (2014). Decentering, rumination, cognitive defusion, and psychological flexibility in people with chronic pain. *Journal of behavioral medicine*, *37*(6), 1215-1225.
- McEvoy, P. M., & Mahoney, A. E. (2011). Achieving certainty about the structure of intolerance of uncertainty in a treatment-seeking sample with anxiety and depression. *Journal of Anxiety Disorders*, *25*(1), 112-122.
- Miller, I. N., Nearing, S., Risi, M. M., & Cronin-Golomb, A. (2013). Frontal and posterior subtypes of neuropsychological deficit in Parkinson's disease. *Behavioral neuroscience*, *127*(2), 175.
- Molnar, F. J., Hutton, B., & Fergusson, D. (2008). Does analysis using "last observation carried forward" introduce bias in dementia research?. *Canadian Medical Association Journal*, *179*(8), 751-753.
- Moss-Morris, R. (2013). Adjusting to chronic illness: time for a unified theory. *British journal of health psychology*, *18*(4), 681-686.

- Mueller, C., Rajkumar, A.P., Wan, Y.M., Velayudhan, L., Chaudhuri, K. R. & Aarsland, D. (2018) Assessment and Management of Neuropsychiatric Symptoms in Parkinson's Disease. *CNS drugs*, 32(7), 621-635.
- Müller, T., Welnic, J., & Muhlack, S. (2007). Acute levodopa administration reduces cortisol release in patients with Parkinson's disease. *Journal of neural transmission*, 114(3), 347-350.
- Mulligan, H., Arps, G., Bancroft, N., Mountfort, R., & Polkinghorne, A. (2011). 'Living Well with Parkinson's': evaluation of a programme to promote self-management. *Journal of Nursing and Healthcare of Chronic Illness*, 3(3), 222-233.
- Nasreddine, Z. S., Phillips, N. A., Bédirian, V., Charbonneau, S., Whitehead, V., Collin, I., ... & Chertkow, H. (2005). The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. *Journal of the American Geriatrics Society*, 53(4), 695-699.
- National Institute for Health and Care Excellence (NICE). Parkinson's disease in adults. NICE guideline [NG71] Published date July 2017. <https://www.nice.org.uk/guidance/ng71/evidence>. Retrieved 7.5.2018.
- Neff, K. D. (2003a). The development and validation of a scale to measure self-compassion. *Self and identity*, 2(3), 223-250.
- Neff, K. (2003b). Self-compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and identity*, 2(2), 85-101.
- Neff, K. D., & Germer, C. K. (2013). A pilot study and randomized controlled trial of the mindful self-compassion program. *Journal of clinical psychology*, 69(1), 28-44.
- Nery-Hurwit, M., Yun, J., & Ebbeck, V. (2018). Examining the roles of self-compassion and resilience on health-related quality of life for individuals with Multiple Sclerosis. *Disability and health journal*, 11(2), 256-261.
- NHS England. Five Year Forward View. London: NHS England, 2014. www.england.nhs.uk/wp-content/uploads/2014/10/5yfv-web.pdf 6.
- Nijhof, G. (1996). Uncertainty and lack of trust with Parkinson's disease. *European Journal of Public Health*, 6(1).
- Norr, A. M., Oglesby, M. E., Capron, D. W., Raines, A. M., Korte, K. J., & Schmidt, N. B. (2013). Evaluating the unique contribution of intolerance of uncertainty relative to other cognitive vulnerability factors in anxiety psychopathology. *Journal of Affective Disorders*, 151(1), 136-142.
- Nyklíček, I., van Son, J., Pop, V. J., Denollet, J., & Pouwer, F. (2016). Does Mindfulness-Based Cognitive Therapy benefit all people with diabetes and comorbid emotional complaints equally? Moderators in the DiaMind trial. *Journal of psychosomatic research*, 91, 40-47.
- O'Doherty, V., Carr, A., McGrann, A., O'Neill, J. O., Dinan, S., Graham, I., & Maher, V. (2015). A controlled evaluation of mindfulness-based cognitive therapy for patients with coronary heart disease and depression. *Mindfulness*, 6(3), 405-416.
- Papagno, C., & Trojano, L. (2017). Cognitive and behavioral disorders in Parkinson's disease: an update. I: cognitive impairments. *Neurological Sciences*, 1-9.

- París, A. P., Saleta, H. G., de la Cruz Crespo Maraver, M., Silvestre, E., Freixa, M. G., Torrellas, C. P., ... & Fernández, V. L. (2011). Blind randomized controlled study of the efficacy of cognitive training in Parkinson's disease. *Movement Disorders, 26*(7), 1251-1258.
- Parkinson, J. (2002). An essay on the shaking palsy. *The Journal of neuropsychiatry and clinical neurosciences, 14*(2), 223-236.
- Pedersen, K. F., Larsen, J. P., Tysnes, O. B., & Alves, G. (2017). Natural course of mild cognitive impairment in Parkinson disease A 5-year population-based study. *Neurology, 88*(8), 767-774.
- Pendlebury, S. T., Welch, S. J., Cuthbertson, F. C., Mariz, J., Mehta, Z., & Rothwell, P. M. (2013). Telephone assessment of cognition after transient ischemic attack and stroke: modified telephone interview of cognitive status and telephone Montreal Cognitive Assessment versus face-to-face Montreal Cognitive Assessment and neuropsychological battery. *Stroke, 44*(1), 227-229.
- Perez-Lloret, S., Negre-Pages, L., Damier, P., Delval, A., Derkinderen, P., Destée, A., ... & Rascol, O. (2014). Prevalence, determinants, and effect on quality of life of freezing of gait in Parkinson disease. *JAMA neurology, 71*(7), 884-890.
- Pfeiffer, R. F. (2016). Non-motor symptoms in Parkinson's disease. *Parkinsonism & related disorders, 22*, S119-S122.
- Philippot, P., Nef, F., Clauw, L., Romrée, M., & Segal, Z. (2012). A randomized controlled trial of mindfulness-based cognitive therapy for treating tinnitus. *Clinical psychology & psychotherapy, 19*(5), 411-419.
- Phillips, W. J., & Ferguson, S. J. (2012). Self-compassion: A resource for positive aging. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 68*(4), 529-539.
- Pickut, B. A., Van Hecke, W., Kerckhofs, E., Mariën, P., Vanneste, S., Cras, P., & Parizel, P. M. (2013). Mindfulness based intervention in Parkinson's disease leads to structural brain changes on MRI: a randomized controlled longitudinal trial. *Clinical neurology and neurosurgery, 115*(12), 2419-2425.
- Pickut, B., Vanneste, S., Hirsch, M. A., Van Hecke, W., Kerckhofs, E., Mariën, P., ... & Cras, P. (2015). Mindfulness training among individuals with Parkinson's disease: neurobehavioral effects. *Parkinson's Disease, 2015*.
- Polusny, M. A., Erbes, C. R., Thuras, P., Moran, A., Lamberty, G. J., Collins, R. C., ... & Lim, K. O. (2015). Mindfulness-based stress reduction for posttraumatic stress disorder among veterans: a randomized clinical trial. *Jama, 314*(5), 456-465.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior research methods, 40*(3), 879-891.
- Pringsheim, T., Jette, N., Frolkis, A., & Steeves, T. D. (2014). The prevalence of Parkinson's disease: A systematic review and meta-analysis. *Movement disorders, 29*(13), 1583-1590.

- Raes, F., Pommier, E., Neff, K. D., & Van Gucht, D. (2011). Construction and factorial validation of a short form of the self-compassion scale. *Clinical psychology & psychotherapy, 18*(3), 250-255.
- Ravenek, M., Rudman, D. L., Jenkins, M. E., & Spaulding, S. (2017). Understanding uncertainty in young-onset Parkinson disease. *Chronic illness, 13*(4), 288-298.
- Reed, G. M., Kemeny, M. E., Taylor, S. E., Wang, H. Y. J., & Visscher, B. R. (1994). Realistic acceptance as a predictor of decreased survival time in gay men with AIDS. *Health Psychology, 13*(4), 299.
- Riedel, O., Klotsche, J., Spottke, A., Deuschl, G., Förstl, H., Henn, F., ... & Trenkwalder, C. (2010). Frequency of dementia, depression, and other neuropsychiatric symptoms in 1,449 outpatients with Parkinson's disease. *Journal of neurology, 257*(7), 1073-1082.
- Rimes, K. A., & Wingrove, J. (2013). Mindfulness-based cognitive therapy for people with chronic fatigue syndrome still experiencing excessive fatigue after cognitive behaviour therapy: A pilot randomized study. *Clinical psychology & psychotherapy, 20*(2), 107-117.
- Robichaud, M. (2013). Cognitive behavior therapy targeting intolerance of uncertainty: Application to a clinical case of generalized anxiety disorder. *Cognitive and Behavioral Practice, 20*(3), 251-263.
- Rocha, F. L., Murad, M. G., Stumpf, B. P., Hara, C., & Fuzikawa, C. (2013). Antidepressants for depression in Parkinson's disease: systematic review and meta-analysis. *Journal of psychopharmacology, 27*(5), 417-423.
- Roemer, L., Lee, J. K., Salters-Pedneault, K., Erisman, S. M., Orsillo, S. M., & Mennin, D. S. (2009). Mindfulness and emotion regulation difficulties in generalized anxiety disorder: preliminary evidence for independent and overlapping contributions. *Behavior therapy, 40*(2), 142-154.
- Rojiani, R., Santoyo, J. F., Rahrig, H., Roth, H. D., & Britton, W. B. (2017). Women benefit more than men in response to college-based meditation training. *Frontiers in psychology, 8*, 551.
- Romenets, S. R., Creti, L., Fichten, C., Bailes, S., Libman, E., Pelletier, A., & Postuma, R. B. (2013). Doxepin and cognitive behavioural therapy for insomnia in patients with Parkinson's disease—a randomized study. *Parkinsonism & related disorders, 19*(7), 670-675.
- Rubin, L. H., Witkiewitz, K., Andre, J. S., & Reilly, S. (2007). Methods for handling missing data in the behavioral neurosciences: Don't throw the baby rat out with the bath water. *Journal of Undergraduate Neuroscience Education, 5*(2), A71.
- Safran, J., & Segal, Z. V. (1996). *Interpersonal process in cognitive therapy*. Jason Aronson, Incorporated.
- Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2018). *Mindfulness-based cognitive therapy for depression*. Guilford Publications.
- Shallcross, A. J., Ford, B. Q., Floerke, V. A., & Mauss, I. B. (2013). Getting better with age: The relationship between age, acceptance, and negative affect. *Journal of Personality and Social Psychology, 104*(4), 734.

- Shapiro, S. L., Brown, K. W., & Biegel, G. M. (2007). Teaching self-care to caregivers: Effects of mindfulness-based stress reduction on the mental health of therapists in training. *Training and education in professional psychology, 1*(2), 105.
- Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of clinical psychology, 62*(3), 373-386.
- Shapiro, S. L., & Carlson, L. E. (2009). The art and science of mindfulness. *Washington, DC: American Psychological Association.*
- Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: new procedures and recommendations. *Psychological methods, 7*(4), 422.
- Shulman, L. M., Gruber-Baldini, A. L., Anderson, K. E., Fishman, P. S., Reich, S. G., & Weiner, W. J. (2010). The clinically important difference on the unified Parkinson's disease rating scale. *Archives of neurology, 67*(1), 64-70.
- Simuni, T., & Fernandez, H. H. (2013). Anxiety in Parkinson's Disease. In *Parkinson's Disease and Nonmotor Dysfunction* (pp. 17-29). Humana Press, Totowa, NJ.
- Sirois, F. M., Molnar, D. S., & Hirsch, J. K. (2015). Self-compassion, stress, and coping in the context of chronic illness. *Self and Identity, 14*(3), 334-347.
- Smoski, M. J., McClintock, A., & Keeling, L. (2016). Mindfulness Training for Emotional and Cognitive Health in Late Life. *Current Behavioral Neuroscience Reports, 3*(4), 301-307.
- Snaith, R. P. (2003). The hospital anxiety and depression scale. *Health and quality of life outcomes, 1*(1), 29.
- Soh, S. E., Morris, M. E., & McGinley, J. L. (2011). Determinants of health-related quality of life in Parkinson's disease: a systematic review. *Parkinsonism & related disorders, 17*(1), 1-9.
- Stanton, A. L., Luecken, L. J., MacKinnon, D. P., & Thompson, E. H. (2013). Mechanisms in psychosocial interventions for adults living with cancer: opportunity for integration of theory, research, and practice. *Journal of consulting and clinical psychology, 81*(2), 318.
- Sotgiu, I., & Rusconi, M. L. (2013). Investigating emotions in Parkinson's disease: what we know and what we still don't know. *Frontiers in psychology, 4*, 336.
- Tabachnick, B. G., & Fidell, L. S. (2007). Using multivariate statistics, 5th. *Needham Height, MA: Allyn & Bacon.*
- Tagliati, M., Chaudhuri, K., & Pagano, G. (2014). Prevalence Of Non-Motor Symptoms In Parkinson's Disease: A Systematic Review With Meta-Analysis (P2. 053). *Neurology, 82*(10 Supplement), P2-053.
- Talkovsky, A. M., & Norton, P. J. (2016). Intolerance of uncertainty and transdiagnostic group cognitive behavioral therapy for anxiety. *Journal of anxiety disorders, 41*, 108-114.
- Tang, Y. Y., Hölzel, B. K., & Posner, M. I. (2015). The neuroscience of mindfulness meditation. *Nature Reviews Neuroscience, 16*(4), 213.
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International journal of medical education, 2*, 53.

- Thabane, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., ... & Goldsmith, C. H. (2010). A tutorial on pilot studies: the what, why and how. *BMC medical research methodology*, *10*(1), 1.
- Vander Haegen, M., & Etienne, A. M. (2016). Cognitive processes across anxiety disorders related to intolerance of uncertainty: Clinical review. *Cogent Psychology*, *3*(1), 1215773.
- Van Dam, N. T., Sheppard, S. C., Forsyth, J. P., & Earleywine, M. (2011). Self-compassion is a better predictor than mindfulness of symptom severity and quality of life in mixed anxiety and depression. *Journal of anxiety disorders*, *25*(1), 123-130.
- Videnovic, A. (2017). Management of sleep disorders in Parkinson's disease and multiple system atrophy. *Movement Disorders*.
- Visted, E., Vøllestad, J., Nielsen, M. B., & Nielsen, G. H. (2015). The impact of group-based mindfulness training on self-reported mindfulness: a systematic review and meta-analysis. *Mindfulness*, *6*(3), 501-522.
- Vøllestad, J., Nielsen, M. B., & Nielsen, G. H. (2012). Mindfulness-and acceptance-based interventions for anxiety disorders: A systematic review and meta-analysis. *British Journal of Clinical Psychology*, *51*(3), 239-260.
- Watkins, E., & Brown, R. G. (2002). Rumination and executive function in depression: An experimental study. *Journal of Neurology, Neurosurgery & Psychiatry*, *72*(3), 400-402.
- Weintraub, D., Newberg, A.B., Cary, M.S., Siderowf, A.D., Moberg, P.J., Kleiner-Fisman, G., ... & Katz, I.R. (2005) Striatal dopamine transporter imaging correlates with anxiety and depression symptoms in Parkinson's disease. *Journal of Nuclear Medicine*, *46*(2), 227-232.
- Wermuth, L., & Bech, P. (2006). Depression in Parkinson's disease—a review. *Acta neurologica scandinavica*, *114*(5), 360-360.
- White, I. R., & Thompson, S. G. (2005). Adjusting for partially missing baseline measurements in randomized trials. *Statistics in medicine*, *24*(7), 993-1007.
- Williams, J. R., Hirsch, E. S., Anderson, K., Bush, A. L., Goldstein, S. R., Grill, S., ... & Pontone, G. (2012). A comparison of nine scales to detect depression in Parkinson disease Which scale to use?. *Neurology*, *78*(13), 998-1006.
- Williams-Gray, C. H., Foltynie, T., Brayne, C. E. G., Robbins, T. W., & Barker, R. A. (2007). Evolution of cognitive dysfunction in an incident Parkinson's disease cohort. *Brain*, *130*(7), 1787-1798.
- Windgassen, S., Goldsmith, K., Moss-Morris, R., & Chalder, T. (2016). Establishing how psychological therapies work: the importance of mediation analysis.
- Young, K. S., van der Velden, A. M., Craske, M. G., Pallesen, K. J., Fjorback, L., Roepstorff, A., & Parsons, C. E. (2017). The impact of mindfulness-based interventions on brain activity: A systematic review of functional magnetic resonance imaging studies. *Neuroscience & Biobehavioral Reviews*.

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta psychiatrica scandinavica*, 67(6), 361-370.

Zvolensky, M. J., Vujanovic, A. A., Bernstein, A., & Leyro, T. (2010). Distress tolerance: Theory, measurement, and relations to psychopathology. *Current Directions in Psychological Science*, 19(6), 406-410.

APPENDIX B

B1. Internal reliability of outcome and putative mediator measures

HADS A Hospital Anxiety and Depression Scale	$\alpha = 0.83$ Bjelland, Dahl, Haug, & Neckelmann, 2002	$\alpha = 0.83$ good
HADS D Hospital Anxiety and Depression Scale	$\alpha = 0.82$ Bjelland, Dahl, Haug, & Neckelmann, 2002	$\alpha = 0.76$ acceptable
AAQ II Acceptance Action Questionnaire II	$\alpha = 0.84$ Bond et al, 2011.	$\alpha = 0.90$ very good
EQ Experiences Questionnaire	$\alpha = 0.90$ Fresco et al, 2007.	$\alpha = 0.85$ good
PHLMS The Philadelphia Mindfulness Scale	$\alpha = 0.86$ Cardaciotto, Herbert, Forman, Moitra, Farrow, 2008.	Time 1 $\alpha = 0.61$ Time 2 $\alpha = 0.69$ Time 3 $\alpha = 0.74$ Time 4 $\alpha = 0.77$ Time 3 and 4 acceptable
SCS Self-Compassion Scale	$\alpha = 0.86$ Raes, Pommier, Neff & Van Gucht, 2011.	$\alpha = 0.89$ very good
IU-12 Intolerance of Uncertainty Scale – short form	$\alpha = 0.91$ Carleton, Norton & Asmundson, 2007.	$\alpha = 0.89$ very good

B2 – Proportion of sample with normal, mild, moderate and severe levels of anxiety at baseline

HADS anxiety level	Total (n=78, %)	MBI (n=40, %)	WLC (n=38, %)
Normal ≤7	37 47.5%	15 37.5%	22 58%
Mild 8-10	21 27%	16 40%	5 13%
Moderate 11-14	15 19%	6 15%	9 24%
Severe 15-21	5 6.5%	3 7.5%	2 5%

B3 – Proportion of sample with normal, mild, moderate and severe levels of depression at baseline

HADS depression level	Total (n=78, %)	MBI (n=40, %)	WLC (n=38, %)
Normal ≤7	52 66.5%	23 57.5%	29 76%
Mild 8-10	14 18%	8 20%	6 15.5%
Moderate 11-14	10 13%	8 20%	2 5%
Severe 15-21	2 2.5%	1 2.5%	1 2.5%

Appendix B4 -Correlations Groups T1

WL control	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety		33%	61%	41%	55%	2%	49%	2%	7%	1%	2%	12%
2. Depression	.58**		25%	18%	40%	10%	36%	<1%	<1%	12%	19%	43%
3. Acceptance	-.78**	-.50**		53%	50%	3%	46%	<1%	5%	1%	1%	9%
4. Decentering	-.64**	-.42*	.73**		56%	6%	35%	3%	3%	<1%	<1%	7%
5 Self-compassion	-.74**	-.63**	.71**	.75**		4%	45%	<1%	10%	<1%	2%	12%
6. Mindfulness Skills	-.15	-.32	.17	.25	.20		<1%	4%	<1%	<1%	2%	2%
13. Intol. of Uncertainty	.70**	.60**	-.68**	-.59	-.67**	.09		<1%	1%	<1%	<1%	17%
14. Gender	.14	.06	.08	-.17	-.04	.19	-.03		10%	7%	5%	1%
15. Age	-.27	-.09	.23	.18	.32*	.09	-.19	.31		12%	<1%	4%
16. Years since diagnosis	-.12	.35*	.12	.05	.07	-.09	.09	.26	.35		5%	34%
17. Mood medication	-.13	.44**	-.12	-.09	-.14	-.15	.02	-.22	-.005	.23		12%
18. Self-report disability	.35*	.66**	-.30	-.26	-.35*	-.15	.41*	.10	.20	.58**	.34*	

MBI intervention	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety		35%	42%	19%	21%	5%	34%	1%	4%	3%	<1%	13%
2. Depression	.59*		28%	15%	28%	11%	25%	7%	<1%	8%	1%	24%
3. Acceptance	-.65**	-.53**		61%	62%	16%	43%	<1%	4%	<1%	<1%	5%
4. Decentering	-.44**	-.39*	.78**		51%	6%	44%	<1%	4%	<1%	<1%	3%
5 Self-compassion	-.46**	-.53**	.79**	.72**		4%	30%	1%	4%	<1%	<1%	8%
6. Mindfulness Skills	-.23	-.33*	.40*	.24	.20		1%	3%	4%	1%	<1%	<1%
7. Intol. of Uncertainty	.58**	.50**	-.66**	-.66**	-.55**	-.10		1%	5%	6%	<1%	28%
8. Gender	.10	-.27	.08	.03	0.10	.17	.12		<1%	3%	5%	<1%
9. Age	-.21	.003	.21	.21	0.20	-.20	-.23	.01		2%	3%	1%
10. Years since diagnosis	.17	.28	-.08	-.09	.002	.12	.25	.16	.14		3%	29%
11. Mood medication	.02	.10	.02	.08	.02	.001	-.09	-.23	.17	.17		2%
12. Self-report disability	.36*	.49**	-.23	-.18	-.28	.01	.53**	-.05	-.11	.54**	.14	

Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). R² reported as a percentage, indicating variance explained. R² values of 1% to 8%: **small; 9% to 24%: **medium**; 25% to 100%: **large**.

Appendix B5 Correlations Groups T2

WL control	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety		58%	48%	35%	41%	<1%	27%	8%	3%	<1%	6%	19%
2. Depression	.76**		38%	33%	38%	1%	25%	1%	<1%	5%	33%	58%
3. Acceptance	-.69**	-.62**		64%	56%	10%	37%	<1%	1%	<1%	4%	16%
4. Decentering	-.59**	-.57**	.80**		62%	11%	23%	4%	4%	<1%	<1%	8%
5. Self-compassion	-.64**	-.62**	.75**	.79**		2%	19%	1%	12%	<1%	1%	14%
6. Mindfulness Skills	-.05	-.12	.32	.33	.15		3%	3%	10%	2%	3%	<1%
7. Intol. of Uncertainty	.52**	.50**	-.61**	-.48**	-.43**	-.17		2%	<1%	4%	3%	<1%
8. Gender	.28	.01	-.08	-.21	-.10	.16	.15		10%	7%	5%	1%
9. Age	-.17	-.04	.13	.22	.34*	.31	.02	.31		12%	<1%	4%
10. Years since diagnosis	.08	.23	.06	.01	.002	.15	.20	.26	.35*		5%	34%
11. Mood medication	.24	.57**	-.19	-.05	-.10	-.18	.18	-.22	-.01	.23		12%
12. Self-report disability	.44**	.76**	-.40*	-.29	-.38*	.06	.35*	.10	.20	.58**	.35*	

MBI intervention	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety		37%	25%	14%	28%	5%	35%	3%	18%	8%	1%	19%
2. Depression	.61**		30%	21%	34%	8%	20%	<1%	8%	19%	<1%	55%
3. Acceptance	-.50**	-.55**		38%	56%	41%	40%	<1%	3%	10%	2%	10%
4. Decentering	-.38*	-.46**	.62**		53%	34%	29%	<1%	7%	1%	1%	3%
5. Self-compassion	-.53**	-.58**	.75**	.73**		38%	42%	<1%	8%	6%	<1%	19%
6. Mindfulness Skills	-.22	-.28	.64**	.58**	.62**		13%	<1%	4%	4%	<1%	<1%
7. Intol. of Uncertainty	.59**	.45**	-.63**	-.54**	-.65**	-.36*		<1%	6%	6%	<1%	15%
8. Gender	.18	-.09	-.06	-.08	.07	.08	.07		1%	3%	5%	<1%
9. Age	-.42**	-.28	.18	.26	.29	-.19	-.25	.01		2%	3%	1%
10. Years since diagnosis	.28	.43**	-.31	-.11	-.24	-.20	.25	.16	.14		3%	29%
11. Mood medication	.11	.00	-.13	.11	-.07	-.07	.02	-.23	.17	.17		2%
12. Self-report disability	.44**	.74**	-.31	-.18	-.43**	-.03	.39*	-.05	-.11	.54**	.14	

**Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). R² values of 1% to 8%: small; 9% to 24%: medium; 25% to 100%: large.

Appendix B6 - Correlations Groups T3

WL control	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety		40%	23%	29%	25%	5%	35%	9%	1%	1%	5%	20%
2. Depression	.63**		37%	37%	44%	10%	33%	1%	<1%	7%	19%	38%
3. Acceptance	-.48**	-.61**		59%	50%	19%	41%	4%	11%	3%	3%	18%
4. Decentering	-.54**	-.61**	.77**		64%	26%	38%	1%	6%	1%	1%	23%
5. Self-compassion	.50**	-.66**	.71**	.80**		10%	19%	<1%	10%	1%	3%	23%
6. Mindfulness Skills	-.23	-.32	.44**	.51**	.31		17%	3%	3%	1%	11%	3%
7. Intol. of Uncertainty	.59**	.57**	-.64**	-.62**	-.44**	-.41*		<1%	<1%	3%	2%	23%
8. Gender	.30	.11	.20	-.11	-.04	.18	.02		10%	7%	5%	1%
9. Age	-.12	-.08	.33	.24	.32	.16	-.07	.31		12%	<1%	4%
10. Years since diagnosis	.11	.27	.16	-.10	.10	.12	.18	.26	.35*		5%	34%
11. Mood medication	.23	.44**	-.18	-.11	-.16	-.33	.14	-.22	-.01	.23		12%
12. Self-report disability	.45**	.62**	-.42*	-.48**	-.48**	-.18	.48**	.10	.20	.58**	.35*	

MBI intervention	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety		12%	5%	5%	5%	12%	5%	19%	3%	1%	2%	4%
2. Depression	.35*		5%	<1%	8%	14%	14%	<1%	2%	7%	<1%	34%
3. Acceptance	-.23	-.23		41%	45%	25%	25%	2%	<1%	10%	7%	2%
4. Decentering	-.22	-.09	.64**		29%	41%	11%	<1%	<1%	6%	2%	1%
5. Self-compassion	-.22	-.28	.67**	.54**		23%	23%	<1%	<1%	<1%	<1%	7%
6. Mindfulness Skills	-.35	-.38*	.50**	.64**	.48**		7%	<1%	9%	4%	<1%	2%
7. Intol. of Uncertainty	.23	.37*	-.49*	-.33	-.48**	-.26		<1%	<1%	7%	<1%	14%
8. Gender	.43*	-.03	-.13	-.02	-.01	-.06	.03		10%	7%	5%	1%
9. Age	-.17	.13	.01	-.04	-.01	-.30	-.08	.31		12%	<1%	4%
10. Years since diagnosis	.10	.26	-.32	-.25	-.06	-.21	.26	.26	.35*		5%	29%
11. Mood medication	.13	.001	.27	-.13	-.07	-.08	-.04	-.22	-.01	.23		2%
12. Self-report disability	.21	.58*	-.13	-.10	-.27	-.13	.38*	.10	.20	.54**	.14	

Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). R² values of 1% to 8%: **small; 9% to 24%: **medium**; 25% to 100%: **large**.

Appendix B7 - Correlations Groups T4

WL control	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety		56%	14%	12%	33%	5%	15%	18%	5%	<1%	5%	4%
2. Depression	.75**		11%	14%	40%	5%	13%	12%	<1%	3%	19%	12%
3. Acceptance	-.37*	-.33*		41%	45%	6%	49%	2%	10%	3%	3%	5%
4. Decentering	-.34*	-.38*	.64**		42%	2%	18%	4%	1%	4%	3%	11%
5. Self-compassion	-.57**	-.63*	.67**	.65**		7%	17%	7%	8%	<1%	4%	13%
6. Mindfulness Skills	-.22	-.22	.25	.13	.26		6%	3%	1%	3%	10%	<1%
7. Intol. of Uncertainty	.39*	.36*	-.70**	-.42*	-.41*	-.25		<1%	<1%	2%	9%	22%
8. Gender	.42*	.34*	.14	-.20	-.26	.18	-.04		10%	7%	5%	1%
9. Age	-.23	-.05	.31	.11	.28	.12	.03	.31		12%	<1%	4%
10. Years since diagnosis	-.04	.17	.17	-.20	-.04	.16	.13	.26	.35*		5%	34%
11. Mood medication	.23	.43**	-.18	-.18	-.20	-.32	.30	-.22	-.005	.23		12%
12. Self-report disability	.20	.34*	-.23	-.33	-.36*	-.04	.47**	.10	.20	.58**	.35*	

MBI intervention	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety		18%	48%	31%	37%	35%	14%	<1%	<1%	<1%	<1%	6%
2. Depression	.52**		19%	29%	40%	15%	12%	2%	2%	13%	4%	28%
3. Acceptance	-.69**	-.43**		49%	42%	44%	35%	<1%	2%	1%	<1%	8%
4. Decentering	-.56**	-.54**	.70**		50%	46%	25%	1%	<1%	<1%	6%	3%
5. Self-compassion	-.61**	-.63**	.65**	.71**		28%	41%	4%	<1%	2%	4%	15%
6. Mindfulness Skills	-.59**	-.39**	.66**	.68**	.53**		19%	<1%	3%	<1%	5%	<1%
7. Intol. of Uncertainty	.38	.35	-.59**	-.50**	-.64**	-.43*		<1%	<1%	4%	1%	12%
8. Gender	.03	-.15	.02	.10	.21	.07	.02		<1%	3%	3%	<1%
9. Age	-.004	.13	-.14	.03	.02	-.18	.02	.01		2%	3%	1%
10. Years since diagnosis	-.012	.36	-.12	-.07	-.15	-.03	.19	.16	.14		3%	29%
11. Mood medication	.03	.19	.07	-.24	-.19	-.23	-.12	-.23	.17	.17		2%
12. Self-report disability	.24	.53**	-.28	-.17	-.39*	-.06	.35	-.05	-.11	.54**	.14	

Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). R² reported as a percentage, indicating variance explained. R² values of 1% to 8%: **small; 9% to 24%: **medium**; 25% to 100%: **large**.

Appendix B8. Regression Coefficients, Standard Errors, and Model Summary Information for the **Anxiety (T4)** Parallel Multiple Mediator Model depicted in Figure 11.

	Consequent																	
	M ₁ (Acceptance T3)			M ₂ (Decentering T3)			M ₃ (Self-compassion T3)			M ₄ (Mindfulness skills T3)			M ₅ (Intolerance of uncertainty T3)			Y (Anxiety T4)		
Antecedent	Coeff.	SE	p	Coef f.	SE	p	Coeff.	SE	p	Coeff.	SE	p	Coef f.	SE	p	Coeff.	SE	p
X (trial arm)	.24	.18	.200	.31	.07	<0.001	.15	.15	.334	.27	.07	<0.001	-.08	.12	.525	-.20	.14	.142
M₁ (Accep.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.04	.10	.446
M₂ (Decen.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.35	.10	.703
M₃ (Self-co.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.10	.14	.446
M₄ (Mind. sk.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.03	.24	.895
M₅ (Int. of u.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.39	.14	.007
Constant	1.86	1.34	.201	1.57	.54	.006	1.34	1.08	.224	.50	.53	.341	1.14	.59	.191	-.54	.88	.541
	R ² = 0.52 F(7, 50) = 7.70, p < 0.001			R ² = 0.61 F(7, 50) = 11.07, p < 0.001			R ² = 0.52 F(7, 50) = 7.78, p < 0.001			R ² = 0.66 F(7, 50) = 13.70, p < 0.001			R ² = 0.59 F(7, 50) = 10.32, p < 0.001			R ² = 0.64 F(12, 45) = 6.58, p < 0.001		

Appendix B9. Regression Coefficients, Standard Errors, and Model Summary Information for the **Anxiety (T3)** Parallel Multiple Mediator Model depicted in Figure 12.

	Consequent																	
	M ₁ (Acceptance T2)			M ₂ (Decentering T2)			M ₃ (Self-compassion T2)			M ₄ (Mindfulness skills T2)			M ₅ (Intolerance of uncertainty T2)			Y (Anxiety T3)		
Antecedent	Coeff.	SE	p	Coef. f.	SE	p	Coeff.	SE	p	Coeff.	SE	p	Coef. f.	SE	p	Coeff.	SE	p
X (trial arm)	.20	.15	.20	.11	.07	.130	.06	.12	.61	-.02	.08	.849	.06	.12	.66	.02	.09	.834
M₁ (Accep.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.20	.09	.035
M₂ (Decen.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.22	.22	.340
M₃ (Self-co.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.07	.13	.702
M₄ (Mind. sk.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.26	.17	.895
M₅ (Int. of u.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.04	.10	.702
Constant	1.20	1.1	.29	1.37	.52	.012	1.27	.92	.17	.06	.56	.917	1.27	.92	.17	.51	.68	.458
	R ² =0.63 F(7, 57)=13.66, p < 0.001			R ² =0.60 F(7, 57)=12.25, p <			R ² =0.71 F(7, 57) = 19.47, p < 0.001			R ² =0.45 F(7, 57)=6.64, p < 0.001			R ² =0.51 F(7, 57)=8.41, p<0.001			R ² =0.71 F(12, 52) = 10.50, p < 0.001		

Appendix B10. Regression Coefficients, Standard Errors, and Model Summary Information for the **Depression (T4)** Parallel Multiple Mediator Model depicted in Figure 13.

	Consequent																	
	M ₁ (Acceptance T3)			M ₂ (Decentering T3)			M ₃ (Self-compassion T3)			M ₄ (Mindfulness skills T3)			M ₅ (Intolerance of uncertainty T3)			Y (Depression T4)		
Antecedent	Coeff.	SE	p	Coef. f.	SE	p	Coeff.	SE	p	Coeff.	SE	p	Coef. f.	SE	p	Coeff.	SE	p
X (trial arm)	.21	.19	.12	.31	.08	<0.01	.16	.15	.31	.29	.07	<0.01	-.10	.12	.40	-.21	.13	.131
M₁ (Accep.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.08	.10	.400
M₂ (Decen.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.35	.26	.217
M₃ (Self-co.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.27	.13	.047
M₄ (Mind. sk.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.04	.24	.863
M₅ (Int. of u.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.29	.13	.034
Constant	2.04	1.3	.12	1.54	.52	.005	1.77	1.0	.10	.69	.49	.163	.96	.81	.24	-.36	.82	.658
	R ² =0.52 F(7, 50)=7.20, p < 0.001			R ² =0.61 F(7, 50) = 11.06, p < 0.001			R ² =0.52 F(7, 50) = 7.76, p < 0.001			R ² = 0.67 F(7, 50) = 14.77, p < 0.001			R ² =0.60 F(7, 50) = 10.77, p < 0.001			R ² =0.55 F(12, 45)=4.59, p < 0.001		

Appendix B11. Regression Coefficients, Standard Errors, and Model Summary Information for the **Depression (T3)** Parallel Multiple Mediator Model depicted in Figure 13.

	Consequent																	
	M ₁ (Acceptance T2)			M ₂ (Decentering T2)			M ₃ (Self-compassion T2)			M ₄ (Mindfulness skills T2)			M ₅ (Intolerance of uncertainty T2)			Y (Depression T3)		
Antecedent	Coeff.	SE	p	Coeff.	SE	p	Coeff.	SE	p	Coeff.	SE	p	Coeff.	SE	p	Coeff.	SE	p
X (trial arm)	.21	.15	.17	.11	.07	.113	.07	.12	.58	-.007	.08	.923	.04	.12	.74	-.15	.07	.05
M₁ (Accep.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.11	.08	.159
M₂ (Decen.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.18	.18	.331
M₃ (Self-co.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.11	.10	.305
M₄ (Mind. sk.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.19	.14	.167
M₅ (Int. of u.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.01	.08	.883
Constant	1.48	1.1	.19	1.53	.52	.005	1.49	1.9	.10	.39	.56	.48	1.31	.91	.16	.64	.57	.264
	R ² =0.63 F(7, 57)=13.83, p < 0.001			R ² =0.6 F(7,57)=12.43, p < 0.001			R ² =0.71 F(7, 57)=19.58, p < 0.001			R ² =0.71 F(7, 57)=19.58, p < 0.001			R ² =0.59 F(7, 57) = 8.41, p < 0.001			R ² =.73 F(12, 52) = 11.55, p < 0.001		

ADDITIONAL PAPERS

Paper 1.

Inclusion of adults with severe mental illness in trials of type 2 diabetes self-management education programmes: a systematic review.

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Abstract

Background: People with severe mental illnesses (SMI), such as schizophrenia and bipolar disorder, are at an increased risk of developing type 2 diabetes. Diabetes self-management education programmes are effective in improving health outcomes in the general population with diabetes. However, people with SMI are often excluded from research and it is not known if they have been included in evaluations of these programmes. The aim of this review was to examine if evaluations of diabetes self-management education programmes included people with SMI, and if so, whether the interventions were beneficial for this population.

Methods: This systematic review examined the inclusion of people with SMI and co-morbid type 2 diabetes in randomised controlled trials of diabetes self-management education programmes. The following bibliographic databases were searched - Cochrane Library, Medline, Embase, PsychINFO, Allied and Complimentary Medicine Database, Health Technology Assessment, NHS Economic Evaluations Database and CINAHL.

Results: A total of 282 trials were included. At least 39% of trials did not recruit any participants with SMI. Only five confirmed inclusion of participants with SMI but they included a very small number of participants with SMI (of the three trials that

reported details, only 13 out of 335 participants had SMI, less than 4%) and did not report their results separately.

Conclusions: This systematic review confirms that people with SMI are excluded, whether purposely or not, from trials of diabetes self-management education, resulting in a lack of an evidence base on which to base treatment paths for this vulnerable population.

Background

The estimated prevalence of diabetes mellitus in people with psychosis is 13%, which is between two and five times higher than the general population (Ward & Druss, 2015). Several factors are thought to contribute to this increased risk, including the effects of anti-psychotic medications, pathophysiology of SMI and lifestyle factors such as poor diet, obesity and physical inactivity (Osborn, Wright, Levy, King, Deo, & Nazareth, 2008). Among people with diabetes mellitus, the risk of acute complications and mortality is also greater in those with SMI (Becker & Hux, 2011; Vinogradova, Coupland, Hippisley-Cox, Whyte, & Penny, 2010).

Self-management of type 2 diabetes mellitus (T2DM) is complex, and to achieve this successfully, diabetes clinical guidelines (National Institute for Health and Clinical Excellence, 2015; Powers et al, 2016; SIGN, 2010; IDF CG, 2006; Royal Australian College of General Practitioners, 2017) recommend structured education for all patients. A number of systematic reviews have reported the positive effects of diabetes self-management education (DSME) programmes (Chrvala Sherr, & Lipman, 2016; Steinsbekk, Rygg, Lisulo, Rise, Fretheim, 2012) such as better glycaemic control, greater diabetes knowledge and self-management skills, and higher self-efficacy, but it is unclear if people with SMI also experience these benefits. A recent Cochrane review of DSME specifically for people with SMI (McBain, Mulligan, Haddad, Flood, Jones, & Simpson, 2016), conducted by members of the current authorship team, identified only one intervention (McKibbin, Patterson, et al, 2006). McKibbin et al recruited people aged over 40 with T2DM and either schizophrenia or schizoaffective disorder. The intervention used adapted materials and reinforced behaviour change, to help overcome impaired motivation

and insight. At the end of the 24-week trial, the intervention group experienced a greater reduction in weight, body mass index (BMI), waist circumference and plasma triglycerides than controls, and had significantly increased their diabetes knowledge, diabetes self-efficacy and self-reported physical activity. The effects on participants' BMI, waist circumference and diabetes knowledge were maintained at 6-month follow-up (McKibbin, Golshan, Griver, Kitchen, & Wykes, 2010) . There were however no statistically significant changes in fasting glucose or glycosylated haemoglobin (A1c) levels. This suggests that where interventions are developed to address the particular needs of people with SMI and T2DM, positive lifestyle changes can be achieved.

Given that McKibbin et al's intervention did not achieve a change in HbA1c, this suggests a need for further research to identify how best to optimise diabetes self-management for people with SMI. The recent and rapid growth of DSME in the general population may help to shed light on this issue - a rapid synthesis of the evidence on interventions supporting self-management (Taylor et al, 2014) identified 179 unique randomised controlled trials (RCTs) of DSME in the general diabetes population. This plethora of data may provide insight into whether and how DSME programmes for the general population have been implemented for people with SMI, and if they have been successful.

The aim of this systematic review was therefore to examine if evaluations of DSME programmes included people with SMI (defined as psychosis, schizophrenia, schizoaffective disorder, bipolar disorder, or depression with psychotic features), and if so, what type of interventions have been successfully implemented and what the benefits were for this population.

Method

A systematic literature search was undertaken in the following databases: Cochrane Library, Medline, Embase, PsychINFO, Allied and Complimentary Medicine Database, Health Technology Assessment, NHS Economic Evaluations Database and CINAHL from January 2004 to July 2014. The search included terms for diabetes, patient education/self-management and randomised controlled trials. The full list

of terms is reported in Additional file 1. Study selection was undertaken independently by two researchers. Data were extracted systematically using an adapted Cochrane data extraction form and authors were contacted for missing data.

Randomised controlled trials (RCTs), published in English in peer-reviewed journals, were included. Participants had to be aged 18 or over and diagnosed with T2DM. Interventions for individuals or groups, in person or online, and which were targeted at improving the self-management of T2DM were included. This included interventions aimed at promoting healthy diet or physical activity. Interventions that focused solely on the management of mental illness were excluded. Trials that recruited only people with SMI were also excluded as the recent Cochrane review had¹² already reviewed these.

Results

From an initial 22659 titles, 1245 abstracts were screened and 585 full paper studies were assessed for eligibility. A total of 282 RCTs, conducted in 40 different countries, were included in the review. (See PRISMA flowchart shown in Figure 1). Studies conducted in the USA dominated (37%), whilst 8.5% were UK-based trials.

Results for recruitment of people with SMI are reported in Table 1 and Additional file 2. At least 110 (39%) RCTs did not recruit any participants with SMI. In a further 30 (11%) RCTs, the authors were unaware if there had been any participants with a SMI diagnosis as this data was not collected.

Five (2%) RCTs (Hill-Briggs et al, 2011; Mohamed, Al-Lenjawi, Amuna, Zotor, & Elmahdi, 2013; Pimazoni-Netto, Rodbard, & Zanella, 2011; Spencer et al, 2011; Wolf et al, 2014) confirmed inclusion of people with SMI, however the numbers recruited were very small (n=13 in the three trials that reported details) and authors did not report their results separately.

For 136 (48%) RCTs it was not possible to obtain data from authors.

Discussion

The key finding of this review was that a substantial proportion of trials of DSME have not included people with SMI. At least 39% of identified trials of DSME did not include any participants with SMI. Only 2% of included trials had participants with a known diagnosis of SMI, and the effect of DSME programmes on this sub-group is unknown as no analyses were performed. Given the increased risk of T2DM in people with SMI and the large number of RCTs of DSME that have been conducted, this is a remarkable omission.

Previous research has found that people with SMI are often excluded from clinical trials. A study that examined 400 highly cited trials across 20 common chronic health conditions published between 2002 and 2010 found that 55% of the papers that described diabetes research had psychiatric exclusion criteria (Humphreys, Blodgett, & Roberts, 2015). Humphreys et al argued that excluding this population results in knowledge gaps that may harm people with SMI when a treatment becomes generalised.

The only trial specifically aimed at promoting health lifestyle choices in people with SMI and T2DM (McKibbin et al, 2006, 2010), included 64 people (n= 32 in each arm) randomised to either treatment as usual with education leaflets, or to Diabetes Awareness and Rehabilitation Training (DART). This 24 week, group-based intervention was delivered by a mental health professional and was tailored for the middle-aged participants who also had Schizophrenia or Schizoaffective disorder. Adaptations for this group included limiting the number of new topics introduced at weekly meetings and using more accessible literature. Topics covered nutrition, exercise, medication and communication skills and were reinforced throughout the programme to compensate for lower motivation and insight.

The King's Fund (Naylor, Das, Ross, Honeyman, Thompson, & Gilbert, 2016) recently recommended that people with SMI should be seen as a priority target group for public health interventions and the UK National Health Service (NHS) Five Year Forward View for Mental Health (Mental Health Task Force, 2016) also proposes that access to evidence-based physical care interventions should be expanded for

people with SMI. However, our findings concur with other research that has identified under-representation of people with psychiatric disorders in research and highlighted this issue as an example of health inequity (Humphreys et al, 2015). It is unclear to what extent this under-representation in research on DSME is also borne out in referral to these programmes in clinical care. Research in the US has found that people with SMI are less likely than those without SMI to receive diabetes education (Goldberg et al, 2007) and anecdotal evidence suggests that this is also the case elsewhere (Taylor & Siddiqi, 2016) but data are unavailable.

Thornicroft (2013) has described the mortality gap between people with SMI and the non-SMI population as “at worst a form of lethal discrimination” and calls for evidence-based interventions to address it, and the Royal College of Psychiatrists (O’Brien et al, 2009) recommends that their members should feel competent to address the physical as well as the mental health needs of people with SMI. However, the lack of research into the effectiveness of DSME programmes in this vulnerable group leaves clinicians without a clear pathway for intervention.

A limitation of this review is that, in spite of our attempts to contact all authors, we were unable to obtain data for a substantial number of trials. It is possible, however, that our findings underestimate the proportion of trials that do not include SMI. We received responses from authors of 73 RCTs that had not reported data in the trial publication, and of these, 38 (52%) did not have any participants with SMI.

This systematic review has shown that people with SMI are often excluded, whether purposely or not, from trials of DSME. If people with SMI are to receive appropriate diabetes care in accordance with current guidelines, it is essential that evidence-based diabetes education is available. This review indicates that there is a need to identify how best to provide DSME for this vulnerable population.

1793 words

References:

- Becker, T., & Hux, J. Risk of acute complications of diabetes among people with schizophrenia in Ontario, Canada. *Diabetes Care*. 2011;**34**(2), 398-402.
- Chrvala CA, Sherr D, Lipman RD. Diabetes self-management education for adults with type 2 diabetes mellitus: A systematic review of the effect on glycemic control. *Patient education and counseling*. 06/2016, Volume 99, Issue 6
- General practice management of type 2 diabetes. Royal Australian College of General Practitioners. <https://static.diabetesaustralia.com.au/s/fileassets/diabetes-australia/5d3298b2-abf3-487e-9d5e-0558566fc242.pdf>
- Guideline Network SI. Management of diabetes: a national clinical guideline. SIGN. 2010.
- Goldberg, R. W., Kreyenbuhl, J. A., Medoff, D. R., Dickerson, F. B., Wohlheiter, K., Fang, L. J. et al. Quality of diabetes care among adults with serious mental illness. *Psychiatric Services*. 2007. 58(4), 536-543. doi:10.1192/bjp.bp.107.045732
- Hill-Briggs F, Lazo M, Peyrot M, Doswell A, Chang YT, Hill MN, Levine D, Wang NY, Brancati FL. Effect of problem-solving-based diabetes self-management training on diabetes control in a low-income patient sample. *Journal of general internal medicine*. 2011 Sep 1;**26**(9):972.
- Humphreys K, Blodgett JC, Roberts LW. The exclusion of people with psychiatric disorders from medical research. *Journal of Psychiatric Research*, 2015; 70: 28-32
- IDF CG. Global Guideline for Type 2 Diabetes: recommendations for standard, comprehensive, and minimal care. *Diabetic medicine: a journal of the British Diabetic Association*. 2006 Jun;**23**(6):579. Downloaded 27/5/2017
- McBain H, Mulligan K, Haddad M, Flood C, Jones J, Simpson A. Self-management interventions for type 2 diabetes in adult people with severe mental illness. *The Cochrane Library*. 2016.DOI: 10.1002/14651858.CD011361.pub2
- McKibbin CL, Patterson TL, Norman G, Patrick K, Jin H, Roesch S, Mudaliar S, Barrio C, O'Hanlon K, Griver K, Sirkin AV. A lifestyle intervention for older schizophrenia patients with diabetes mellitus: a randomized controlled trial. *Schizophrenia research*. 2006 Sep 30;**86**(1):36-44
- McKibbin CL, Golshan S, Griver K, Kitchen K, Wykes TL. A healthy lifestyle intervention for middle-aged and older schizophrenia patients with diabetes mellitus: A 6-month follow-up analysis. *Schizophrenia research*. 2010 Aug 31;**121**(1):203-6.
- Mental Health Task Force to the NHS in England: The Five Year Forward View for Mental Health. [cited 19th March 2016]. Available from: <https://www.england.nhs.uk/mentalhealth/taskforce/>
- Mohamed H, Al-Lenjawi B, Amuna P, Zotor F, Elmahdi H. Culturally sensitive patient-centred educational programme for self-management of type 2 diabetes: a randomized controlled trial. *Primary care diabetes*. 2013 Oct 31;**7**(3):199-206.
- National Institute for Health and Clinical Excellence. Type 2 Diabetes: management. *NICE guideline published*: 2 December 2015. [cited April 2016]. Available from: <http://www.Nice.org.uk/guidance/ng28>
- Naylor C, Das P, Ross S, Honeyman M, Thompson J, Gilbert H (2016). Bringing together physical and mental health. A new frontier for integrated care. London: The King's Fund. Available at: http://www.kingsfund.org.uk/sites/files/kf/field/field_publication_file/Bringing-together-Kings-Fund-March-2016_0.pdf accessed 19th March 2016

- Powers, M. A., Bardsley, J., Cypress, M., Duker, P., Funnell, M. M., Fischl, A. H., ... & Vivian, E. (2017). Diabetes self-management education and support in type 2 diabetes: a joint position statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. *The Diabetes Educator*, 43(1), 40-53.
- O'Brien, G., Bullock, R., Black, S., Cormac, I., Jones, G., Kerr, M., ... & Ramsay, R. 2009. Physical health in mental health; Final report of a scoping group". London: Royal College of Psychiatrists. *BMJ* 2013;346:f2539 doi: 10.1136/bmj.f2
- Osborn DP, Wright CA, Levy G, King MB, Deo R, Nazareth I. Relative risk of diabetes, dyslipidaemia, hypertension and the metabolic syndrome in people with severe mental illnesses: systematic review and metaanalysis. *BMC psychiatry*. 2008 Sep 25;8(1):1.
- Pimazoni-Netto A, Rodbard D, Zanella on behalf of the Diabetes Education and Control Group MT. Rapid improvement of glycemic control in type 2 diabetes using weekly intensive multifactorial interventions: structured glucose monitoring, patient education, and adjustment of therapy—a randomized controlled trial. *Diabetes technology & therapeutics*. 2011 Oct 1;13(10):997-1004.
- Spencer MS, Rosland AM, Kieffer EC, Sinco BR, Valerio M, Palmisano G, Anderson M, Guzman JR, Heisler M. Effectiveness of a community health worker intervention among African American and Latino adults with type 2 diabetes: a randomized controlled trial. *American journal of public health*. 2011 Dec;101(12):2253-60.
- Statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. *Clinical Diabetes*. 2016. 34(2), 70-80
- Steinsbekk, A., Rygg, L., Lisulo, M., Rise, M. B., & Fretheim, A. Group based diabetes self-management education compared to routine treatment for people with type 2 diabetes mellitus. A systematic review with meta-analysis. *BMC health services research*. 2012.12(1), 1.
- Taylor J & Siddiqi N. Improving health outcomes for adults with severe mental illness and comorbid diabetes: is supporting diabetes self-management the right approach? *Journal of Psychiatric and Mental Health Nursing*, 2016, 23, 322–330
- Taylor, S. J., Pinnock, H., Epiphaniou, E., Pearce, G., Parke, H. L., Schwappach, A., ... & Sheikh, A. (2014). A rapid synthesis of the evidence on interventions supporting self-management for people with long-term conditions: PRISMS–Practical systematic Review of Self-Management Support for long-term conditions.
- The Cochrane Collaboration. Data collection form for intervention reviews: RCTs only. <http://training.cochrane.org/resource/data-collection-forms-intervention-reviews>
- Thornicroft G. Premature death among people with mental illness. *BMJ* 2013;346:f296
- Vinogradova Y, Coupland C, Hippisley-Cox J, Whyte S, Penny C. Effects of severe mental illness on survival of people with diabetes. *The British Journal of Psychiatry* 2010;197:272-7.
- Ward M, Druss B. The epidemiology of diabetes in psychotic disorders. *The Lancet Psychiatry*. 2015 May 31;2(5):431-5
- Wolf MS, Seligman H, Davis TC, Fleming DA, Curtis LM, Pandit AU, Parker RM, Schillinger D, DeWalt DA. Clinic-based versus outsourced implementation of a diabetes health literacy intervention. *Journal of general internal medicine*. 2014 Jan 1;29(1):59-67.

Appendix B12

Table 1. Number and % of RCTs that included or excluded participants with SMI

	Reported in paper n	Response from author n	Response not received n	Total n	%
RCTs with participants with SMI diagnosis		5		5	1.8
RCTs with no participants with SMI diagnosis:					
Explicitly excluded SMI	72	28		100	35.6
Not explicitly excluded but no-one with SMI recruited		10		10	3.6
RCTs unaware of participants with SMI diagnosis		30		30	10.7
RCTs with no data			136	136	48.4
TOTAL RCTs	72	73	136	281	100.0

Paper 2.

The contribution of health psychology theory and practice to the treatment of acute and long-term neurology patients

ABSTRACT

Neurology patients, and neuropsychology, have long been the domains of clinical psychologists. However, health psychology theory and practice can help explain patients' behaviour and inform interventions to alleviate psychological distress following traumatic neurological events such as stroke or brain injury, or diagnosis of long-term neurological disease. This paper reflects on the author's clinical practice in both a stroke unit and in neurology outpatient services while completing a doctorate in health psychology.

BACKGROUND

I had been working in a post-acute, community acquired-brain injury centre for over eight years when it became clear that to progress in my career and become a chartered psychologist I would need to complete a doctorate. I had already gained a Master's in Health Psychology, which I had found both fascinating and relevant to my area of work, and despite neurology and neuropsychology seemingly dominated by clinical psychologists, the biopsychosocial perspective offered by health psychology greatly influenced my doctoral route, which I have never regretted.

Last year, I successfully applied as a trainee health psychologist for a clinical psychologist role, in a general hospital, working on the acute stroke unit for about a third of my time, and as part of a neuro-rehab team for the remainder. The team consists of a clinical psychologist with an interest in neuropsychology, an assistant psychologist, specialist neuro-physiotherapists, occupational therapists, rehabilitation assistants and a brain injury specialist nurse. The out-patients are varied in both diagnosis and length of illness – whether newly-diagnosed patients with multiple sclerosis or Parkinson's disease – the two most frequent diagnoses – or patients living with these and similar diseases over many decades. Other neurological disorders, encephalitis, traumatic brain injury, and more rarely,

Huntingdon's disease, motor neurone disease and post-polio syndrome, are also treated within our team.

Referrals to psychological services are made by consultants, GPs, clinical nurse specialists, or other therapists if patients are considered to be struggling with acceptance, treatment adherence, or social adjustment, and patients are also referred for cognitive assessment both to inform therapy and to establish baseline and outcomes of interventions.

An increasing (and fascinating) group of referred patients includes people with a diagnosis of functional neurological symptoms, a complex disorder with a biopsychosocial aetiology, whose symptoms appear to be similar to people with neurological deficits, but which are in fact potentially reversible following multi-disciplinary, including psychological, intervention.

Patients on the stroke unit will all have had a stroke – an interruption to blood flow to the brain, but the effects of the stroke and their recovery will vary enormously, depending on neuro-location, age and co-morbidities, with a mean stay of eight weeks. The patient's social support and pre-morbid psychological resources will impact recovery, and the psychologist's role includes building relationships with family and friends in order to gain insight into the patient's previous personality, lifestyle, cognitive and emotional status, hopes and motivations, while also supporting the family with their own adjustment needs following this frequently sudden event which leads, for many, to loss of identity, family role, financial stability and shared hopes for the future.

HEALTH PSYCHOLOGY – CONTRIBUTIONS TO PRACTICE

Health psychologists train towards gaining competency in five broad areas: preventing health-damaging behaviours, promoting behaviours that enhance health, in understanding health cognitions that may predict and change health outcomes, improving health communication between patient and professionals, and finally, understanding the psychological impact of illness on patients and their wider social circle, and developing interventions to improve patients' ability to

rehabilitate, live with chronic illness and reduce distress and disability. Each area will be examined within the context of working in a neurological setting, both acute and non-acute, with a view to describing the relevance of health psychology theory and practice.

Preventing health damaging behaviours:

Strokes are primarily caused by modifiable life-style behaviours (Di Legge, Koch, Diomedi, Stanzione, & Sallustio, 2012; Boehme, Esenwa, & Elkind, 2017), however, in the acute phase, there is little opportunity for these behaviours to be perpetuated. This presents an opportunity to discuss self-management skills with the patient and their family and friends, for instance to prepare for the patient's return to a smoke-free home.

Post-acute therapy for stroke patients and for patients with neurological diagnoses should also introduce and reinforce lifestyle changes, however the delivery of information has to account for patients who may lack insight into their deficits, or who may lack cognitive skills, presenting with memory deficits, slow processing (for both verbal and written information), weak visuospatial and attentional skills, and poor executive functioning.

In post-stroke patients, limiting the development of depression may in turn reduce levels of anxiety (Wright, Wu, Chun, & Mead, 2017), and therapy targeting depression, including behavioural activation and motivational interviewing both in acute and non-acute settings, may contribute to lower mortality rates (Watkins et al, 2011; Ayerbe, Ayis, Crichton, Rudd & Wolfe, 2014).

Promoting and protecting healthy behaviours:

Rehabilitation from the effects of stroke is sometimes painful, often difficult and distressing - in the early stages the patient may find recognising their deficits extremely upsetting, including coming to terms with losses that may involve identity, careers, financial independence, relationships, and even their homes. In the later stages, adherence to rehabilitation and engaging with behavioural changes to

incorporate healthy behaviours such as exercise and health eating, while struggling with ongoing physical, cognitive and emotional disruption, can feel overwhelming. Premorbid behavioural patterns may have contributed to the stroke, or if continued, may increase disability levels, including for instance, all-or-nothing behaviour. Learning to identify physical, cognitive and stamina limitations while dealing with neurological fatigue, and structuring a meaningful, value-led rather than goal-led life is optimised by multidisciplinary team input, with specialist neuro-physiotherapy, neuro-occupational therapy and health psychology working collaboratively with the patient, in both the clinical and home setting (Taylor, 2015; Rudd, Bowen, James & Young, 2016).

Engaging patients in self-management and peer-led support groups is another important element of rehabilitation, in many cases requiring patients to explore their new identity, regain confidence, and move towards feeling safe as their identity develops to encompass the changes they have experienced (Gracey, Evans, & Malley, 2009). While the Y shaped model was developed to explain the way that discrepancies of self can become resolved in acquired brain injury, it also works well in neurological disease. An overarching, biopsychosocial and holistic model of adjustment to chronic illness is posited by Moss-Morris (2013), based on self-regulation theory (Leventhal et al, 1997), and which allows for mapping a patient's unique experience of chronic illness, whether post-stroke, neurodegenerative disease, or traumatic brain injury, enabling the identification of areas of behaviour that are maintaining the disequilibrium. Collaborating on and sharing formulations enable the patient to see therapy as an opportunity that they can use to move forward.

Health-related cognitions:

Illness perceptions have been shown to predict outcome and to be useful targets for interventions to improve health outcomes for people with chronic illness (Hagger & Orbell, 2003; Dempster, Howell, & McCorry, 2015) and also with neurological conditions: Huntingdon's disease (Helder, Kaptein, Kempen, Weinman,

Houwelingen, & Roos, 2002), multiple sclerosis (Jopson & Moss-Morris, 2003), and carers of people with stroke (McClenahan, & Weinman, 1998).

According to Leventhal (Leventhal, Brisette, & Leventhal, 2003), both cognitive and emotional perceptions of the health threat are processed in parallel and interactively, and there is constant and dynamic inter-relation between appraisal and coping. Deficits in patients' cognitive and emotional skills need to be understood before attempting to understand their illness perceptions, to explore coping strategies and to identify maladaptive beliefs.

Communication between professionals and patient/family/carer

Any multi-disciplinary team needs good communication for effective joint working, and in a stroke unit, the number of health professionals involved with a single patient during their hospital stay may amount to 20-30 people, with post-discharge services adding maybe another 10-15 staff members. These professionals belong to a meta-team, ie teams within teams, and sharing professional knowledge, patient history and goal-setting is essential for effective patient treatment (Wade, 2016). Communication includes regular teaching sessions, both attending in-service teaching by medical clinicians, to delivering workshops to rehabilitation assistants on grief and loss following diagnosis or stroke.

Communication is also important between the patient, their family and friends, and the professional team. However, prognosis in stroke and traumatic brain injury recovery is often uncertain, and it may be weeks before a clear understanding of rehabilitation potential is gained, and discharge plans can be discussed. During that time family dynamics change, and co-morbidity, hospital acquired infection and low mood, will also influence length of stay, increasing uncertainty, and delaying progress. The psychology service can play a part not just within the multi-disciplinary meetings, but also in supporting families, eliciting patient and family hopes and expectations, ensuring that treatment is coherent. Families can be both helpful and obstructive: there is a fine line between a loved one encouraging the patient to engage in rehabilitation (for instance in persisting with drinking

thickened fluids) and being perceived as nagging. Observing how families relate to the patient is an important part of building an understanding of how the family understands the effects of the stroke and the treatment pathway, and how they may support that patient's coping both in hospital and once discharged. The contribution of families to the efficacy of post-stroke self-management programmes has also been recognised (Warner, Packer, Villeneuve, Audulv, & Versnel, 2015).

Families are also important in supporting self-management in people with neurological diagnoses: in deteriorating conditions, family members are likely to face taking over the health management decisions and tasks, and it may be important that there is joint understanding with the patient about treatment goals and wishes. In functional neurological symptoms there may be secondary gains for the patient's partner or families that cause them to obstruct rehabilitation efforts. However, a study examining the illness beliefs of both family members and patients with functional symptoms found that family members endorsed psychological factors as a causation more than the patients, suggesting that they may be important routes to engagement in psychological interventions for people with functional symptoms (Whitehead et al, 2015). Functional neurological symptom disorder is a condition where the wording of the diagnosis and the aetiological stance of the professional, usually a neurologist, delivering the diagnosis is crucial to any potential rehabilitation (Stone, Carson, & Hallett, 2016).

Psychological aspects of illness: impact on patient and family and interventions:

The Royal College of Physicians recommends that patients in a stroke unit should have 45minutes daily of each therapy, including psychology, if they are able to engage (Bowen, James, & Young, 2016). In reality most patients in the stroke unit are extremely fatigued, and in order to spend any time with them a psychologist needs to work collaboratively with other therapies, for instance being with the patient while they are having physiotherapy in the gym, practicing independence skills in the kitchen, or in informal groups, where conversations can be easier than the bedside in a busy bay. Many patients have cognitive and communication

difficulties, especially soon after the stroke, and therapeutic interventions are necessarily brief.

A common cause of severe distress for patients is how to deal with what they perceive as the humiliation of having to have personal care carried out by young nursing staff, frequently of the opposite sex. Acknowledging that these procedures are difficult for the patient, assuring them of the professionalism of the staff, normalising the procedures at this stage of their recovery, and occasionally practicing simple visual imagery with the patient can help them cope.

While the stroke patient may be dealing with traumatic and sudden changes to their identities and feelings of locus of control, their families are also coming to terms with the possible changes in personality, physical and cognitive functioning of their relative, often without any confirmed medical prognosis especially early in the patient's recovery, and their own identity change in becoming carers, with possible financial and social consequences. Concern about uncertainty is high on the list for people with stroke and their carers, particularly around recurrence of stroke, and psycho-education interventions are frequently welcomed (White, Barrientos, & Dunn, 2014).

While there is scant evidence that psychotherapy helps stroke anxiety (Knapp et al, 2017), or that it significantly improves depression following stroke (Hackett, Anderson, House & Xia, 2008), a small but significant effect of psychological interventions on preventing depression has been shown (Hackett, Anderson, House, & Halteh, 2008), indicating that early treatment may be important in preventing low mood and the consequent deleterious effects on functioning.

Intolerance of uncertainty is a construct that is frequently included in modern anxiety disorder models, and represents a fear of the unknown (Carleton, Norton, & Asmundson, 2007). Neurological conditions like Parkinson's disease are progressive and unpredictable: motor symptoms and non-motor symptoms, including cognitive deterioration, can be embarrassing and debilitating, and make

social interaction very difficult (Parkinson's UK, 2017). Talking therapies that include worry exposure, cognitive behavioural therapy and mindfulness-based interventions can help patients build psychological flexibility and resilience by increased levels of acceptance, decentering, self-compassion, mindfulness skills and tolerance of uncertainty (Kabat-Zinn, 1990; Butler & Rouf, 2004; Homan & Sirois, 2017).

However, neurological conditions, most of which are inherently neurodegenerative, have a high correlation with cognitive impairment, which in turn is predictive of disability (Bobholz & Gleason, 2005; Skandsen, Finnanger, Andersson, Lydersen, Brunner, & Vik, 2010; Aarsland, Brønnick, & Fladby, 2011). Understanding a patient's level of cognitive functioning is fundamental to understanding their behaviours, illness beliefs, emotional status and potential for rehabilitation or adjustment therapy.

In an acute setting like a stroke unit, understanding the patient's cognitive abilities can inform the therapy team of any specific deficits the patient may be experiencing, particularly the deficits that the patient may lack conscious awareness of, such as unilateral neglect, or disinhibition, which can lead to falls and delays in rehabilitation. These cognitive deficits also impact on the patient's mood, with communication difficulties in particular being predictive of low mood following stroke (Humphreys, Thomas, Phillips, & Lincoln, 2015).

In post-acute settings, cognitive function assessment including neuropsychological testing if appropriate, contributes to understanding the emotional, cognitive, or behavioural difficulties that the patient and their families are reporting. Collaborating with the patient on formulation and planning tailored interventions can only be conducted once the patient's cognitive context has been assessed and incorporated into a social and physical assessment of the patient that is then shared with other professionals in the multi-disciplinary team (Lezak, Howieson, & Loring, 2004).

Baseline cognitive testing in stroke units is frequently carried out by occupational therapists, with input from a psychologist when a need for further testing of higher-order skills is identified, assessing possible deficits that would impact on the patient's post-acute rehabilitation – such as apraxia (an inability to carry out purposive actions), or executive dysfunction (skills required in mental control and self-regulation).

In the outpatient department, cognitive assessment is required for brain injury patients, again as a baseline and also to inform placements in secondary or tertiary rehabilitation units. Understanding executive dysfunction, a frequent consequence of frontal lobe damage, can help a family recognise that their loved one's behaviours, which may include disinhibition, apathy, poor planning and decision-making, are a result of their brain injury, and compensatory strategies and extensive occupational therapy can help retrain some of these skills.

Neurological settings provide many opportunities for health psychologists to use their theoretically-driven assessments and interventions, such as the common sense model (CSM, Leventhal, Meyer, & Nerenz, 1980), but assessment of patient cognitive and emotional functioning can help establish how interventions aimed at cognitive or emotional appraisals and of the health threat and coping strategies may need modification.

Neuropsychological assessment integrates cognitive testing with the patient's history and behaviour, preferably including a witness account from a close relative or friend to provide a fuller picture of that patient's baseline skills, personality and motivation (Evans, 2003)

Cognitive testing should be undertaken when there is uncertainty about the level of deficit caused by the neurological condition, when there is a need to measure cognitive function to assess intervention effectiveness, to assess the patient's readiness to return to work, independent living, and education, and there is also a justification in some cases, including functional cases, for testing to demonstrate

normal functioning to the underconfident patient. Understanding the neurology patient's level of cognitive function should be an essential part of assessment, should feature in the formulation, and should inform the choice of therapy, which may need adaptation to compensate for deficits.

An example of a therapeutic intervention would be cognitive restructuring and disputation, which may be too challenging for people who have difficulty with abstract reasoning, or with language processing. Post-stroke patients may benefit more from behavioural interventions – disputation of thoughts of being hopeless and helpless may not be possible, but working on demonstrating what strengths the patient may still have, reinforcing small progressions in rehabilitation using visual aids including video, and motivating families to reinforce simple relaxation strategies and coping self-statements, can be beneficial (Kneebone, 2016).

Similarly, mindfulness interventions require attentional and executive functioning skills, particularly mental manipulation, which again may be too taxing for some patients. In one study of people with Parkinson's disease, 57% were shown to have mild cognitive impairment within 3-5 years of diagnosis (Williams-Gray, Foltynie, Brayne, Robbins, & Barker, 2007) indicating that timing of the intervention may impact on the effectiveness of learning new skills.

Adjustment to living with the chronic and long-term effects of stroke, or traumatic brain injury, or a functional neurological symptom disorder, may mean having to follow a more structured lifestyle, which for people with memory difficulties may require compensatory strategies and support to carry out. Without a clear picture of the extent of the memory or speed of processing deficits, a multi-disciplinary approach to rehabilitation may lack coherence and may not be pitched at an achievable level to maximise the patient's potential (Prakash, Janssen, & Derry, 2016).

Neuro-psychometric tests have been validated for specific use in many neurological diseases, and care should be taken that testing is undertaken in optimal conditions

with consideration for the patient's particular health conditions, such as pain and fatigue, mood levels or medication dose and timing, which may all impact performance. Equally, consideration as to the specific cognitive domains that accompany different neurological diseases should enable the patient to only undertake tests that target assessment of those particular cognitive deficits, so as to minimise patient burden and potential distress.

However, many neuropsychological test materials remain available only to qualified, Health and Care Professions Council registered, clinical, forensic, or counselling psychologists, and health psychologists are specifically excluded. The route to further training in clinical neuropsychology is only open to clinical or educational psychologists in the UK, with the possibility of counselling psychologists becoming eligible in the near future (personal communication, April 2018, Qualification in Clinical Neuropsychology (QiCN)).

Health psychologists, whose theory and practice emphasise a biopsychosocial aetiology of illness and holistic treatment of long-term conditions, are useful members of multi-disciplinary teams working in neurological conditions. However, the barriers to formal training in neuropsychological testing are preventing health psychologists from independently contributing to complete understanding of how these complex patients perceive their difficulties and how best to help them self-manage their condition, thus maximising their potential.

3235 words

REFERENCES

Aarsland, D., Brønnick, K., & Fladby, T. (2011). Mild cognitive impairment in Parkinson's disease. *Current neurology and neuroscience reports*, *11*(4), 371-378.

Ayerbe, L., Ayis, S., Crichton, S. L., Rudd, A. G., & Wolfe, C. D. (2014). Explanatory factors for the increased mortality of stroke patients with depression. *Neurology*, *83*(22), 2007-2012.

Bobholz, J. A., & Gleason, A. (2005). Cognitive dysfunction in multiple sclerosis. *Alzheimer's Disease and Related Disorders*, 165.

Boehme, A. K., Esenwa, C., & Elkind, M. S. (2017). Stroke risk factors, genetics, and

prevention. *Circulation research*, 120(3), 472-495.

Bowen, A., James, M., & Young, G. (2016, January). Royal College of Physicians 2016 National clinical guideline for stroke. RCP.

Butler, G. & Rouf, K. (2015) Generalized anxiety disorder, in *Oxford Guide to Behavioural Experiments in Cognitive Therapy*, (p. 121). Oxford University Press.
10.1093/med:psych/9780198529163.003.0006

Carleton, R. N., Norton, M. P. J., & Asmundson, G. J. (2007). Fearing the unknown: A short version of the Intolerance of Uncertainty Scale. *Journal of anxiety disorders*, 21(1), 105-117.

Dempster, M., Howell, D., & McCorry, N. K. (2015). Illness perceptions and coping in physical health conditions: A meta-analysis. *Journal of psychosomatic research*, 79(6), 506-513.

Di Legge, S., Koch, G., Diomedi, M., Stanzione, P., & Sallustio, F. (2012). Stroke prevention: managing modifiable risk factors. *Stroke research and treatment*, 2012.

Evans, J. J. (2003). Basic concepts and principles of neuropsychological assessment. *Handbook of clinical neuropsychology*, 15-26.

Gracey, F., Evans, J. J., & Malley, D. (2009). Capturing process and outcome in complex rehabilitation interventions: A "Y-shaped" model. *Neuropsychological Rehabilitation*, 19(6), 867-890.

Hackett, M. L., Anderson, C. S., House, A., & Halteh, C. (2008). Interventions for preventing depression after stroke. *Cochrane Database Syst Rev*, 2.

Hackett, M., Anderson, C., House, A. O., & Xia, J. (2008). Interventions for treating depression after stroke. *Cochrane Database of Systematic Reviews*, (4), 1-95.

Hagger, M. S., & Orbell, S. (2003). A meta-analytic review of the common-sense model of illness representations. *Psychology and health*, 18(2), 141-184.

Helder, D. I., Kaptein, A. A., Kempen, G. M., Weinman, J., Houwelingen, H. C., & Roos, R. A. (2002). Living with Huntington's disease: Illness perceptions, coping mechanisms, and patients' well-being. *British Journal of Health Psychology*, 7(4), 449-462.

Homan, K. J. (2016). Self-compassion and psychological well-being in older adults. *Journal of Adult Development*, 23(2), 111-119

Homan, K. J., & Sirois, F. M. (2017). Self-compassion and physical health: Exploring the roles of perceived stress and health-promoting behaviors. *Health Psychology Open*, 4(2), 2055102917729542.

Humphreys, I., Thomas, S., Phillips, C., & Lincoln, N. (2015). Cost analysis of the Communication and Low Mood (CALM) randomised trial of behavioural therapy for stroke patients with aphasia. *Clinical rehabilitation*, 29(1), 30-41.

Jopson, N. M., & Moss-Morris, R. (2003). The role of illness severity and illness representations in adjusting to multiple sclerosis. *Journal of psychosomatic research*, 54(6), 503-511.

Kabat-Zinn, J. (1990). Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness. New York: Delacorte

Knapp, P., Campbell Burton, C., Holmes, J., Murray, J., Gillespie, D., Lightbody, C. E., ... & Lewis, S. R. (2017). Interventions for treating anxiety after stroke. *Cochrane Database of Systematic Reviews*.

Kneebone, I. I. (2016). A framework to support cognitive behavior therapy for emotional disorder after stroke. *Cognitive and Behavioral Practice, 23*(1), 99-109.

Leventhal, H., Benyamini, Y., Brownlee, S., Diefenbach, M., Leventhal, E., Patrick-Miller, L., & Robitaille, C. (1997). Illness representations: Theoretical foundations. In K. J. Petrie & J. Weinman (Eds.), *Perceptions of health and illness: Current research and applications* (pp.19-45). London, Uk: Harwood.

Leventhal, H., Brissette, I., & Leventhal, E. A. (2003). The common-sense model of health and illness. IN L. D. Cameron & H. Leventhal (Eds.), *The self-regulation of health and illness behaviour* (pp.42-65). London, UK: Routledge.

Leventhal, H., Meyer, D., & Nerenz, D. (1980). The common sense representation of illness danger. *Contributions to medical psychology, 2*, 7-30.

Lezak, M. D., Howieson, D. B., Loring, D. W., & Fischer, J. S. (2004). *Neuropsychological assessment*. Oxford University Press, USA.

McClenahan, R., & Weinman, J. (1998). Determinants of carer distress in nonacute stroke. *International journal of language & communication disorders, 33*(sup1), 138-143.

Moss-Morris, R. (2013). Adjusting to chronic illness: time for a unified theory. *British journal of health psychology, 18*(4), 681-686.

Parkinson's, U. K. (2012). Parkinson's prevalence in the United Kingdom. 2009. *Parkinson's UK*, 1-13.

Prakash, R. S., Janssen, A. L., & Derry, H. M., (2016) *Neuropsychological Assessment*, in *Assessment in Health Psychology*, (pp. 213-226). Hogrefe Publishing.

Rudd, T., Bowen, A., James, M., & Young, G. National clinical guideline for stroke Prepared by the Intercollegia the Stroke Working Party. 2016.

Skandsen, T., Finnanger, T. G., Andersson, S., Lydersen, S., Brunner, J. F., & Vik, A. (2010). Cognitive impairment 3 months after moderate and severe traumatic brain injury: a prospective follow-up study. *Archives of physical medicine and rehabilitation, 91*(12), 1904-1913.

Stone, J., Carson, A., & Hallett, M. (2016). Explanation as treatment for functional neurologic disorders. In *Handbook of clinical neurology* (Vol. 139, pp. 543-553). Elsevier.

Taylor, A. (2015). Building the House of Care: How Health Economies in Leeds and Somerset are Implementing a Coordinated Approach for People with Long-term Conditions. *The Health Foundation, London*.

Wade, D. (2016). Rehabilitation – a new approach. Part three: the implications of the theories. *Clinical Rehabilitation, 30*(1), 3-10.

Warner, G., Packer, T., Villeneuve, M., Auduly, A., & Versnel, J. (2015). A systematic review of the effectiveness of stroke self-management programs for improving function and participation outcomes: self-management programs for stroke survivors. *Disability and Rehabilitation*, 37(23), 2141-2163.

Watkins, C. L., Wathan, J. V., Leathley, M. J., Auton, M. F., Deans, C. F., Dickinson, H. A., ... & Lightbody, C. E. (2011). The 12-month effects of early motivational interviewing after acute stroke: a randomized controlled trial. *Stroke*, STROKEAHA-110.

Williams-Gray, C. H., T. Foltynie, C. E. G. Brayne, T. W. Robbins, and R. A. Barker. "Evolution of cognitive dysfunction in an incident Parkinson's disease cohort." *Brain* 130, no. 7 (2007): 1787-1798.

White, C. L., Barrientos, R., & Dunn, K. (2014). Dimensions of uncertainty after stroke: perspectives of the stroke survivor and family caregiver. *Journal of Neuroscience Nursing*, 46(4), 233-240.

Whitehead, K., Stone, J., Norman, P., Sharpe, M., & Reuber, M. (2015). Differences in relatives' and patients' illness perceptions in functional neurological symptom disorders compared with neurological diseases. *Epilepsy & Behavior*, 42, 159-164.

Wright, F., Wu, S., Chun, H. Y. Y., & Mead, G. (2017). Factors associated with poststroke anxiety: a systematic review and meta-analysis. *Stroke Research and Treatment*, 2017.

SECTION C

PROFESSIONAL PRACTICE

Case Study: Teaching and Training Part I – Health Professionals

Understanding Functional Neurological Symptom Disorder – Training for Multi-disciplinary Staff at a Brain Injury Rehabilitation Centre

Background

I have worked at a post-acute, outpatient brain injury centre for the past six years, more recently as a trainee health psychologist. The centre assesses and treats around 110 adult clients a year who have either had a stroke or a traumatic brain injury and who are expected to make further recovery.

Plan and design training programmes that enable students to learn about psychological knowledge, skills, and practices.

Training needs within the clinical team for better understanding of Functional Neurological Symptom Disorder (FNSD) were recently identified as more research is published about the disorder and more clients with predominantly FNSD or functional symptoms comorbid with organic disease are referred.

Many members of the team had expressed dismay, apprehension and concern about their competency to provide treatment for this group of clients, who make up between 10 and 20% of the total intake. As I progressed in my doctoral studies I realised that there was a role for health psychology to both inform treatment of FNSD and to change the attitudes of some of the health professionals that I worked with. I completed a behaviour case study on a client with FNSD who was successfully treated to self-manage her symptoms and reintegrate in family, social and work roles, and I later conducted a systematic review into the role of illness perceptions in the management of this distressing and disabling condition. With this theoretical and practice-based background, I continued to develop my therapeutic skills working with people with FNSD and I felt confident that I could share my expertise with my colleagues.

The team had expressed a need to understand the aetiology and background of the diagnosis, and to be able to source evidence of best management. Evidence base is important as there are occasions when clients are referred to us outside our core contract criteria and their case (and evidence for treatment needs) is presented to a funding board. The centre is also developing a private treatment arm and is required to demonstrate evidence-based practice when marketing this service.

A needs assessment was carried out by informal contact with team members, heads of departments and the clinical lead, and identified gaps in knowledge about functional symptoms and in management efficacy (Hauer & Quill, 2011). The teaching plan was discussed with my workplace supervisor (appendix 1). I emailed the team to advertise the date and time of the training and asked if any of them would like to bring a case study forward which could be reflected in the last half an hour. No case study was suggested before the day.

Because our staff team comprised highly specialist professionals, many received their initial training at least 15 years ago. FNSD and its management is still an emerging area of research, with the involvement of neurology and neurological rehabilitation only since around the Millennium. A constructivist teaching approach was adopted, which acknowledges that the teacher only facilitates learning, and new knowledge and experience is incorporated into existing knowledge and experience, which this mainly senior and experienced audience has a wealth of.

Deliver such training programmes

I discussed giving a presentation as part of the centre's 6-weekly education programme when internal or external lecturers deliver training to the whole team for an hour and a half. My previous experience in teaching and training was limited: I had participated in co-presentations but I had never delivered teaching on my own. Initially, I delivered the seminar on FNSD to a small sub-group of the team, two clinical psychologists (one being my workplace supervisor), a social worker and an occupational therapist. Their feedback was very useful in adjusting the delivery of

my future seminars. It was agreed that there was a great deal of information within the slides and it was suggested to reduce the burden by creating extra slides. After, this first seminar, I felt better prepared for the following seminars that I facilitated. I delivered a second seminar to three professions (two physiotherapists, three occupational therapists and one speech and language therapist). I was approached after the second lecture to deliver another hour-long presentation to two rehabilitation assistants, a student OT and a physiotherapist who had been on sick-leave at the time of the education session. The third presentation was slightly altered as the group included rehabilitation assistants who have not had the academic training of the other professions, and the presentation was limited to just one hour. I therefore decided to only describe functional symptoms using the Cognitive Behavioural Model and remove the slide on the Common-Sense Model. I also included an explicit mention of the role of rehabilitation assistants within the treating team – as all members need to foster the trusting environment necessary for people with FNSD.

In all there were three training sessions, two 15 days apart in November 2016 and one in March 2017, and the content of each presentation was developed to suit the audience and the allocated time.

To encourage the learner (in this case, fellow health professional) to be an active contributor, I decided to involve them from the start in sharing their anxiety about this patient group. Some of the team revealed that they were not even sure if they had treated people with FNSD, as a straightforward diagnosis is rarely made by neurologists. Some also expressed concern about the sub-group of people who present with post-concussion syndrome and queried their inclusion in functional syndromes. This illustrates the problem of nomenclature and nosology that is still not resolved within this field but should be clarified by the publication of the International Classification of Diseases – 11 which is due for publication in 2018.

Kaufman (2003) discusses how, in a constructivist view of facilitating learning, it is important for the teacher to expose the learners' inconsistencies in their current understanding and then engage them to learn in an active, experiential way.

Creating a cognitive dissonance with their existing understanding of FNSD aetiology was important as this would allow for new information to be assimilated in a more coherent way.

The presentation began by discussing how uncomfortable dealing with people with FNSD can be - a flip-chart was used to write down what the team thought when faced with functional clients, and comments ranged from “heart-sink” to “challenging”.

Adult learners are motivated to learn when they feel they can express themselves in a safe place, diagnose their own learning needs and evaluate their own learning (Kaufman, 2003). The information presented was contextualised to real practice by looking at best management evidence and by examining the role the centre could have in becoming more confident in their expertise in this field. I tried to involve most of the professions: I attempted to examine research about how people with FNSD’s families influence outcome, to include the social worker who has responsibility for supporting the loved ones of people receiving rehabilitation, but I unfortunately had to highlight the lack of evidence in family work in this area. The roles of physiotherapy, occupational therapy and psychology were clarified, and the role of rehabilitation assistants was included in the third presentation. Discussion was encouraged by making time between slides, in the second lecture for instance a speech and language therapist recounted her experience of functional dysphonia.

Treatment for FNSD involves behaviour change, particularly boom-and-bust behaviour, and requires commitment and self-efficacy on the part of client and therapist. Self-efficacy theory (Bandura, 1986) posits that if people feel they have succeeded in a task (in this case treating a person with functional neurological symptoms) they will feel more confident in repeating it. The success rate in FNSD treatment is low, around one in four severely affected will improve (Stone, 2010) and the literature on management is scarce, however there is increasing acceptance that multi-disciplinary interventions involving at minimum physiotherapy and psychology increase patient engagement and promote better functioning. A successful case study was included in the presentation to reinforce the message that as a team we were already making a difference to people with FNSD.

It was also emphasised that the centre and its staff were ideally placed to provide a service for this population both as a core service and as private providers, further increasing self-efficacy.

A PowerPoint presentation was used as an effective way to communicate; colourful and animated text, vivid images and linear models were used to aid learning. Kosslyn et al (2012) describe eight cognitive communication principles, two of which, discriminability and salience of the visual information, are increased by colour and movement. Clear labelling of graphs and time to process the information also aids learning. With the first group, handouts were distributed at the outset, but it was noticeable that people spent a lot of time writing and reading them. In subsequent presentations, the slides were later emailed to the attendees, which also minimised paper wastage.

Reflexivity:

The training was delivered using the main meeting room, and on each occasion the audience sat around the central table and I presented from my chair at right angles to them and the screen. I used my own laptop connected to the projector, which being familiar, lessened my anxiety. I had also asked for help in the lunch hour the day before the first presentation to ensure I was competent with the technology.

I used cognitive behavioural skills (Williams & Chellingsworth, 2010) on myself – I rationalised unhelpful, catastrophic thinking; I also used reframing – my somatised anxiety about presenting “became” the expression of my excitement at delivering a learning opportunity to familiar colleagues who wanted to share in my passion for developing an effective treatment for this distressed client group!

The information about FNSD is highly complex and time to explain the slides was limited, but I was aware that I occasionally included too much data to process easily on slides, in the hope that slides would be revisited in the attendee’s own time. In future I would create two documents, one with the slides and another with the

additional material and reading suggestions, which would retain the clarity of the presentation

Plan and implement assessment procedures for such training programmes.

The training programme was evaluated by the questionnaires that every attendee completed before and after the presentations, asking them to rate their level of understanding of FNSD and their confidence in treating people with FNSD, both before and after each presentation (appendices 3 and 4).

Unit 4.4 Evaluate such training programmes

All groups reported having greater understanding of FNSD and more confidence in treating this client group after the presentations (understanding increased by 48% in group 1, by 20% in group 2 and by 45% in group 3. treatment confidence increased by 75%, 9% and 50% in groups 1,2 and 3 respectively). It is interesting to note that the second group included a senior physiotherapist who reported being less confident and having less understanding after the presentation. She wrote on her initial rating "I may be confident but not happy working with people with FNSD" and her post-presentation rating was lower than at the beginning. She has since asked for some one-to-one teaching in FNSD. More importantly, the seminars fostered ongoing discussions about presentation and management, including how to support people with FNSD in receiving benefits, or returning to work, and how to market the interdisciplinary team as experts in FNSD rehabilitation. However, this was a very general overview of a very complex area, and further sessions on specific sub-groups of FNSD such as post-concussion syndrome including further case reflection would increase competency within the team.

Repeating and refining these presentations and answering questions from different viewpoints has helped me consolidate my knowledge and developed my ability to focus on the more salient points. I hope that I have stimulated a discussion within the team about both the need to develop our management skills for FNSD clients, and for the role of Health Psychology within that team.

1998 words

References

Bandura, A. (1986). The explanatory and predictive scope of self-efficacy theory. *Journal of social and clinical psychology, 4*(3), 359-373.

Kaufman, D. M. (2003). ABC of learning and teaching in medicine: Applying educational theory in practice. *Bmj, 326*(7382), 213.

Kosslyn, S. M., Kievit, R. A., Russell, A. G., & Shepard, J. M. (2012). PowerPoint® presentation flaws and failures: a psychological analysis. *Frontiers in psychology, 3*.

Hauer, J., & Quill, T. (2011). Educational needs assessment, development of learning objectives, and choosing a teaching approach. *Journal of palliative medicine, 14*(4), 503-508.

Stone, J. (2009). Functional symptoms in neurology THE BARE ESSENTIALS. *Practical neurology, 9*(3), 179-189.

Williams, C., & Chellingsworth, M. (2010). *CBT: A clinician's guide to using the Five Areas approach*. CRC Press.

Appendix C1. Teaching and Training I

Teaching plan for professionals.

1. Acknowledge this topic is controversial and difficult – perhaps provoking an emotional response.
2. Explain difficulty in nomenclature (but be prepared to not be definite.)
3. Answer the questions.
4. Involve the audience: words used by staff members themselves
5. Some history of how FNSD is now managed by neurology.
6. Involve all main professions
7. Use a successful case study to underline that we already have a lot of the skills needed to manage these cases.
8. Look at how the centre fits into national guidelines on treating FNSD

Appendix C2

FUNCTIONAL NEUROLOGICAL SYMPTOMS DISORDER

Wednesday 3rd November 2016

Please complete this side of the sheet before the presentation begins.

1. How confident are you that you understand Functional Neurological Symptom Disorder (FNSD)?

1	2	3	4	5
not at all				very confident

2. How confident are you in your practice with people with FNSD?

1	2	3	4	5
not at all				very confident

NOTES

At the end of the presentation, please turn over and complete the form.

Appendix C3

Subjective ratings of understanding and treatment confidence

<i>Mean understanding pre-presentation</i>	<i>Mean understanding post-presentation</i>	<i>Mean treatment confidence pre-presentation</i>	<i>Mean treatment confidence post-presentation</i>
All three presentations: (n=15)			
2.8	3.8	2.5	3.4
Presentation 1 (n=4)			
2.7	4.0	2.0	3.5
Presentation 2 (n=6)			
3.4	4.1	3.3	3.6
Presentation 3 (n=5)			
2.2	3.2	2.0	3.0

Case Study: Teaching and Training Part II – General Public

A Lecture on Functional Symptoms (Medically Unexplained Symptoms) to MSc Students

Background

In 2016 I was invited to give a guest lecture on “Medically Unexplained Symptoms” (MUS) for Health Psychology MSc students as part of the module Understanding and Managing Long-term Conditions. I have completed a systematic review on the role of Illness Perceptions in Functional Neurological Symptom Disorder (FNSD) and a case study, and I work clinically with people with FNSD as a Trainee Health Psychologist. I have also read extensively about models that may explain the aetiology and potential therapy targets of MUS.

Plan and design training programmes that enable students to learn about psychological knowledge, skills, and practices.

The module leader had emailed me some feedback from a Staff and Student Liaison Committee meeting where the students requested that lectures incorporate real-life cases, with qualitative narratives and quantitative data, and opportunities for group exercises. The importance of cultural context was also mentioned because of their own diverse backgrounds.

This follows one of Kaufman’s (2003) principles – that real-life problems are best for engaging adult learners. I researched what Health Psychology theory had been covered in previous lectures, so that mentioning the Common-Sense Model would not be a new concept in an already complex subject area.

The first half of the lecture’s focus was a biopsychosocial explanation for functional or persistent physical symptoms, including the controversial and emotive debate around aetiology, and incorporating a generic Cognitive Behavioural Model (Deary et al, 2007), the Common-Sense Model (Leventhal et al, 2016; Cameron & Jago, 2008), and research evidence from Irritable Bowel and Chronic Fatigue Syndromes.

The second half on FNSD examined in greater depth how factors contribute to symptomology, and a case study of a successful multi-disciplinary rehabilitation of an anonymised client with FNSD.

Two group exercises were incorporated within each half of the lecture, to break up any passivity and promote active learning (Hauer & Quill, 2011). Cultural differences in attitudes and management of functional disorders was also included in the presentation, in line with the learner-centred teaching model (Dennick & Exley, 2004) where the students' own experiences are valued.

Equipment needs were ascertained with the module leader who provided a flip chart and pens, and the maximum attendance confirmed as 14. Slides were prepared for projection with Powerpoint and handouts (Appendix 1) were later put on the University intranet.

Reflection:

I had only limited presentation experience at my workplace. I used my cognitive behavioural therapy skills to reframe my anxiety symptoms as excitement, and to reduce catastrophic thinking by rationalising and thoroughly preparing for as many eventualities as possible.

Deliver such training programmes

I arrived early to ensure familiarity with the room and technology. I tried to reduce my anxiety about delivering my lecture by having a water bottle and running order (Appendix 2) to hand, and by stretching while the room was empty.

Seven students out of a possible 14 attended – and two of these were 20 minutes late. This was disruptive and concerning, as they missed my personal introduction and discussion about the potential controversy and emotional nature of this illness.

During the break, I ensured that I spoke to every member of the group – no one worked in a clinical setting and only three appeared very engaged with Health

Psychology theory and practice. The latecomers revealed that they felt distanced by the way other group members dominated discussions every week.

The two participants who sat directly in front of me were the most knowledgeable, one revealing that they had severe symptoms that involved many interactions with medical staff who had not been able to give them either a satisfactory diagnosis or treatment. This student appeared to be highly critical of the stance of the lecture - I repeated the complexity and controversy surrounding the diagnosis and treatment and asked them to be open to a biopsychosocial explanation.

Reflection:

It was challenging to include the quieter group members, and I perhaps did not give them enough time, nor did I draw them into conversations enough. With hindsight, I would separate the two dominant members in both group exercises to increase engagement and I should have included a reversal of the task in exercise 1 giving all the students a chance to experience both perspectives. Neither exercise felt very successful, and I should not have assumed that the students had clinical experience as in my own MSc cohort. I did feel that I engaged with the more active students: people with FNSD have been shown to be defensive and frustrated by the inclusion of psychological causation in their symptoms (Stone et al, 2010) but biological evidence helped make my lecture more acceptable. I also described another case, to emphasis my empathy for the distress of people with functional symptoms.

Plan and implement assessment procedures for such training programmes

This lecture was part of the MSc in Health Psychology, and my role was to introduce an emerging area of health research and practice to potential Health Psychologists. I hoped to stimulate their interest but it was not my role to formally assess the students' learning outcomes.

Evaluate such training programmes

A student feedback form (Appendix 3) was designed to evaluate how useful the students found the lecture, the content and group exercises, the amount of time allowed for questions and open-ended questions asking for suggestions.

The students' feedback (Appendix 4) and personal conversations revealed that the majority found the subject stimulating. The mean ratings for usefulness, delivery and time for questions were over 8 out of 10 and for the group exercises, 6.9. One person's feedback was negative, rating the group exercises and question time at 2 out of 10, and stating a lack of encouragement for group discussion. Having overcome the initial feelings of failure, I feel this generated useful reflection on how to improve further teaching sessions: I had found it difficult to include the quieter members and in future I would make more effort to scan the audience.

999 words

References:

- Cameron, L. D., & Jago, L. (2008). Emotion regulation interventions: A common-sense model approach. *British Journal of Health Psychology*, *13*(2), 215-221.
- Deary, V., Chalder, T., & Sharpe, M. (2007). The cognitive behavioural model of medically unexplained symptoms: a theoretical and empirical review. *Clinical psychology review*, *27*(7), 781-797.
- Dennick, R., & Exley, K. (2004). *Small group teaching: Tutorials, seminars and beyond*. Routledge.
- Kaufman, D. M. (2003). ABC of learning and teaching in medicine: Applying educational theory in practice. *Bmj*, *326*(7382), 213.
- Leventhal, H., Phillips, L. A., & Burns, E. (2016). The Common-Sense Model of Self-Regulation (CSM): A dynamic framework for understanding illness self-management. *Journal of behavioral medicine*, *39*(6), 935-946.
- Stone, J., Warlow, C., & Sharpe, M. (2010). The symptom of functional weakness: a controlled study of 107 patients. *Brain*, *133*(5), 1537-1551.

Appendix C4

Supervisor's feedback on teaching

Date of the Lecture: 23.02.2017

Title of the lecture: Functional Symptoms (Medical Unexplained Symptoms)

Lecturer: Anne Coxon

Observer: Dr Angeliki Bogosian

Attendees: 7 MSc Health Psychology students

Anne delivered a very engaging and informative lecture on medically unexplained symptoms. The lecture was very interactive, but Anne could have assessed students' understanding more regularly throughout the lecture. Anne did a good job giving clinical examples from her work and linking her examples with the theoretical models she was presenting. The biopsychosocial model to explain functional symptoms were described concisely and accurately. The information given was up-to-date. She used a mix of different teaching modalities, i.e. slides, group activities, reflections to facilitate learning. The slides were at times busy with text. Using 3-4 bullet points with 3-5 words in each bullet point in each slide, adding more pictures and diagrams could have made them easier to read during the lecture. However, Anne talked around the slides well and presented everything that was on the slides. Only two slides could have been explained better. The slide on emotional stimuli and alexithymia could have been explained further since the constructs presented are not commonly used in health psychology. The slide with the compassionate scale needed more explaining, i.e. that lower scores meant more compassion otherwise it did not make sense. The case study presented in the second half of the lecture facilitated learning and linked the theoretical models presented earlier with a real life example. The group activity after the case presentation facilitated student engagement, but it could have been better to allow more time for discussion with the students and also find ways to engage the students who remained silent during the lecture. Even though, I understand why students' questions when they referred to part of the lecture that would come later on in the presentation, were not addressed. It might have helped to increase students' participation if diversions of

the content were allowed. Sometimes discussion that arises from questions can be used as an opportunity to make teaching points. Usually, students remember better when teaching emerges from their queries and arrive at the realisation rather than listening to a lecture. Anne was professional and friendly during the session and managed to put everyone at ease. Overall, I found the lecture very informative and I was impressed with how knowledgeable Anne is.

Case Study: Consultancy

A systematic review of the inclusion of people with severe mental illness in trials of structured educational interventions for self-management of type 2 diabetes mellitus

Assessment of requests for consultancy

The initial request for consultancy came from a member of the postgraduate teaching staff who is also part of a team of two Research Fellows at City, University of London, partly funded by the East London Foundation Trust, to develop research into long-term health conditions. She offered a selection of possible consultancy projects to Trainee Health Psychologists who are required to demonstrate competency as a consultant working in a relevant area.

The project that was of interest to me was described as assisting in a systematic review of the literature examining the inclusion of people with Severe Mental Illness (SMI) trials of type 2 diabetes mellitus (T2DM) self-management interventions. People with SMI are at a higher risk of developing T2DM partly because of their medication and lifestyle (Osborn et al, 2008). I am interested in how people self-manage long-term conditions and I was beginning to plan undertaking my own systematic review requirement for my Doctorate, and I thought that this would provide me with good database training. I was also keen to have the opportunity of working with an established research team and to be a co-author on any resulting publication. I discussed the potential project with my supervisor and applied to be considered for the consultancy.

This consultancy was based on Schein's (1978) Expert Model of Consultancy, with the client retaining control and guiding the consultant towards the tasks that need undertaking. During the initial meeting between the clients and the consultant, the outline of the project was discussed. The goal of the project was to look for evidence that people with SMI were not being included in diabetes education trials, which

would result in a guidance informing interventions specifically aimed at this vulnerable population. McKibben et al (2006) had shown that older people with schizophrenia and T2DM could benefit from a tailored self-management intervention, but this study appeared to be unique. It was hoped that the proposed systematic review would lead to funding for a larger study that would address this health service deficit. However, as no budget was available for the systematic review, the clients were looking for someone to undertake this work without payment as part of their doctoral studies, and who in return would benefit from working collaboratively with an experienced team and being named as a co-author on any resulting paper.

The clients explained that some of the searchings had already been completed and uploaded to a Refman database by an A-level student undertaking work experience. There was now need to assess the abstracts of 1245 studies for eligibility in the final review of inclusion of people with SMI. If the study was not explicit in stating the inclusion or exclusion criteria, the consultant was to contact the author by email and request more details. A protocol of the review had already been written by the clients and was emailed to the consultant following the initial meeting, to enable a contract to be drawn up. The final contract was signed by the consultant and clients on 2nd March 2015 (see Appendix 1).

It became evident at the second meeting held with the clients that the software package, Refman, on which the database was stored, was not compatible with my MacBook. I had to arrange to borrow another laptop on which to download the software and the database files. Having done this, it then became clear that this software was not supported by City University and there were no tutorials available from the library staff. However, I was able to gain some training from an experienced colleague at my workplace.

Reflection:

My lack of Information Technology experience became apparent both with the unfamiliar database software and use of online file sharing. It was very confidence

lowering – and I felt unprofessional having to admit that I did not understand some of the technological terms or how to upload data – but the university help desk staff were very good at explaining the methodology of file sharing. I have since become more familiar with all the available online tools, I enrolled in a database tutorial session and attended a one-to-one session at the university library to increase my IT competency. More importantly, I have learned to accept that requesting assistance early on is a more efficient way of working collaboratively.

Plan consultancy

A protocol for the systematic review had already been written by the clients and was emailed to me to aid planning. This systematic review was not going to follow all the accepted research stages (Moher et al, 2010); for instance, the emphasis was not on examining the quality of the papers that would be included in the review, but to obtain the percentage of study participants who had a diagnosis of SMI. Further definition of terms like SMI was necessary. Although the protocol contained some of the criteria determining whether studies were eligible for the review (eg population), more detail was required in order to filter the studies and further exclusion categories were added as filtering progressed.

Aims:

1. To demonstrate the level of inclusivity of people with SMI in trials of structured education for self-management of Type 2 Diabetes Mellitus.
2. To publish a relevant paper in a peer-reviewed journal.

Objectives:

1. Filter 1245 abstracts (already uploaded to Refman database).
2. Filter the full-text articles of the papers remaining from the first step.
3. Tabulate the included papers into exclusion or inclusion of people with SMI.
4. Contact authors of papers where it was not specified if people with SMI were included or excluded.

5. Collate the data to demonstrate the level of inclusion of people with SMI in trials of self-management interventions for people with Type 2 Diabetes Mellitus.

The time frame agreed was 5 months, with an estimate of 30 hours for the first objective, and 65 hours in total for objectives 2-5. I estimated this by piloting (categorizing a few abstracts as eligible or not for the systematic review) and also through a direct enquiry to the clients as to how feasible the time scale was. I had completed a restricted systematic review as part of my Masters (MSc) level of the Health Psychology Stage 1 training some years previously, and so had limited experience of undertaking a task of this size.

Schein (1979) describes the Expert Model of Consultation where the client retains control and effectively purchases the services of the consultant to undertake a piece of work using specific skills to solve the problem. (This is in contrast to the Doctor-Patient Model where the consultant is required to diagnose the problem). In this project, the clients “purchased” the consultant’s willingness to learn and expand their knowledge base, their existing research skills and their time commitment to fulfilling the doctoral requirements. Schein identifies that for this model to be successful the client must have made a correct diagnosis of their own problem, has to have correctly identified the ability of the consultant to solve the problem, and has to have correctly communicated the problem. Schein also emphasizes that the client must be committed to using the consultant’s help, as the end product must be both achievable and desirable.

Where the problem is more complex, Schein (1978) proposes the Process Consultation Model - the client retains control but the consultant is involved in the process of diagnosing and solving the problem. In this case, the client and consultant worked together on how best to obtain the missing abstracts, full papers and updated author emails, how to categorise the abstracts, what data extraction was feasible within the time constraints, and finally, how to write up the results. As

outlined in the PRISMA guidelines (Moher et al, 2010), one of the clients acted as the second reviewer for the full papers.

Reflection

Both the clients and I believed that the abstracts and the full papers had already been accessed and were readily available. However, it did not become apparent until later that many were missing and considerable time would be needed to obtain this data. Schein talks about accessing your ignorance –

“You cannot determine what is the current reality if you do not get in touch with what you don't know about the situation and have the wisdom and the courage to ask about it.” (page 7, Schein 1997).

This was something I struggled with throughout the project – it was not easy to determine which skills I was expected to have, and which I needed to develop further.

Establish, develop and maintain working relationships with clients

As so much of this project was collaborative, close working ties between the clients and the consultant were essential. The consultant lives and works 100 miles from the clients' base, so physical meetings were limited, totalling 9 throughout the 19 months of consultancy. However, there were 2 telephone meetings and 12 emailed progress reports (examples in appendices 2 and 3), shared database files with both parties having access on line, and final paper revisions which were easily discussed by email.

As the clients were not budgeted to complete this work, they had limited time to respond to queries and collaborate with problem-solving. One of the clients was on maternity leave for much of the project, and there were inevitable gaps in access to the other client because of annual leave. However, the overall contact between the clients and consultant was good.

Reflection

I felt I had a good working relationship with the client who was not on maternity leave, and with whom I had most contact. As the contract revision in August 2015 required, she provided supervision in guiding me throughout the processes of filtering the data, and was able to access interlibrary loans and update emails for authors when required. It felt frustrating at times when certain tasks were added to my workload, for instance having to search for 20% of the 1245 abstracts and 47% of the 585 full text papers, and when a table of results was later added to the online journal submission. However, I felt we developed enough of a trusting relationship that they would support me to finish the task.

Conduct consultancy

Meetings between the consultant and the clients were used to discuss studies that were difficult to categorise, for instance defining the term self-management, and discussing US studies where Diabetes was rarely defined as Type 2. There continued to be exclusion changes throughout the main screening – for instance pilot studies were only included in the review in September 2015 following a discussion. In April 2016 it became clear that one of the exclusion criterion (studies that only had participants with SMI) was not what the clients had intended and needed reviewing, which led to screening another seven papers and including one of them in the review. At the meetings, the clients had the experience of having conducted both systematic and Cochrane reviews, whilst the consultant had more detailed knowledge of the studies being included in this review, and brought the queries to the table. This fits well with the process consultation model – the consultant is the facilitator and the client provides the relevant expertise (Schein 1990).

Reflection:

The clients were at all times respectful of my points of view, but ultimately there was always an awareness that they retained the expert role in this project. They were always supportive and showed understanding of my work load.

Monitor the process of consultancy

I maintained a diary that recorded the project's progress and also recorded the hours of work involved. Despite the time-consuming nature of producing a systematic review, there is a lot of pressure to finish as soon as possible: if there is too long a gap between searching the literature and completion, newly published research could render the work obsolete.

The original contract had stated that the project was to be completed by the beginning of August 2015. By July it became clear that the estimated time involved (95 hours) had already been exceeded by 100%. I was under pressure to complete other doctoral projects, as well as working at my voluntary placement. I decided that too much had already been invested in the consultancy project to stop, and at the next progress meeting with the client, I proposed that time spent on the consultancy after August 1st 2015 should be considered as supervised practice and go towards that requirement of the doctoral studies. I had already obtained my academic supervisor's agreement, and I was keen to complete this task and publish the paper. A revision to the original contract was drawn up and agreed by the clients (see Appendix 4).

Factors that were identified as causing major delays in producing the review were missing abstracts, missing full papers and waiting for email responses to author enquiries. In order to speed up the process, I identified two solutions: the first was to spend more time on the consultancy project. In January 2016 I proposed taking annual leave from my workplace to increase the number of days that could count towards supervised practice. Secondly, the amount of data extraction was streamlined: the clients had requested that I collect demographic data about the participants in all the included studies (age, race and gender). This proved to be very time consuming; the heterogeneity of the papers' publication meant that this information was not always in the results section and could not be easily copied and pasted into the spreadsheet. I suggested that it would be more efficient to concentrate on including the participants' mental health co-morbidity information,

in order to fulfil the objective of the review. The clients confirmed their agreement to both these proposals.

Reflection:

Time pressure provoked a lot of anxiety in me. I was eager to complete one of the competencies of my doctorate, whilst working 4 days a week in a clinical setting. At the same time, I completed my own systematic review, using different database software, and the total amount of information processing often felt overwhelming. Knowing that the time spent on this project was contributing to my total supervised practice for my doctorate was encouraging (Appendix 5). My motivation to finish was to be able to publish a completed paper which I hope will contribute to reversing the inequality in health care faced by people with SMI, but the process was often uncomfortable.

Evaluate the impact of the consultancy

Appelbaum and Steed (2003) suggest that the consultant and the clients are jointly accountable for the result of the project. They propose that successful consulting engagements include consultancy competency, clear expectations, consultant flexibility to client needs, partnership between consultant and client, and inclusion of the consultant from the start of the project. The latter was not possible in this project as some of the work had already been put in place, including the basic database, and whilst the level of consultant competency and expectations were not very clear at the start of the project, there was good flexibility on both sides as obstacles occurred because of the good communication that was fostered between the consultant and the clients.

The clients completed a simple questionnaire (see Appendix 6) which asked them to evaluate the consultant's input to the project, and they replied very positively. The resulting short report on the review (the main objective of the consultancy), was submitted to the British Journal of Psychiatry, with a view to reach the readership most likely to be responsible for the health of people with SMI and T2DM. However, after rejection from this very competitive journal, and feedback from the

reviewers, the clients encouraged me to rewrite the paper looking at the inclusion (rather than exclusion) of people with SMI in T2DM and to submit this article to BioMed Central Psychiatry (Coxon et al, submitted June 2017).

Unfortunately, this revised paper was also rejected,

Reflection

Being rejected by a journal for the first time can feel personally wounding and I was glad to be guided towards rewriting and resubmission by the more experienced clients. This extended an already lengthy consultation period, and at times I often doubted my ability to complete this work. I have learnt that much more questioning at the initial preparation stage would have allowed me to better assess the scope of this task. However, it was a very good opportunity to work collaboratively within a team of experienced researchers who were generous with their time, knowledge and patience. I now feel more competent in conducting a research project, better able to identify my own learning needs, and more confident in negotiating future consultancies.

2787 words

References

Appelbaum, S. H., & Steed, A. J. (2005). The critical success factors in the client-consulting relationship. *Journal of management development*, 24(1), 68-93.

Coxon, A., McBain, H., Mulligan, K. (submitted June 2017, under review) Inclusion of adults with severe mental illness in trials of type 2 diabetes in self-management education programmes: a systematic review. *BioMed Central Psychiatry*.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group. (2010). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *International journal of surgery*, 8(5), 336-341.

Osborn DP, Wright CA, Levy G, King MB, Deo R, Nazareth I. Relative risk of diabetes, dyslipidaemia, hypertension and the metabolic syndrome in people with severe mental illnesses: systematic review and metaanalysis. *BMC psychiatry*. 2008 Sep 25;8(1):1.

Schein, E. H. (1978). The role of the consultant: content expert or process facilitator? *The Personnel and Guidance Journal*, 56(7), 22-26.

Schein, E. H. (1997). The concept of "client" from a process consultation perspective: A guide for change agents. *Journal of Organizational Change Management*, 10(3), 202-216.

Accessed 13th October 2016: <http://dspace.mit.edu/bitstream/handle/1721.1/2647/SWP-3946-36987393.pdf>

Schein, E. H. (1999). *Process consultation revisited: Building the helping relationship*. Reading, MA: Addison-Wesley.

Appendix C5. Consultancy contract

CONSULTANCY CONTRACT

This Consultant Agreement is made and effective from 2nd March 2015

BETWEEN: Anne Coxon, Trainee Health Psychologist at City University
London (the “Consultant”)

AND: Dr Kathleen Mulligan, Senior Research Fellow and Dr Hayley
McBain, Research Fellow at City University London (the Client).

The Consultant has been asked to assist with a project that involves contributing to a systematic review of the literature examining the inclusion of people with severe mental illness (SMI) in self-management interventions for people with type 2 diabetes.

The parties hereto agree as follows:

1. Consultation services:

The consultancy involves delivery of the following:

1. Filter approximately 1245 abstracts describing trials of diabetes self-management interventions already identified are appropriate for inclusion in the review.
2. Filter full text articles of the papers remaining from first step 1 of the consultancy.
3. Tabulation of the included papers according to whether they exclude or include people with severe mental illness.

4. Making contact with the authors of papers if people with severe mental illness are not specified in the article, to ascertain whether they were included in the study.
5. Collation of the data to demonstrate the level of inclusion of people with severe mental illness in trials of self-management interventions for people with type 2 diabetes.

2. Terms of agreement

This agreement will begin on 2nd March 2015 and end on 1st August 2015 or upon the completion of the agreed deliverables if sooner. Either party may cancel this agreement on 7 days' notice to the other party in writing.

3. Resources

The consultant will not receive payment for their services. The client will ensure that the consultant is equipped to conduct the project effectively. The consultant will be named as a co-author on any publication of this work.

4. Time devoted by consultant and contact arrangements

The following time is anticipated:

- Deliverable 1 - filtering abstracts - approximately 30 hours, and will be delivered by the end of April 2015.
- Deliverables 2, 3, 4 and 5 are estimated to take 65 hours and will be delivered by the end of July 2015.

The consultant will communicate regularly with the client via email and monthly face-to-face meetings to review the progress of the consultancy and deliverables.

5. Changes to the contract

Changes to the deliverables and timeline of this contract may be undertaken if necessary with agreement from both parties.

6. Disputes

If any controversy, dispute or claim arises between the parties with respect to this agreement, the parties will make good faith efforts to resolve such disputes informally.

7. Signatures

Consultant Name:

Mrs Anne Coxon

Consultant Signature:

Client Name:

Dr Hayley McBain

Client Signature:

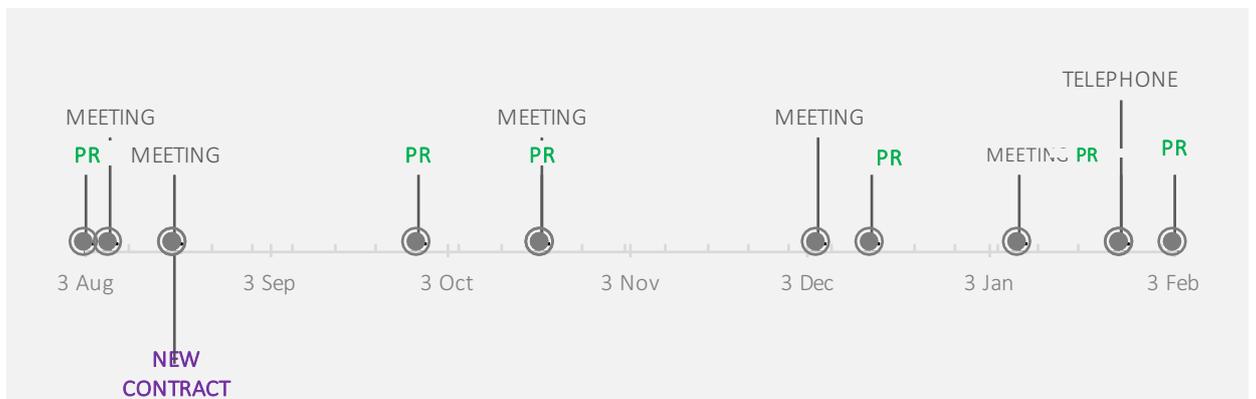
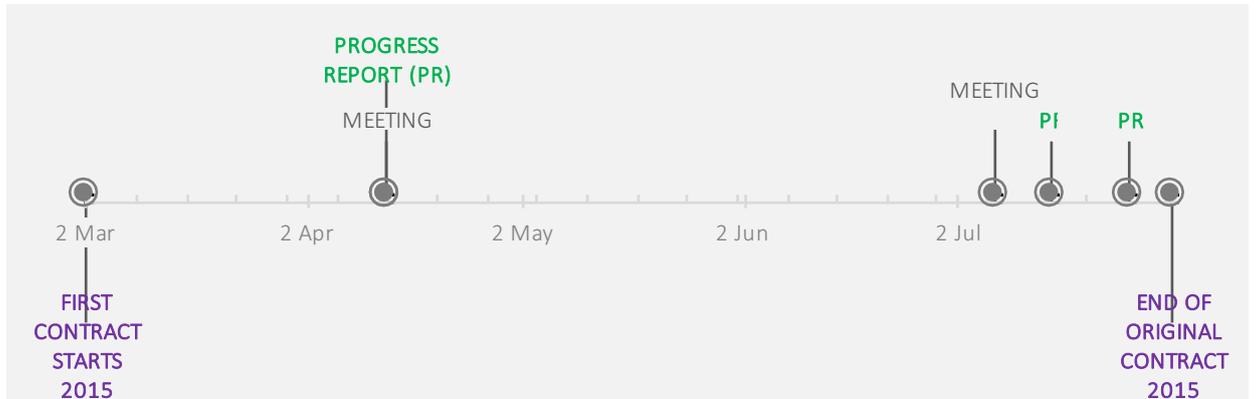
Client Name:

Dr Kathleen Mulligan

Client Signature:

Appendix C6

TABLE 1. Timeline of Consultancy project.



PR = Progress Report by email

Appendix C7 Examples of Progress Reports

PROGRESS REPORT ON CONSULTANCY 18th October 2015

Anne Coxon for
Dr Kathleen Mulligan
Dr Hayley McBain

1. Missing full text papers – total 1 –

6974	King, AB Wrong paper originally d/loaded	Evaluation of a patient education booklet (SIMPLESTART) effect on postprandial glucose control in type 2 diabetes	Not on Researchgate	Diabetes Technol Ther. 2007 Jun;9(3):241-5
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2. Full text papers

Originally 581 references identified by abstract and by title to need full text screening. Then 4 pilots identified as RCTs so included. So now total is **585**.

Database name in Reference Manager, New Folder	No of references
Incl excl_ftextscreenneededAC	347
Incl excl_fulltextmissingAC	1
Incl excl_ftexts_onlySMI.AC	7
Incl excl_fulltext_dupl.AC	2
Incl excl_foreignlangAC	11
Incl excl_fulltext_followupAC	31
Incl excl_fulltext_notEducAC	18
Incl excl_fulltext_notType2AC	28
Incl excl_fulltext_notRTCac	92
Incl excl_notpaperAC	48
Grand Total	585

Meeting on Monday 19th October at 11.30 at City University.

PROGRESS REPORT ON SR of SMI in T2D - 14th December 2015

Anne Coxon for
Dr Kathleen Mulligan
Dr Hayley McBain

1. Full text screening:

Please see the Excel worksheet on OneDrive for data extraction so far – 92 studies have been processed (76 have data).

RefMan changes shown below:

Database name in Reference Manager, New Folder	No of ref at October 2015	No of ref as of 14 Dec 2015
Incl excl_ftextscreenneededAC	348	255
Incl excl_ftextscompletAC		76
Incl excl_fulltextmissingAC	0	0
Incl excl_ftexts_onlySMI.AC	7	7
Incl excl_fulltext_dupl.AC	2	3
Incl excl_foreignlangAC	11	11
Incl excl_fulltext_followupAC	31	36
Incl excl_fulltext_notEducAC	18	20
Incl excl_fulltext_notType2AC	28	29
Incl excl_fulltext_notRTCac	92	97
Incl excl_notpaperAC	48	51
Grand Total	585	585

2. Time:

I have spent the following time on the SR (1 day equivalent to 7 hours)

September 2015	4 days
October 2015	2 days
November 2015	2.5 days
December 2015	5 1/3 days

As you can see, progress is slow, the full text screen and data extraction is just over ¼ done and has taken over 9 days so far. I have managed to take some extra days off work in January and should be able to give another 8 days before the end of January.

One of the most time-consuming factors in data extraction are participant age/gender/race which are often in table form and cannot be cut and pasted. Would it be feasible to not collect this any further to speed up the process?

3. Mailing authors.

I have started mailing authors. Some email addresses have already returned as unknown. Will chase on Research Gate.

Meeting Notes 18th August 2015

Anne Coxon
Dr Hayley McBain
Dr Kathleen Mulligan

At City University, London

1. Contract.

The initial consultancy contract has reached the agreed time limit, and the systematic review is not yet complete, mainly because of the number of full papers that needed to be found. It has been agreed that the consultant, Anne Coxon, will continue to work one full day a week (8 hours) on the Systematic Review until January 1st 2016 when the contract will be reviewed.

In return for this work, the Clients, Dr McBain and Dr Mulligan, will endorse that these hours are supervised hours that contribute to the total supervised hours for the Generic Competency of the Professional Doctorate in Health Psychology.

The Consultant will continue to provide progress reports and will meet with the Clients face to face on a monthly basis.

2. Work to do:

- Re-check all pilots for inclusion/exclusion
- Make up an excel sheet for the data extraction, copy and paste
 - inclusion/exclusion criteria
 - country/gender/age/race
 - study type
 - author(s) names and email
 - date of email asking for more detail

Appendix C8 Time sheet

Anne Coxon Trainee Health Psychologist

Supervised Practice:

Conducting a Systematic Review of the inclusion of people with Severe Mental Illness in trials of type II diabetes self-management education.

Time spent:

	Month	No of Days (=7 hours)
2015	September	4
	October	2
	November	2.5
	December	5.5
2016	January	8.5
	February	3
	March	1
TOTAL		26.5

Monthly email progress reports.

Face to face meetings: 19th October 2015, 10th November 2015, 14th December 2015 and 7th March 2016.

Telephone meeting: 25th January 2016.

This is to confirm that Anne Coxon, the consultant, undertook the work detailed above:

Client name: *Dr Hayley McBain*

Signature: 

Date: 26th April 2016

Client name: *Dr Kathleen Mulligan*

Signature: 

Date: 26th April 2016

Appendix C9
Consultancy Evaluation – Anne Coxon

A systematic review of the inclusion of people with severe mental illness in self-management interventions for people with type 2 diabetes.

1. Please describe your experience of working with the consultant.

My experience of working with Anne has been excellent. She has been organized and systematic in her work, has completed all tasks efficiently, communicated progress effectively and required very little supervision. It has been a pleasure to work with Anne.

2. Were all the agreed tasks described in the contract carried out?

Yes, all of the agreed tasks were completed.

3. Were the tasks carried out to the expected standard?

The tasks were carried out to an excellent standard. Anne exceeded expectations by continuing the work and drafting a manuscript for submission to an academic journal.

4. Did the consultant keep you adequately updated on progress?

We had regular meetings and Anne also provided clear progress reports on the work.

5. How could the consultant improve their practice?

Anne worked very well and I do not have any suggestions to improve her practice.

6. Would you consider employing the consultant for future projects?

Yes, I would definitely consider employing Anne for future projects.

I was very impressed with Anne's consultancy work on this project.

Best wishes,

Kathleen Mulligan

Case Study: Behaviour Change

Changing the perpetuating behaviours in Functional Neurological Symptom Disorder

INTRODUCTION

Functional Neurological Symptom Disorder (FNSD) (Conversion Disorder) describes patients who present with neurological symptoms but in whom no organic or structural changes can be found. However, the patient's functioning is severely impaired, they are distressed and concerned, and were until recently given the non-positive diagnosis of medically unexplained symptoms, without a clear prognosis or treatment plan.

Stone et al. (2010) found that 5.6% of new neurology outpatients could be classified as having Conversion Disorder. Despite this level of incidence, research into the predisposing, precipitating and perpetuating factors in the development and maintenance of FNSD, and its treatment, has been limited until recently.

People with FNSD are not feigning their motor, cognitive or communication weaknesses, and very often a physical trauma such as severe illness or injury precedes the onset of symptoms, but the consequential symptoms are excessive, and in the case of functional weakness, there are positive signs (such as distraction) that demonstrate that motor function remains intact.

Also, often present at onset is psychological trauma or overload; historically, Conversion Disorder or "hysteria" was explained as the physical manifestation of psychological distress. Recent advances in neuroscience have led to biopsychosocial explanations of how FNSD develops and is maintained (Edwards, Adams, Brown, Parees & Friston (2012) and Carson et al. (2012).

Recommended treatment for FNSD includes graded exercise and Cognitive Behavioural Therapy (Stone, J., 2011). Jon Stone states that a positive diagnosis, an

explanation of the potential reversibility of the condition and an endorsement of the patient's genuine distress and disability are the foundations of successful treatment. Treatment is rehabilitative, and follows a similar pathway to that of structural neurological events such as stroke. However, the extent of symptom reversibility is not predictable and there is probably a tendency for the patient to always be vulnerable to further episodes of FNSD.

Wilson's (2007) account of neuropsychological rehabilitation - a complex, collaborative, goal-setting pathway that addresses the cognitive, social and emotional aspects of reducing disability and achieving optimum well-being - describes the trajectory of brain-injured people. People with FNSD may also be understood by a chronic illness model of adjustment - their symptoms may have already endured for several years and their recovery may be fluctuating and uneven and by their own beliefs, unachievable. Moss-Morris (2013) proposes a working model of adjustment to chronic illness that describes the multiple contributory factors (personal, social and environmental, as well as key critical events) that lead to a disruption of emotional equilibrium and quality of life.

The pursuit of equilibrium is also central to Leventhal's Common-Sense Model (Leventhal & Diefenbach, 1991) of the parallel processes of managing a health threat (fig.1). This model can explain how a person with FNSD, who may have attentional bias to threat cues (Hou et al, 2014), and be hyper-vigilant and hypersensitive to the physical symptoms of anxiety (Dimartini et al, 2014), develops avoidant behaviours, which are both disabling and distressing.

Leventhal et al (1984) Common Sense Model

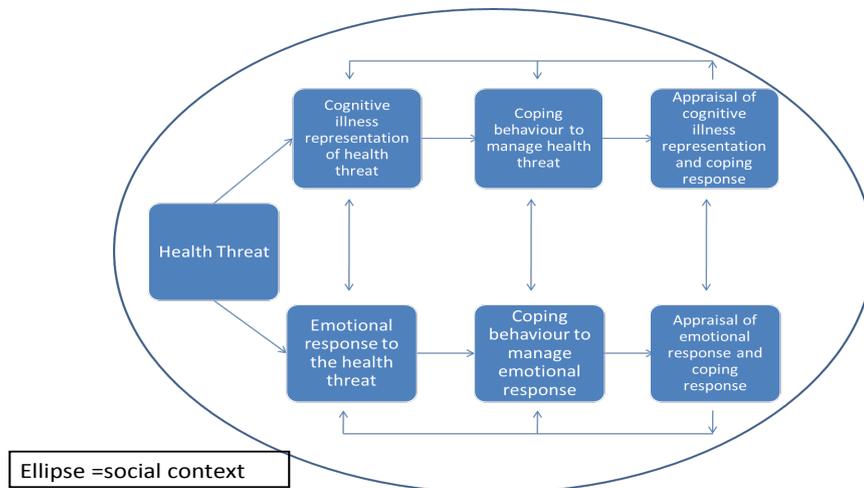


Figure 21. The Common-Sense Model of the Processes of Managing a Health Threat (Leventhal & Diefenbach, 1991)

As symptom perception is central to understanding FNSD, interventions that aim to help people with FNDS return to more productive and independent lives, and lessen their distress, should target Illness Perceptions.

Cognitive behavioural models of other functional disorders (for instance, chronic fatigue) have described the predisposition to, and perpetuation of, the symptoms as being mediated by Illness Perceptions and “boom-and-bust behaviour”, and successful interventions have focused on these. (Castell, Kazantzis, & Moss-Morris, 2011). While the trigger for the FNSD patient’s condition is not always identifiable, there are behaviours that maintain the level of disability and which are barriers to reversing the effects of the symptoms.

THE CONTEXT OF THE BEHAVIOUR CHANGE INTERVENTION

The setting: a multidisciplinary outpatient community rehabilitation centre for post-acute acquired brain injury clients. This case study was conducted according to the British Psychological Code of Ethics; all notes were retained securely; to

protect the client's confidentiality, a pseudonym has been used and some non-essential demographic characteristics have been altered. The client gave informed consent in writing.

The Case: Susan (S), aged around 40, collapsed and was admitted to hospital with stroke-like symptoms. Her husband had recently been diagnosed with aggressive cancer and she had been promoted at work a month earlier to a senior management position. For several days, she was unable to move her left side or speak. She gradually became more mobile, and communication improved by discharge two weeks later, but she and her husband remained concerned by the lack of definitive diagnosis, as all the imaging showed no structural changes. She was eventually referred to a psychiatrist who found no underlying psychopathology, and who suggested functional disorder, later confirmed by a neurologist.

About 18 months after this crisis, she used a stick for walking, reported poor memory and executive functioning and slurred speech. She avoided social contact and described extremes of activity: either being bedbound and exhausted, or chaotically working in her domestic environment and having to repeat tasks because of memory problems. Susan continued to seek help through her GP for her symptoms, and was referred to the Brain Injury Centre, in line with National Health Service recommendations for Functional Symptoms (NHS, July 2015).

Once funding for treatment was secured, Susan was assessed and treated by an inter-disciplinary team comprising a Specialist Occupational Therapist, a Speech and Language Therapist and a Specialist Physiotherapist, alongside the Psychology team. A collaborative planning meeting with Susan and her husband, identified that Susan would benefit from greater understanding of her disorder, from cognitive and physical retraining, and lifestyle changes to promote better social engagement, symptom self-management and health outcomes. A Trainee Health Psychologist, under the close supervision of a Consultant Clinical Psychologist, was assigned to assess and deliver the psychological intervention.

BASELINE ASSESSMENT

Clients with FNSD may be resistant to the idea of psychological therapy. They avoid any suggestion that their symptoms are “all in the mind” and that they can control them. Including a physiological explanation for functional conditions may help engage clients in psychological therapy (Castell, et al. 2011). The Common-sense Model was used to describe to Susan the parallel emotional and cognitive processes of dealing with any health threat.

Because Susan had revealed a great deal of self-criticism and shame about her condition at assessment, the psychology team believed that Compassion Focused Therapy (CFT) (Gilbert, (2014), a collaborative, non-judgmental, third-wave therapy that has been shown to improve psychological well-being in patients with traumatic brain injury (Ashworth, F., Gracey, F. & Gilbert, P., 2011, and Ashworth, F., Clarke, A., Jones, L., Jennings, C., & Longworth, C., 2015) would be appropriate.

Gilbert (2014) posits that the evolved brain is potentially problematic because of the conflict between primitive drives and our evolved cognitive competencies. CFT is designed to develop people’s inner compassion to improve resilience and functioning through Compassion Mind Training (CMT) – developing skills such as mindful awareness and identifying values, while at the same time using traditional CBT interventions such as graded exposure practice and reducing safety behaviours.

Barriers to following self-management of symptoms advice are not addressed in traditional patient education programmes, and exploring an individual’s beliefs and understanding is recommended before tailoring an intervention to change behaviours. (Mulligan, Steed & Newman, 2010). It was decided to use the **Brief Illness Perception Questionnaire** (Brief IPQ) (Broadbent, Petrie, Main & Weinman, 2006) to elicit Susan’s beliefs about her symptomology and disorder causation. The Brief IPQ was designed to rapidly assess in 8 simple items the main dimensions of the Illness Perception Questionnaire-Revised (IPQ-R) (Moss-Morris, Weinman, Petrie, Horne, Cameron, & Buick, 2002) as well as assessing causal perceptions. The wording of the questions was altered to reflect the biopsychosocial

nature of Susan's disorder (see appendix 1). The Brief IPQ also gave a baseline for the intervention, which aimed at altering Susan's Illness Perceptions to promote changes in behaviour, reduce her distress, manage her symptoms more effectively, and enable her to self-soothe and reduce the effect of her threat system.

The Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983) is a 14-item self-report measure, designed for people with physical health conditions, and is routinely used to assess mood at the Brain Injury Centre. The scale comprises two sub-scales measuring Anxiety and Depression with a score of 8 or higher out of 21 in either representing significant symptomology.

The Fears of Compassion Scale (FCS) (Gilbert, McEwan, Matos & Ravis, 2011) was developed to assess how resistant a person may be to showing compassion to others, showing compassion to themselves, or receiving compassion. As the Scale has no published norms, it was used for before and after intervention comparison and as an interview schedule to begin a dialogue about the client's personal meaning of compassion.

FORMULATION

Establishing a therapeutic relationship is essential to any intervention, but perhaps more so in FNSD because of the repeated perceived rejections of the validity of Susan's symptoms by clinicians, family members and colleagues. Liaising with the interdisciplinary team is also essential: Physiotherapists have traditionally been trained to regard inconsistent neurological behaviours as indications of feigning (Edwards, Stone and Nielson, 2012). Assessment comprised the first 4 sessions, as suggested by Gilbert, but was ongoing throughout treatment, building up a collaborative formulation.

Formulation – Compassion focused:

Once it was established that CFT was an appropriate approach to take with Susan, the assessment continued with an explanation of the 3 circles model and the emotional regulation system (Gilbert, 2010) and with Susan identifying that she

herself fitted into the model (see figure 2). The 3 circles provided a way of eliciting information that then contributed to a more detailed formulation that described her safety/defensive behaviours, and allowed her to express and explore the unintended consequences and self-to-self relating that became the focus of the intervention. The compassion formulation maps well onto Leventhal's Common-sense Model of health threat as well as to Moss-Morris' model of adjustment to chronic illness, which emphasizes the need to identify the historical influences on how people cope with changes to their wellbeing.

Susan was asked to complete a 3 circles template (downloaded from <http://psychology.tools/>) at home and bring it to the next session. Further exploration of her historical influences, relationships and understanding of her diagnosis continued for the next 3 sessions. A trusting therapeutic relationship developed that enabled her to share her perceived shame memories, her feelings of guilt at being unwell and the subsequent loss of job role, and her difficulties in being able to share her symptoms and diagnosis with other people.

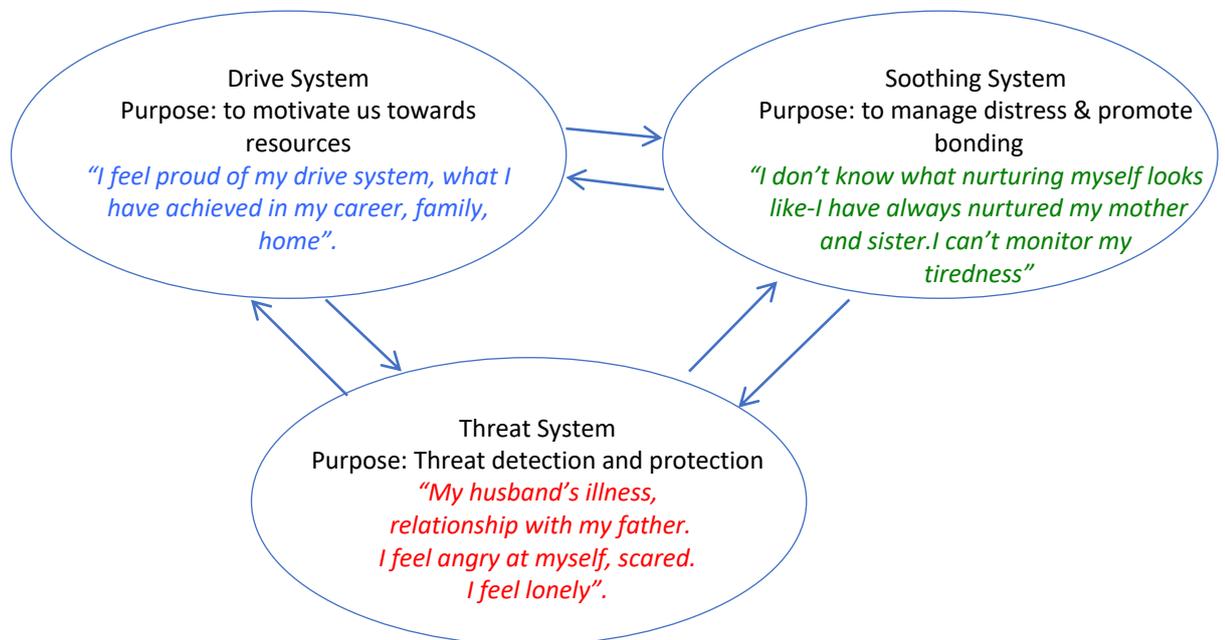


Figure 22. Emotional Regulation System (adapted from Gilbert, P. (2005))

1. Historical influences: A critical mother, who continues to be very dependent, along with Susan's sister. Her father is not reliable; dominant and very aggressive in the past and now estranged. Her husband, always "a rock", now threatened by serious illness.

2. Key fears:

External: Susan feels very sensitive to other people's perceptions.

Internal: feeling alone, exhausted with struggling to pretend to feel emotions.

3. Safety/defensive behaviours:

External: always nurturing others, focusing on other, boom and bust behaviour.

Internal: "choking" when feeling emotions. Terrified about becoming tearful, avoiding having the time to be emotional (so either busy or asleep).

4. Unintended Consequences:

External – feels used by family and friends.

Internal: identity loss – no longer the career woman, nor running the family and home.

Self-attacking: weak – reverts to safety/defensive behaviours.

OUTCOME OF ASSESSMENT AND FORMULATION

The assessment and collaborative formulation identified beliefs and behaviours that were barriers to Susan recovering from her potentially reversible symptoms.

The Brief IPQ revealed that Susan felt that she had no personal control, and only moderate faith in any treatment control. She had numerous symptoms, high concern and low coherence. She felt very angry and believed that these symptoms would continue forever. The HADS showed moderate levels of depression and normal levels of anxiety, whilst the FCS gave insight into Susan's fears of expressing compassion for others, for responding to compassion and her difficulties in expressing compassion and kindness to herself.

Information about FNSD was discussed with Susan to enable her to feel confident in

explaining her diagnosis to her husband, thus increasing her coherence about her symptoms, their biopsychosocial aetiology and potential reversibility. Her symptoms and diagnosis were validated and normalised by signposting her to the FNS website (www.neurosymptoms.org.uk) and by the team approach to her rehabilitation.

The role of the Trainee Health Psychologist in designing and planning an intervention to address the barriers to Susan's rehabilitation included explaining the formulation to the interdisciplinary team, and collaborating on therapeutic goal setting, understanding each team members' role in the delivery of interventions.

DESIGN, PLAN, IMPLEMENTATION AND DELIVERY OF INTERVENTION

The primary behaviour change identified was to stop the boom and bust cycle: Susan described a chaotic lifestyle, of not being able to sit down and relax, of not allowing herself physical pleasure (even using her shower-time to clean the tiles), not knowing what the time was and having bad days when she was unable to get out of bed. This perceived lack of ability to self-regulate her activity levels was causing her severe distress.

Motivational Interviewing (MI) techniques (Rollnick, Miller & Butler, 2008) were used to elicit which behaviours should be targeted first: activating the client's own motivation for change is one of four guiding principles of MI, and the client is more likely to commit to change if they verbalise the process themselves rather than be directed by the therapist. Susan identified that sleep disturbance was a primary issue, as was her inability to "feel emotions".

The first few sessions therefore, included exploring better sleep hygiene (reducing caffeine intake, regulating bedtimes, curtailing the use of her I-pad in the bedroom). The Occupational Therapist supported the practical changes that implemented this behaviour change, and the Physiotherapist engaged Susan in graded exercise that improved her stamina and helped regulate her body clock. At the same time, CMT was practiced to re-activate Susan's self-soothing system and reduce the safety behaviours she used to avoid situations that could trigger extreme emotional reactions, such as the feelings she experienced when her husband was first diagnosed, just before her collapse. The simple body scan and relaxation exercise

from Gilbert (2010) was practiced at every session and Susan developed her own, very rapid exhalation exercise to use when she felt overwhelmed by sensory or cognitive stress. Compassion under the Duvet, The Perfect Nurturer (Gilbert 2010), and other exercises that promoted self-compassion and encouraged thought defusion were expanded to include reattributing some of her symptomology to the physical sensations of anxiety.

Over 20 sessions in a time frame of 6 months, a variety of psychological techniques were used in cognitive, behavioural and emotional interventions (see Appendix 2 for a table of psychological intervention techniques).

OUTCOME OF BEHAVIOUR CHANGE INTERVENTION

Michie & Abraham (2004) recommend caution in measuring success of behaviour change – outcome measures should measure the targeted health outcome (not adherence per se for instance). The targeted behaviour change in this case was to stop the cycle of boom-and-bust and for Susan to gain an understanding of her symptoms, to manage her symptoms so that she could function physically and emotionally, and develop skills to prevent relapses.

The Brief IPQ has demonstrated that higher perceived consequences, identity, emotional response and concern are associated with worse psychological, social, and physical functioning, and worse health outcomes. Higher perceived control is associated with better psychological, social and physical functioning and better health outcomes and longer perceived timeline is associated with worse psychological outcomes and quality of life. (Broadbent, Wilkes, Koschwanez, Weinman, Norton and Petrie, 2015). The radar chart shows the change in each of the IPQ items:

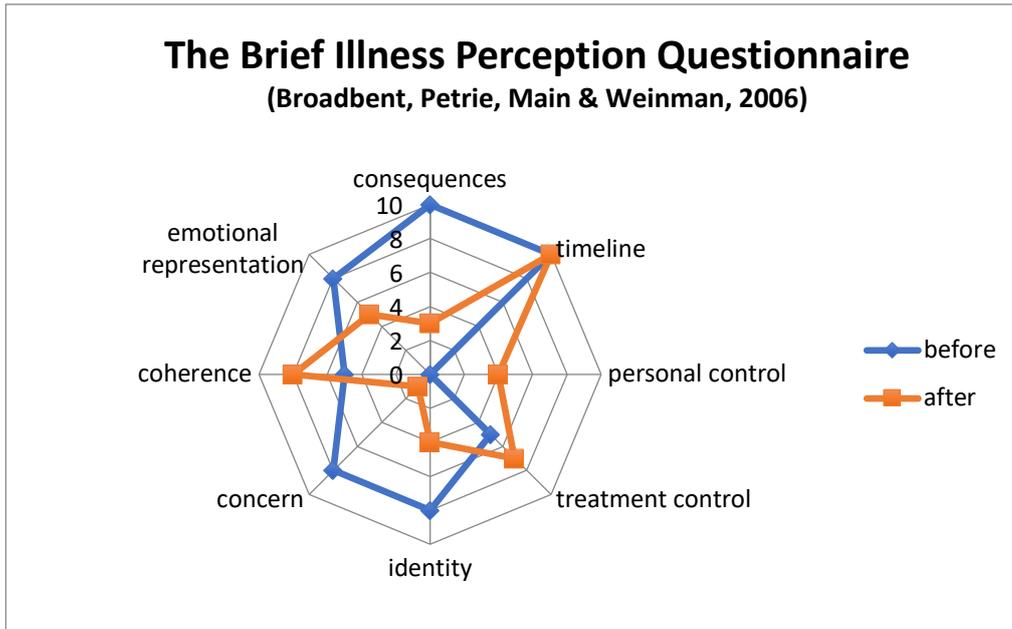


Figure 23. The Brief Illness Perception Questionnaire – before and after intervention

Changes in Susan’s self-report levels of anxiety and depression and fears of compassion can be seen in the following charts:

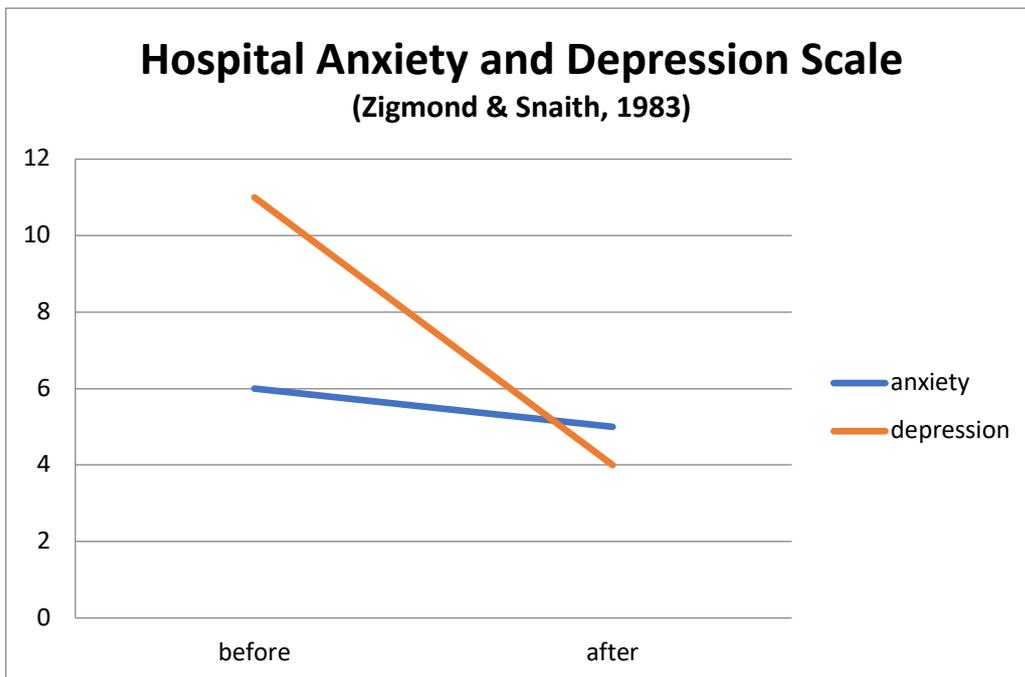


Figure 24. Anxiety and Depression – before and after intervention

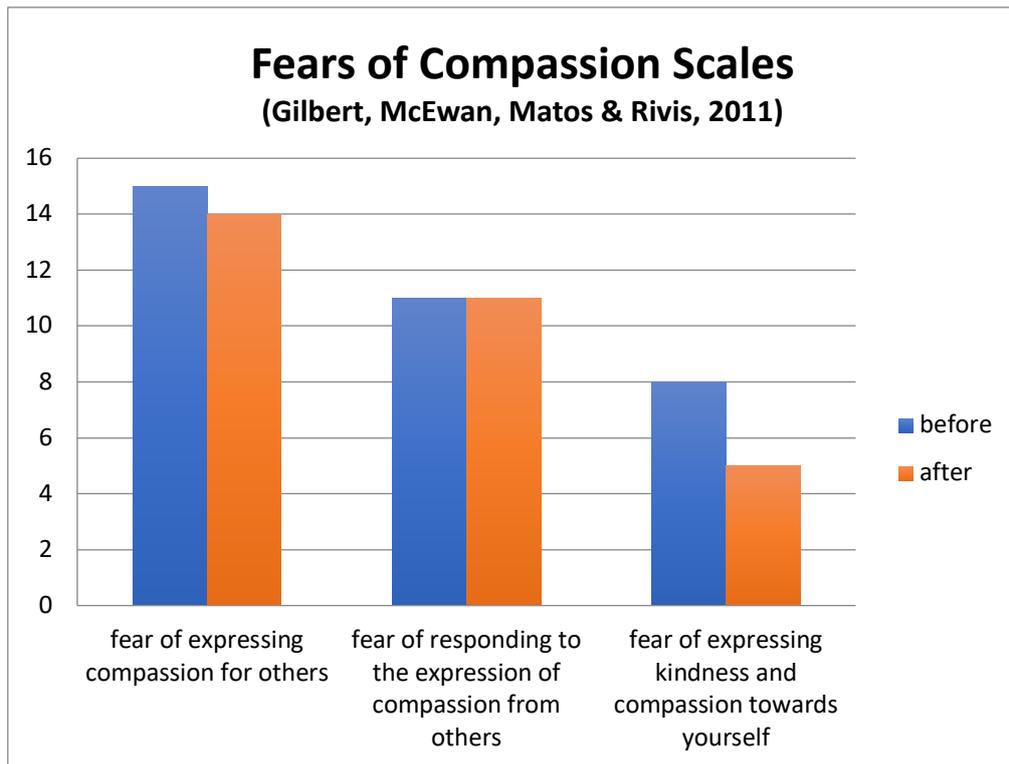


Figure 25: Fears of Compassion Scales

These positive outcome measures were shared with Susan, her husband and the treating team, and she contributed her own evaluation: “Although I know I have a little way to go before I’m happy with the me I am now, I have accepted and learnt to embrace the change and now look forward.” Susan’s re-found ability to interact socially and her success in setting up a new home-craft business were concrete evidence of the reduction in the disabling effects that FNSD had on her life after her interdisciplinary intervention. A report with these results was shared with the Care Commissioning Group.

It is not normal practice at the Centre to contact clients after discharge, so it has not been possible to follow-up Susan’s progress without ethical approval.

REFLECTION

This case was my first intervention in FNSD as a Trainee Health Psychologist. I was extremely well supported by a Consultant Clinical Psychologist with fortnightly formal supervision and access to the psychology team whenever needed. One of the greatest challenges was to engage the other disciplines in acknowledging Susan’s

diagnosis of FNSD, which remains stigmatized among health professionals. Some team members saw FNSD as a negative diagnosis, others found it difficult to accept it was not a case of malingering. Recent evidence-based research was shared and discussed amongst the team (including Carson, A. J., Stone, J., Warlow, C., & Sharpe, M., 2004; Edwards et al, 2012), however, it was daunting to put forward this protocol and lead a senior team as a trainee, and I felt quite isolated at times. Focusing on the client's distress and the positive behaviour changes, and not on aetiology, was more motivating for fellow professionals. Engaging people with FNSD is challenging – but also, as in this successful case –very rewarding.

2996 words

REFERENCES:

Ashworth, F., Gracey, F., & Gilbert, P. (2011). Compassion focused therapy after traumatic brain injury: Theoretical foundations and a case illustration. *Brain Impairment*, 12(02), 128-139.

Ashworth, F., Clarke, A., Jones, L., Jennings, C., & Longworth, C. (2015). An exploration of compassion focused therapy following acquired brain injury. *Psychology and Psychotherapy: Theory, Research and Practice*, 88(2), 143-162.

Bakvis, P., Roelofs, K., Kuyk, J., Edelbroek, P. M., Swinkels, W. A., & Spinhoven, P. (2009). Trauma, stress, and preconscious threat processing in patients with psychogenic nonepileptic seizures. *Epilepsia*, 50(5), 1001-1011.

Bandura, A. (1997) *Self-efficacy: The Exercise of Control*. New York: Freeman

British Psychological Society. Code of Ethics and Conduct Guidance; published by the BPS August 2009.

<https://beta.bps.org.uk/sites/beta.bps.org.uk/files/Policy%20%20Files/Code%20of%20Ethics%20and%20Conduct%20%282009%29.pdf>

Broadbent, E., Petrie, K. J., Main, J., & Weinman, J. (2006). The brief illness perception questionnaire. *Journal of psychosomatic research*, 60(6), 631-637.

Broadbent, E., Wilkes, C., Koschwanetz, H., Weinman, J., Norton, S., & Petrie, K. J. (2015). A systematic review and meta-analysis of the Brief Illness Perception Questionnaire. *Psychology & health*, 30(11), 1361-1385.

Carson, A. J., Brown, R., David, A. S., Duncan, R., Edwards, M. J., Goldstein, L. H., ... & Nicholson, T. R. (2012). Functional (conversion) neurological symptoms: research since the millennium. *Journal of Neurology, Neurosurgery & Psychiatry*, 83(8), 842-850.

Carson, A. J., Stone, J., Warlow, C., & Sharpe, M. (2004). Patients whom neurologists find difficult to help. *Journal of Neurology, Neurosurgery & Psychiatry*, 75(12), 1776-1778.

Castell, B. D., Kazantzis, N., & Moss-Morris, R. E. (2011). Cognitive Behavioral Therapy and Graded Exercise for Chronic Fatigue Syndrome: A Meta-Analysis. *Clinical Psychology: Science and Practice*, 18(4), 311-324.

Demartini, B., Batla, A., Petrochilos, P., Fisher, L., Edwards, M. J., & Joyce, E. (2014). Multidisciplinary treatment for functional neurological symptoms: a prospective study. *Journal of neurology*, 261(12), 2370-2377.

Demartini, B., Petrochilos, P., Ricciardi, L., Price, G., Edwards, M. J., & Joyce, E. (2014). The role of alexithymia in the development of functional motor symptoms (conversion disorder). *Journal of Neurology, Neurosurgery & Psychiatry*, jnnp-2013

Edwards, M. J., Adams, R. A., Brown, H., Pareés, I., & Friston, K. J. (2012). A Bayesian account of 'hysteria'. *Brain*, 135(11), 3495-3512.

Edwards, M. J., Stone, J., & Nielsen, G. (2012). Physiotherapists and patients with functional (psychogenic) motor symptoms: a survey of attitudes and interest. *Journal of Neurology, Neurosurgery & Psychiatry*, 83(6), 655-658.

Gilbert, P. (2010) *Compassion Focused Therapy. Distinctive Features*. London and New York: Routledge.

Gilbert, P. (2010) *Training Our Minds in, with and for Compassion: An Introduction to Concepts and Compassion-Focused Exercises*. Downloaded January 2015 from http://www.compassionatemind.co.uk/downloads/training_materials/3.%20Clinical_patient_handout.pdf

Gilbert, P. (2014). The origins and nature of compassion focused therapy. *British Journal of Clinical Psychology*, 53(1), 6-41.

Gilbert, P., McEwan, K., Matos, M., & Ravis, A. (2011). Fears of compassion: Development of three self-report measures. *Psychology and Psychotherapy: Theory, Research and Practice*, 84(3), 239-255.

Hou, R., Moss-Morris, R., Risdale, A., Lynch, J., Jeevaratnam, P., Bradley, B. P., & Mogg, K. (2014). Attention processes in chronic fatigue syndrome: Attentional bias for health-related threat and the role of attentional control. *Behaviour research and therapy*, 52, 9-16.

Graham, C. D., Gillanders, D., Stuart, S., & Gouick, J. (2014). An Acceptance and Commitment Therapy (ACT)-Based Intervention for an Adult Experiencing Post-Stroke Anxiety and Medically Unexplained Symptoms. *Clinical Case Studies*, 1534650114539386.

LaFrance, W. C., Baird, G. L., Barry, J. J., Blum, A. S., Webb, A. F., Keitner, G. I., ... & Szaflarski, J. P. (2014). Multicenter pilot treatment trial for psychogenic nonepileptic seizures: a randomized clinical trial. *JAMA psychiatry*, 71(9), 997-1005.

Leventhal, H., & Diefenbach, M. (1991). The active side of illness cognition. In *Mental representation in health and illness* (pp. 247-272). Springer US.

Leventhal, H., Leventhal, E. A., & Breland, J. Y. (2011). Cognitive science speaks to the "common-sense" of chronic illness management. *Annals of Behavioral Medicine*, 41(2), 152-163.

Michie, S., & Abraham, C. (2004). Interventions to change health behaviours: evidence-based or evidence-inspired?. *Psychology & Health*, 19(1), 29-49.

- Moss-Morris, R., Weinman, J., Petrie, K., Horne, R., Cameron, L., & Buick, D. (2002). The revised illness perception questionnaire (IPQ-R). *Psychology and health, 17*(1), 1-16.
- Moss-Morris, R., Spence, M. J., & Hou, R. (2011). The pathway from glandular fever to chronic fatigue syndrome: can the cognitive behavioural model provide the map?. *Psychological medicine, 41*(05), 1099-1107.
- Motivational interviewing in health care: helping patients change behavior. Stephen Rollnick, William R. Miller, and Christopher C. Butler. Guilford Press, New York, 2008. ISBN: 978-1593856120.
- Mulligan, Steed and Newman, in Stan Newman, Liz Steed and Kathleen Mulligan Maidenhead: Open University Press/McGraw Hill, 2009, pp 310, ISBN 978 0 335 21786 1
- Department of Health: Medically Unexplained Symptoms/ Functional Symptoms Positive Practice Guide; IAPT, Improving Access to Psychological Therapies, July 2014.
<https://www.uea.ac.uk/documents/246046/11919343/medically-unexplained-symptoms-positive-practice-guide-.pdf/55aea215-100e-4925-a968-65d6e89ad9b3>
- Ruddy, R., & House, A. (2005). Psychosocial interventions for conversion disorder. *The Cochrane Library*.
- Sharpe, M., Stone, J., Hibberd, C., Warlow, C., Duncan, R., Coleman, R., ... & Matthews, K. (2010). Neurology out-patients with symptoms unexplained by disease: illness beliefs and financial benefits predict 1-year outcome. *Psychological medicine, 40*(04), 689-698.
- Sharpe, M., Walker, J., Williams, C., Stone, J., Cavanagh, J., Murray, G., ... & Carson, A. (2011). Guided self-help for functional (psychogenic) symptoms A randomized controlled efficacy trial. *Neurology, 77*(6), 564-572.
- Stone, J., Pal, S., Blackburn, D., Reuber, M., Thekkumpurath, P., & Carson, A. (2015). Functional (Psychogenic) Cognitive Disorders: A Perspective from the Neurology Clinic. *Journal of Alzheimer's disease: JAD, 48*, S5-S17
- Stone, J. (2011). Functional neurological symptoms. *JR Coll Physicians Edinb, 41*(1), 38-41.
- Stone, J., Carson, A., Duncan, R., Roberts, R., Warlow, C., Hibberd, C., ... & Cavanagh, J. (2010). Who is referred to neurology clinics?—the diagnoses made in 3781 new patients. *Clinical neurology and neurosurgery, 112*(9), 747-751.
- Stone, J., Carson, A., Duncan, R., Roberts, R., Warlow, C., Hibberd, C., ... & Cavanagh, J. (2010). Who is referred to neurology clinics?—the diagnoses made in 3781 new patients. *Clinical neurology and neurosurgery, 112*(9), 747-751.
- Stone, J., Warlow, C., & Sharpe, M. (2010). The symptom of functional weakness: a controlled study of 107 patients. *Brain, 133*(5), 1537-1551.
- Wearden, A., & Peters, S. (2008). Therapeutic techniques for interventions based on Leventhal's common sense model. *British Journal of Health Psychology, 13*(2), 189-193.
- Williams, C. & Chellingsworth, M. (2010) *CBT: A Clinician's guide to using the five areas approach*. Boca Raton; New York; Abingdon. CRC Press.
- Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta psychiatr scand, 67*(6), 361-370.

Appendix C11. Interventions for behaviour change

PSYCHOLOGICAL INTERVENTION TECHNIQUES	DEFINITION	CASE EXAMPLE	LIKELY MECHANISMS TARGETED
<i>Assessment, formulation and engagement techniques</i>			
Information about functional neurological symptom disorder	Elicit from S her understanding of her condition. Collaboratively identify areas that she would like to work on. Using S's own language, reflect information, encouraging a therapeutic relationship.	Directing S to neurosymptoms. or g written by a neurologist specializing in FNSD. (Stone, 2015)	Inaccurate illness beliefs, treatment outcome expectancies, coherence.
Explanation of parallel processing of health information and coping (Common Sense Model)	Collaboratively develop a formulation of the case, using elicited information, and identify goals and agenda for therapeutic sessions.	Showing diagram of Common-Sense Model (CSM). Collaborating on mapping threat/perceptions (cognitive and emotional)/appraisal onto CSM.	Adjustment behaviour Building trust between therapist and client.
<i>Cognitions</i>			
Acceptance	Supporting S in accepting the diagnosis of FNSD in collaboration with other disciplines (OT, PT, SLT, SW), demonstrating positive symptomology. Validating the reality of the symptoms. Socratic questioning to increase self-reflection and awareness of	Reducing the anxiety about disease. Fostering possibility of symptoms being reversible. Providing an explanation of primitive brain drives are difficult to control, as well as possible biological aetiology for vulnerability to FNSD.	Addressing shame and self-criticism.

	<p>coping styles.</p> <p>Explaining the evolved brain theory of 3 drives, and the regulatory effect of soothing on the threat system.</p>		
Attention	<p>Mindfulness-based exercise to promote present moment awareness, to relax and reduce attention to symptoms.</p> <p>Demonstrating that distraction can allow normal functioning. Including cognitive ability. Link from anxiety levels to attention to function explored.</p>	Body scan exercise undertaken at every session.	<p>Cognitions/illness beliefs</p> <p>Self-efficacy</p>
Behaviours			
Activity Monitoring	Diary of good days and bad days to examine self-management of time and stamina. Guide S towards activity scheduling taking responsibility for pacing.	Using a watch, sitting and crocheting/watching a film.	<p>Behavioural</p> <p>Boom and bust situations</p>
Assertiveness skills training	Graded exposure of being able to tell people about FNSD, or its effects.	Explaining symptoms to her husband, her family, withdrawing for short periods when overloaded. Having a script.	<p>Increasing social support through explanation.</p> <p>Encouraging independence from family members who may also be maintaining the unhelpful</p>

			behaviours.
Graded exposure	Collaborate on a fear hierarchy for social situations and increase exposure in a graded way.	Talking face to face with her clients instead of internet, delivering to her clients, answering the phone, being with members of the extended family, going to pilates.	Behavioural avoidance/social situations
Problem focused strategies	Identifying problems, eliciting solutions from the client.	Caffeine intake, relaxing with crochet, relaxing in bath.	Behavioural. Not avoiding. Increasing mastery and activation.
<i>Physical symptoms</i>			
Emotional expression	Providing S opportunities to experience the physical responses of anxiety or sadness in a safe environment so as to be able to begin to identify the symptoms in a less threatening way.	Talking about emotional situations in the past, or emotional triggers in films etc. Drawing cupboard with emotions. Listing all the emotions.	Exposure to physical symptoms of emotional origin. Identifying emotions
Sleep routines	To encourage routine and prevent boom and bust cycle.	Reduction in use of caffeine, ipad at bedtime. Using a watch to monitor time.	Self-management
Anxiety management	Skill training in anxiety reduction techniques: collaborating on safe place guided imagery, breathing practice.	Using the Whoosh when overwhelmed. Technique shared with OT for situations requiring executive functioning.	Self-management
<i>Compassionate mind training</i>			
Being kind to	Graded	Happy place imagery,	Developing soothing

<p>oneself exercises</p>	<p>exposure to pleasurable emotions.</p> <p>Compassion under the duvet:</p> <p>Perfect nurturer:</p>	<p>bath.</p> <p>Repeating to herself every morning: I am warm and wise.</p> <p>Imagining what a perfect nurturer/friend would say: for Susan that was someone just like her, being kind to herself.</p>	<p>system (Gilbert, 2000)</p>
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Case Study - Generic Professional Skills

Background

I had been working at a community outpatient acquired brain injury service for 8 years as both a volunteer and later as an assistant psychologist, while also completing a Master's in Health Psychology. Volunteering as an Epilepsy Society information officer, at Addenbrooke's Hospital first seizure clinic, and as an assistant at Headway in Suffolk, expanded my understanding of complex neurological conditions, and enhanced my interaction with people at challenging times in their lives.

However, I realised I needed to complete Stage 2 of training to become a Health and Care Professions Council (HCPC) registered, chartered psychologist, both in order to further my career and also to advance my own competency as a therapist and as an applied psychologist. I completed all my supervised practice at the same acquired brain injury centre, with excellent workplace supervision from a consultant psychologist who specialised in neuropsychology, and with support from a highly specialist interdisciplinary therapy team.

I applied for a clinical psychology position in neuro-rehab and stroke unit in a general hospital and I have now been in post for over a year. I work therapeutically with people on the acute stroke ward as well as with acquired brain injury and all neurological diagnoses, including functional symptoms, in outpatients. I conduct neuropsychological assessment when appropriate, I am involved in group work, staff education, onward referrals, family support, and liaising with consultants, therapy teams and rehabilitation assistants.

Implement and maintain systems for legal, ethical and professional standards in applied psychology

All patient information must be treated securely (British Psychological Society (BPS) Code of Ethics and Conduct, 2009) and practitioner psychologists have a responsibility to ensure that paper and electronic data are securely stored and only shared with other professionals when in the patient's best interests (HCPC

Standards of Conduct, Performance and Ethics, 2016) and when patient consent has been obtained (Information Governance Alliance, 2018). Record keeping is maintained to a high standard with locked filing cabinets and password protected electronic records. Information sharing is essential when working in a multi-disciplinary team to ensure timely and accurate understanding of the patient's emotional and cognitive status to enable engagement in rehabilitation, and is facilitated through encrypted email, and prompt updating of continuous notes. Assessment and discharge reports and letters are shared with other clinicians, and as a trainee, countersigned by a supervisor.

Patients are told at first meeting that I am a health psychologist in training, that I do share information with my supervisor and team members if required, and that I follow a protocol that if there is disclosure of potential self-harm, or harm to others, other agencies, including their General Practitioner, the mental health crisis team or the police, may be contacted.

Patient-therapist boundaries are always respected, especially important when living in the same community as the population I am treating, and I try and balance being naturally friendly and empathetic with a professional stance. For example, I now work within a multi-disciplinary team, seeing patients in a busy outpatients clinic with rooms allocated to me on an ad hoc basis, which occasionally have not been fit for purpose, as they lack sufficient soundproofing to enable the patient to speak freely without the possibility of being overheard, and indeed, being able to hear other clinicians. Through discussions with other therapies, administration and other psychologists about the need to maintain client privacy and to foster an environment that promotes trust between therapist and patient, our room allocation has become more therapy-friendly.

Some brain-injured patients may have erratic and potentially dangerous behaviour, and, following risk assessment, the initial session may be carried out with another member of staff present. Where there is suspicion of abuse or neglect, either of the patient, and the people they live with, or perpetrated by them, the hospital

safeguarding team are contacted to investigate further (HCPC, 2012). If the presenting problem is predominantly mental health, or if there is suspicion of dementia, rather than adjustment to a neurological diagnosis or an acquired brain injury, the patient is referred to the appropriate services. Ensuring that referring consultants, GPs and external services are aware of our acceptance criteria is an ongoing task.

Contribute to the continuing development of self as a professional applied psychologist

I have been a member of the BPS since my undergraduate psychology degree in 2002, and of the DHP since starting my Master's. I have familiarised myself with, and follow, the legal, ethical and professional requirements, and I ensure that any assistants or trainees for whom I have had responsibility have also followed good practice. I have kept logs of all my activity during the doctorate, and I have regularly reflected upon my development as a health psychologist in training. Looking back on nearly four years of training, I can see how I have developed in my approach to some of the early interventions I undertook.

I attended all the core workshops for the doctorate in the first year, and the Division of Health Psychology conferences in 2014, 2015 and 2016. I have improved my therapeutic skills through external courses on health psychology clinical practice, mindfulness-based interventions for health psychologists, acceptance and commitment therapy for physical health problems and cognitive behavioural therapy for health psychologists. I continue to develop my competencies and I am registered to attend a three-day workshop on compassion-focused therapy, delivered by the developer, Paul Gilbert, in November 2018. The most challenging skills training has been the 8 week mindfulness course (and day retreat) which I initially undertook to understand the participant experience in the mediation study for my thesis, but which has fundamentally impacted my perspective on life, and thus the way I have developed as an applied psychologist. As an example, by learning to decenter, to be less reactive, I feel that I have improved my listening skills, not only with patients but also with fellow professionals.

I have also undertaken research skills training: a workshop on single case studies and case series was attended in my first year of the doctorate as I had initially been contemplating writing a thesis on smoking cessation for post-stroke patients, who have difficulty accessing services because of cognitive, mobility and communication difficulties. Unfortunately, the centre where I worked would not support this intervention as it was felt that smoking cessation services were already available in the community.

I have also attended symposia on medically unexplained symptoms and behaviour change in practice, both giving me greater insight into how different disciplines and cultures view functional symptoms, and how health psychology can be applied in public health. Two inspiring events that I attended in March 2017 and March 2018 were the 1st and 2nd Annual Practitioner Applied Health Psychology Conferences convened by SCCH, which provided opportunities to network and which greatly enhanced my confidence in becoming an applied health psychologist.

After each learning opportunity, I have been able to feed back to my colleagues, whether at workplace psychology department meetings, or multidisciplinary groups, helping to consolidate my learning, and enabling me to consider how this new knowledge can be applied to benefit the particular patient group I work with. Writing reflective journals about my learning experiences has also helped me evaluate how I am developing.

Academic supervision has been undertaken regularly and formal agendas and minutes have been recorded. Work commitments and distance from the university has meant I had to occasionally participate by video-conference, and this required me to become extremely organised in what documents were sent ahead and signposted during the discussions. Peer supervision within my doctoral cohort has also been extremely beneficial, both the supportive group effect and having access to consultation when faced with obstacles, either at work, academically or practically in completing competency requirements.

Annual reviews provide a useful opportunity to reflect on progress in all the competencies, and to receive feedback from a supervisory panel and, informally, from peers. Listening to fellow doctoral students tackling the course requirements in very diverse employment settings has been both inspiring and also reassuring, demonstrating the shared hurdles, in particular the extreme time pressure of combining study, work commitments and life!

I continue to be a lay member of the Scientific advisory committee of Epilepsy Research UK, evaluating grant proposals and I have twice sat on fellowship interview panels. I have recently been invited to join the Programme Steering Committee (as an independent member) of a development, trial and qualitative evaluation of a modular mental health treatment in children and young people with epilepsy (NIHR PGfAR: RP-PG-0616-20007). Being involved in high level research has made me much more aware of the complexities of large scale trials and the need for excellent communication between research teams, funders, and personal and public involvement. My role is to represent consumers of the research outcomes, as well as the potential trial participants, and having almost completed my doctorate in Health Psychology, I feel I now have a more rounded view of applied medical research, with greater understanding of the difficulties faced by research teams, the pressure from funders for results, and the value patients and families place on research that not only addresses pure science, but also the psychological and social aspects of living with long-term conditions.

I have been able to incorporate much of my training into my everyday work. I am enthusiastic about promoting health psychology theory and practice in a health setting that has traditionally been focused on clinical psychology interventions. I have given several presentations to team members at both of my work placements based on the common sense model (CSM, Leventhal, Diefenbach, & Leventhal, 1992) to engage staff in better communication with patients and improve understanding of how patients and families appraise and cope with health threats. I frequently use the Brief Illness Perceptions Questionnaire (B-IPQ, Broadbent, Petrie, Main, & Weinman, 2006) with my patients to explore their beliefs, and I find this a useful

way to structure early sessions. I conducted the systematic review on the utility of illness perceptions to see if there was evidence that could be useful in the management of people with functional neurological symptom disorder, a condition that presents in about a third of my outpatient caseload.

While undertaking my supervised practice, I received at least an hour a fortnight (usually weekly) of supervision from an HCPC registered, consultant clinical psychologist, as well as ad hoc supervision from the interdisciplinary team. In my most recent position, my supervisor and line-manager left the service three months after I joined, and I had to recruit an HCPC registered, practitioner psychologist from another trust to provide supervision to me and the assistant psychologist I work with. At the same time, I instigated peer supervision sessions with an assistant psychologist for mutual support with our case load. The Division of Health Psychology guidelines for applied trainees only states that adequate clinical supervision should be given (BPS, DHP, 2018), however, the division of Clinical Psychology recommends that trainees receive a minimum of one hour supervision a week (BPS, 2010).

Attempts to publish my work in peer reviewed journals have been challenging and so far, unsuccessful: I have submitted a systematic review (with two of my supervisors as co-authors) as well as the systematic review I conducted as part of my consultation competency with a research team. The latter paper was revised following rejection and subsequently rejected again by a second journal. While initially it is extremely disappointing, the reviewers in each case have been thorough and made helpful comments – both papers will be resubmitted in the near future. I have also submitted an article to the Health Psychology Update journal, detailing the contribution health psychology theory and practice can make within neurology, and critiquing the availability of formal neuro-psychometric training for health psychologists; this is awaiting review.

I presented a poster of my systematic review at the 2016 Health psychology conference in London, as a work in progress, and found that comments made by the other presenters and viewers were encouraging and helpful. A poster entitled “Rehabilitation of Functional Neurological Symptom Disorder: A Case

Study describing the Central Role of Psychology in an Interdisciplinary Team Intervention” was accepted at the 2nd International Case Management Conference.

My teaching and training competency undoubtedly took me out of my comfort zone, as I had previously very little experience in presenting to audiences, however, I feel I have gained in confidence and grown in self-efficacy and I now take up every opportunity available to share my knowledge with others. For instance, I had two invitations in 2017 to present to health psychology Masters’ students at City, University of London, on my experience of working within a neurological field. Feedback has helped me reflect on the audience’s perspective which I now bear in mind when preparing a presentation, and I am also more conscious of how other people present information when attending workshops.

Provide psychological advice and guidance to others

My supervised practice placement involved assessing the emotional and cognitive status of patients with acquired brain injuries, informing the multidisciplinary team, formulating a joint plan for rehabilitation, and if necessary, conducting therapy with that patient. I was able to have nearly 300 face-to-face hours with patients with a variety of presentations, from different cultural and socioeconomic backgrounds, ranging in age from 18 to late 70s. Neurological conditions almost always lead to some cognitive deficit, and this needs to be assessed before treatment can start. Therapy ranged from cognitive behavioural therapy, motivational interviewing to compassion focused therapy, and took place both in the patient’s residence (either their own home or a nursing home) or at the centre. These sessions gave me the opportunity to develop a therapeutic relationship based on empathy and trust, in order to then help patients identify goals. Where I lacked knowledge in health conditions, I undertook literature reviews, I sought information from health professionals, including sitting in on consultant clinics, and from the very experienced and highly specialist multi-disciplinary team that I worked with. I also believe that patients and their families are their own experts, and listening to their experiences, understanding their beliefs about their health condition and treatment, is crucial to successful interventions. Formulations need to be as collaborative as

possible, and should be shared, if confidentiality allows, with all members of the team working with the patient.

I have worked in client areas that are extremely sensitive – people with acquired brain injury may also have comorbid, visible injuries, but many patients live with invisible damage, high-level cognitive difficulties from different aetiologies, including functional cognitive deficits, that require rehabilitation but which the patient may not wish to advertise, for career, relationship and social reasons. As a practitioner psychologist, helping someone to feel confident about their new identity (Gracey, Evans & Malley, 2007) and also respecting their right to privacy can sometimes feel conflicting, but in time, using cognitive and behavioural interventions to promote social interaction, and working within a compassion focused therapeutic framework (Gilbert, 2009) and towards a value-driven life, some patients can find positive changes (post-traumatic growth - Grace, Kinsella, Muldoon & Fortune, 2015).

I also provide psychological advice to fellow clinicians. For instance, brain-injured patients are frequently assessed for basic cognitive function in the acute phase, by specialist nurses or by occupational therapists, and I am called upon to help interpret the results, or conduct more in-depth testing, in order to refer the patient on to the most appropriate rehabilitation. The patient's emotional state, their potential natural cognitive recovery, and their emotional support are all considered when recommending referral. Occasionally, further cognitive testing is not in the patient's best interests at that time, and more qualitative and objective assessments of their psychological state may be more helpful, and I have to manage other clinicians' expectations that formal testing is necessary.

Provide feedback to clients

Feedback to my clients, both patients and colleagues within the teams, needs to be tailored to their needs. In a multi-disciplinary team meeting, attended by therapists, social workers, nursing staff and consultants, and occasionally family members, my contributions have to be concise – I may recommend the patient is prescribed antidepressants, or behavioural activation with occupational therapists – I am often the

only person in the room who has been able to spend time exploring that person's motivation, cognition and emotional state, and I have to advocate for them, for instance as to where they are going to be discharged.

Feedback to patients requires careful tailoring, taking into account any cognitive and sensory deficits, and materials should be adjusted accordingly, for instance including pictorial aids and using speech and language therapists or interpreters if there are language barriers. The patient's rehabilitation capacity, or the progress of the neurological disease, is also considered . Explaining to a patient with Parkinson's or motor neurone disease that they have mild cognitive impairment may help them prepare for future cognitive decline and allow them to state their wishes before that eventuality. It may also give the family greater understanding of some of their loved one's behaviours. However, care needs to be taken so as not to demotivate that patient from continuing with maintaining their skills. An accessibly written report for the patient and their family following feedback is always provided, enabling them to have clear and coherent record of how their treatment has been carried out with recommendations to maintain their wellbeing.

In my present role, when providing therapy to outpatients, feedback is mutual: at the beginning of each session patients are invited to comment on how they felt their last session contributed to (or not) to a previously agreed plan, whether it is to identify and work towards a value-led life, or to become more active in self-management, or to feel more able to integrate socially.

Conclusion

The four years I have spent as a health psychologist in training have been extremely fulfilling. I have grown in confidence, and gained knowledge and skills, and I now feel better able to translate theoretical work to my applied work as a practitioner. This is especially evident in the work I do with people with functional neurological disorder, a challenging but potential rewarding area of multidisciplinary work that until very recently has been shunned by clinicians from many disciplines. I very much hope to expand this interest once I achieve chartership.

3058 words

REFERENCES

British Psychological Society. (2009, 2018). Code of ethics and conduct: Guidance published by the Ethics Committee of the British Psychological Society.

<https://www.bps.org.uk/news-and-policy/bps-code-ethics-and-conduct>

BPS. 2010. Accreditation through partnership. Additional guidance for clinical psychology training programmes Guidelines on clinical supervision. <https://www.bps.org.uk/sites/bps.org.uk/files/Accreditation/Guidelines%20on%20clinical%20supervision.pdf>

Broadbent, E., Petrie, K. J., Main, J., & Weinman, J. (2006). The brief illness perception questionnaire. *Journal of psychosomatic research*, 60(6), 631-637.

Gilbert, P. (2009). Introducing compassion-focused therapy. *Advances in psychiatric treatment*, 15(3), 199-208.

Gracey, F., Evans, J. J., & Malley, D. (2009). Capturing process and outcome in complex rehabilitation interventions: A “Y-shaped” model. *Neuropsychological Rehabilitation*, 19(6), 867-890.

Health and Care Professions Council (HCPC). 2012. Confidentiality–guidance for registrants. © Health and Care Professions Council 2017 Publication code: 20080206dPOLPUB (revised October 2017). <http://www.hpc-uk.org/mediaandevents/news/index.asp?id=875>

HCPC. 2016. Standards of conduct, performance and ethics.

www.hcpc-uk.org/publications/standards/index.asp?id=38

HCPC. 2016. Guidance on conduct and ethics for students.

www.hcpc-uk.org/assets/documents/10002C16Guidanceonconductandethicsforstudents.pdf

IGA (Information Governance Alliance) 2018. The General Data Protection Regulation, Guidance on Consent. NHS Digital. Accessed 28th July 2018. <https://digital.nhs.uk/data-and-information/looking-after-information/data-security-and-information-governance/information-governance-alliance-iga/general-data-protection-regulation-gdpr-guidance>

Leventhal, H., Diefenbach, M., & Leventhal, E. A. (1992). Illness cognition: using common sense to understand treatment adherence and affect cognition interactions. *Cognitive therapy and research*, 16(2), 143-163.

SECTION D

SYSTEMATIC REVIEW

The Role of Illness Perceptions in the Management of Functional Neurological Symptom Disorder – A Systematic Review of the Literature.

Abstract:

While Functional Neurological Symptom Disorder (FNSD) is prevalent in primary and secondary care, there is scant evidence for treatment efficacy. Illness beliefs have been shown to inform people's health behaviours across a variety of illness and may be considered a potential therapeutic target for people with FNSD. This systematic review examined the role of illness perceptions in the management of FNSD. EBSCO CINAHL, PsycINFO, Ovid EMBASE, MEDLINE and ISI Web of Science electronic databases were searched in 2016, and updated in 2018. Nine studies were included with a total of 2161 participants (FNSD patients n=253). One paper was rated as medium quality, eight as good. The results showed that illness perceptions were associated with psychological well-being and symptom management for people with FNSD, and that illness perception scales could be useful in guiding interventions to improve health outcomes for people with FNSD, and could help identify those patients who would most benefit from intensive multidisciplinary rehabilitation.

Background:

Functional Neurological Symptom Disorder (FNSD) belongs to a complex umbrella group of Somatic Symptom and Related Disorders (The Diagnostic and Statistical Manual for Mental Disorders-5 (American Psychiatric Association, 2013) but has previously been variously labelled as Somatization, Medically Unexplained (Physical) Symptoms, Psychogenic and Psychosomatic Symptoms, Hysteria. Around 30% of neurology outpatients have a functional disorder, even if it is not their main presentation, and 5% of neurology patients can be diagnosed with FNSD (Stone et al., 2010).

Along with Non-Epileptic Attacks, Functional Weakness is the main presentation of FNSD, but other symptoms include motor, memory, speech and executive function difficulties. The prevalence of FW is estimated to be close to that of multiple sclerosis (Stone, Warlow & Sharpe, 2011), and on self-report it is perceived to be as disabling and as distressing as stroke (Stone et al., 2010). Spontaneous remission of symptoms occurs in about 30% of cases, however most people with FNSD will have symptoms long-term (Stone, Sharpe, Rothwell, & Warlow, 2003; Sharpe et al., 2010).

In the last decade, a minority of people with FNSD have reported improved symptomology following intensive inpatient treatment centres by multidisciplinary teams (Saifee et al., 2012; Demartini, Batla, Petrochilos, Fisher, Edwards, & Joyce, 2014; Nielsen et al, 2016). The Department of Health (2014) has recommended a step-wise approach to treatment (usually graded exercise and psychological therapy) for all functional syndromes, and suggests treatment should be embedded within the clinical speciality of the organic disease equivalent to increase engagement. They recommend that patients' illness beliefs are elicited from the primary care stage. In fact, the cognitive behavioural model of somatic symptom disorders (Deary, Chalder & Sharpe, 2007) proposes that the patient's symptom interpretation and subsequent deconditioning contribute to a self-perpetuating pattern of illness behaviour.

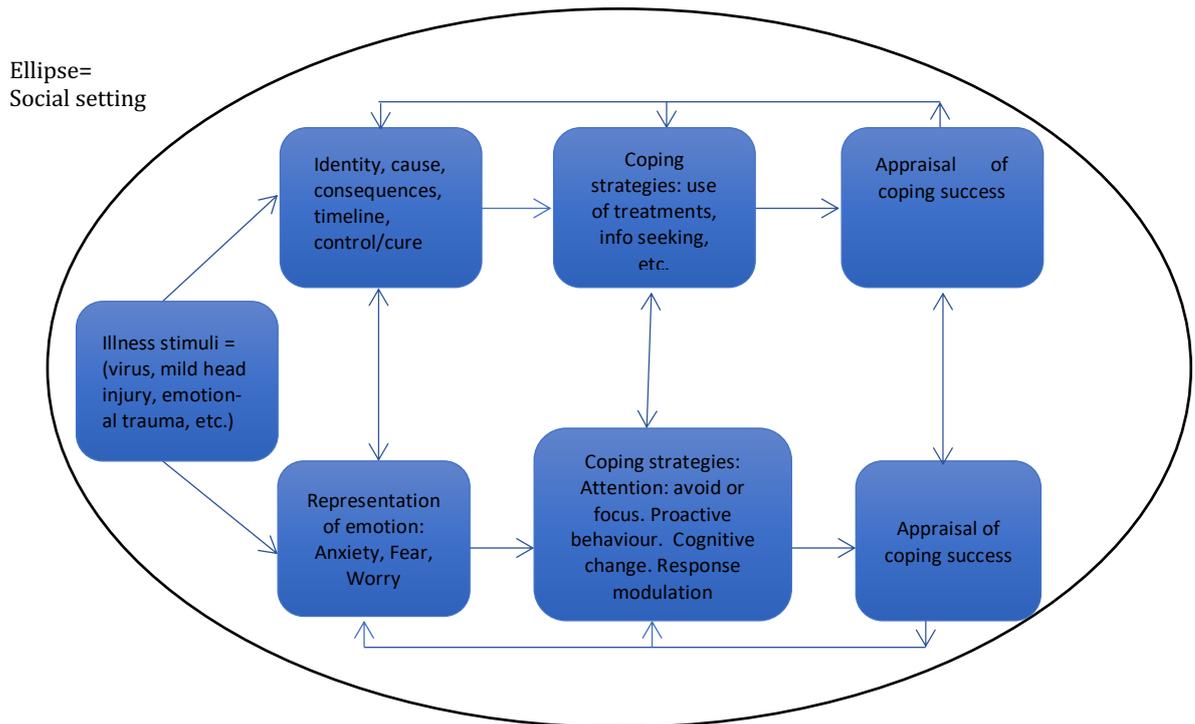
Illness perceptions are central to the Common-Sense Model (CSM) (Leventhal, Phillips & Burns, 2016)– a dynamic model that describes how a health threat is interpreted both cognitively and emotionally, incorporating existing health-related prototypes into activated representations of both the threat and treatment, and informing continuous assessment of coping performance and outcome (see Figure 2). The resulting personal illness perceptions of symptom identity, cause, chronicity, controllability and what this means to the individual emotionally, can be examined and measured through questionnaires and have been shown to predict health outcome (Hagger & Orbell, 2003; Frosthalm et al., 2007), and interventions can be targeted to improve coping and outcome (Jones, Smith & Llewellyn, 2015).

The CSM has been used to explain coping style and adjustment to a number of somatic symptom disorders. For example, in chronic fatigue syndrome, attribution of symptoms to “overdoing it” and to external factors leads to a maladaptive cycle of complete rest and bouts of excessive activity, exacerbating the symptoms and resulting in chronic disability (Moss-Morris & Wrapson, 2003). A systematic review of treatment for chronic fatigue syndrome has reported that interventions that are directed at beliefs are the most effective, and that cognitive change, including less negativity about symptoms and higher sense of symptom controllability, contributes more to outcome than behavioural change (Knoop, Prins, Moss-Morris, & Bleijenberg, 2010). Further, increased personal control has been shown to mediate the effect in CBT interventions in severe somatic symptom disorders (Christensen, Frostholm, Ørnbøl, & Schröder, 2015).

As well as cognitive misinterpretation of symptoms, studies in other somatic symptom disorders have found differences in the way people emotionally process health threats (Rimes, Ashcroft, Bryan & Chalder, 2016). Monitoring of threat-related stimuli and levels of attention paid to the threat are regulated by the emotional arm of the elaborated CSM (Cameron & Jago, 2008), and this may contribute to the development of functional symptoms in people whose emotional processing overpowers the cognitive arm of symptom recognition, coping strategy and appraisal; for instance not recognising symptoms as being physical manifestations of emotions may be the result of overwhelming fear, anxiety and worry, maladaptive emotional coping and appraisal of coping. Beliefs about the unacceptability of emotional expression have also been demonstrated to mediate in the relationship between emotional suppression and quality of life in people with Irritable Bowel Syndrome (Bowers & Wroe, 2016). It has been reported that people with FNSD have higher levels of alexithymia (an inability to recognise emotions) and are threat hypervigilant (Demartini, Petrochilos, Ricciardi, Price, Edwards, & Joyce, 2014). A pilot study of an emotional regulation training extension to a traditional CBT intervention for people with multiple somatic symptom disorders was encouraging (Gottschalk, Berking & Rief, 2015).

Exploring both the cognitive and emotional representations and coping strategies of people with FNSD may lead to identifying modifiable factors. Given their likely important role, a review of the current literature exploring the role of illness perceptions in the management of FNSD has therefore been undertaken.

Figure 26. Adapted from Cameron & Jago, 2008. The common-sense model of the self-regulation of illness behaviour, with the elaboration of emotion-focused coping.



Objectives:

1. Examine whether illness perceptions, as defined by the Common-Sense Model (cause, identity, control, time-line and consequences) are associated with psychological well-being and symptom management for people with FNSD.
2. Review the evidence for the effectiveness of changing illness perceptions for people with FNSD.

METHODS

Search strategy

The procedures were informed by standardised systematic reviewing guidelines (Centre for Reviews and Dissemination, 2009) and a PRISMA checklist was completed (Appendix A).

The EBSCO CINAHL and PsycINFO, Ovid EMBASE, MEDLINE and ISI Web of Science electronic databases were searched from 1996 to August 2015 (1996 being the publication year of the original Illness Perception Questionnaire) (see Appendix B).

Given the plethora of terms used to describe patients with FNSD, the electronic search strategy included the exploded MeSH terms: conversion disorder, dissociative disorder, medically unexplained, somatoform disorder, and key words “hysteri*”, “functional neurological symp*”, “functional motor”, “functional weakness” and “psychogenic”. These were combined with exploded MeSH term: illness perception, and key word “IPQ”. Papers were screened for neurological content. The Cochrane Database of Systematic Reviews was searched for appropriate primary studies. Grey literature searching included OPEN and BASE search engines. References of papers were hand searched and the patient websites www.neurosymptoms.org and www.fndhope.org were also searched.

The search was limited to English language empirical studies published in peer-reviewed journals and conducted during September 2015 (see figure 3 for flow-chart diagram).

Selection strategy:

Studies were included if they met the following criteria: the participants were over 18 years old and were diagnosed with Functional Neurological Symptom Disorder or Conversion Disorder (but not solely Non-Epileptic Attack Disorder) or Functional Weakness, as described in DSM-5; the participants could be recruited through primary or secondary care, or through community services or charities and the study was undertaken with the aim of understanding the perpetuating factors in

FNSD and/or improving outcome for people with FNSD. Studies included illness perception domains (cause, identity, timeline, chronicity, control) assessed by validated illness perception measures (Illness Perception Questionnaire (Weinman, Petrie, Moss-Morris, & Horne, 1996), Illness Perception Questionnaire- Revised (Moss-Morris, Weinman, Petrie, Horne, Cameron, & Buick, 2002) or the Brief Illness Perception Questionnaire (Broadbent, Petrie, Main, & Weinman, 2006), from single items to entire questionnaires. Studies also had to include some measure of psychological variables as a primary or secondary outcome (e.g. psychological distress, quality of life, anxiety or depression.)

Studies were excluded if they only included participants with only non-epileptic seizure disorder (NESD), or only chronic pain, or only fibromyalgia, or only other somatic illness that is not FNSD. This review focused on FNSD but excluded Non-Epileptic Seizures, for which there is a growing and separate body of research.

Quality assessment of studies:

To assess the methodological quality and reporting of studies, a quality assessment tool was adapted from Ariëns, van Mechelen, Bongers, Bouter, & van der Wal (2001) (see Appendix A), which has been used in previous reviews (Harrison, McCracken, Bogosian, & Moss-Morris, 2014) and is an objective checklist to identify biases. The quality of all studies was assessed by the lead author (AC). To improve the accuracy of this assessment a sub-section (n=3, 37.5%) of papers was randomly selected and rated by an independent researcher. Fourteen items in eight categories were independently rated as either present or not applicable (1) or not present (0) to provide a total positive score for three of the studies. Scores were classified as poor (0-8), medium (9-11) and good (12-14). No discrepancy was found between the two raters.

Search results:

Using the search criteria described, 237 studies were identified for possible inclusion. Of these, 48 duplicate studies were excluded, and after a screening of title and abstract, a further 174 were excluded (see Figure 3). The full texts of 15 studies

were accessed to determine eligibility by the first author, and seven of these did not have a separate analysis of FNSD within their results. The remaining eight studies were reviewed for study design, participant characteristics, intervention and outcomes by two researchers (see Table 1).

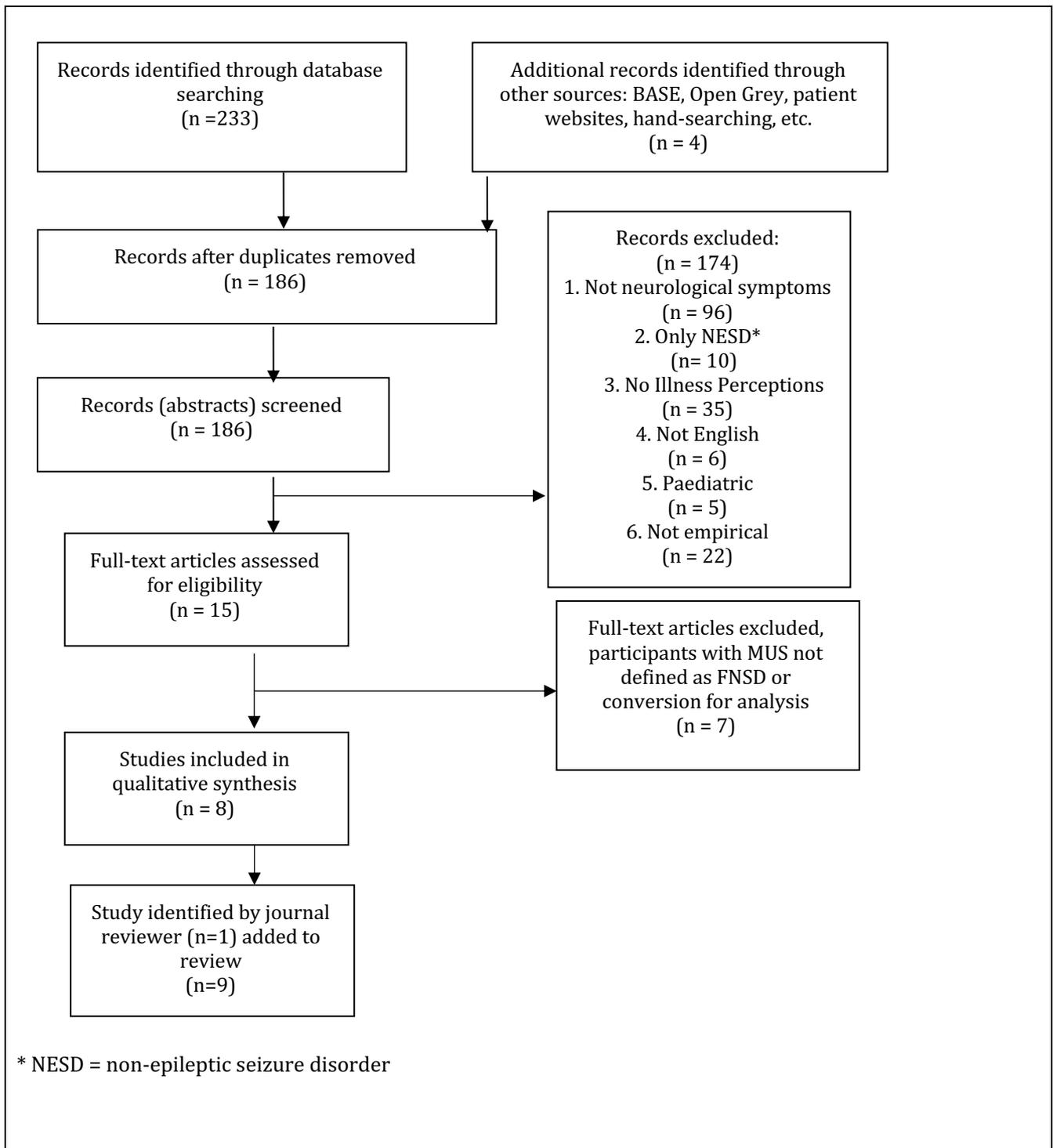
Search update:

A further search was conducted in June 2018 before journal submission but no papers were found that met the inclusion criteria. However, a reviewer identified a missing study (Nielsen et al, 2016) and this has been included in the review.

Data synthesis

Meta-analysis of these studies was attempted, but the heterogeneity of participants, study type, outcome measures, and follow-up periods prevented a meaningful synthesis of the data. The studies are discussed in narrative review (Popay et al., 2006), and where available, effect sizes are presented (Table 2).

Figure 27. Flow diagram for identification of studies using Illness Perceptions in populations of FNSD or conversion disorder, excluding studies that focused only on non-epileptic seizures.



RESULTS

Description of the included studies:

All the studies (n=9) included were conducted in the United Kingdom: three were based in London and three in Scotland. A further two had Functional Weakness participants from Scotland and Non-Epileptic Seizure participants or participants with epilepsy from Sheffield. One study recruited in Manchester.

Four studies were cross-sectional (Jackson, Kincey, Fiddler, Creed, & Tomenson, 2004; Stone, Warlow, & Sharpe, 2010; Ludwig, Whitehead, Sharpe, Reuber, & Stone, 2015; Whitehead, Stone, Norman, Sharpe, & Reuber, 2015), one was a randomised controlled trial (Sharpe et al., 2011), one a randomised feasibility study (Nielsen et al, 2016), two were prospective one-year cohort studies (Sharpe et al., 2010; Demartini, Petrochilos et al., 2014), and one a two-year retrospective follow-up (Saifee et al., 2012). Eight of the studies were assessed to be of good quality, one study was assessed to be of medium quality (Demartini, Petrochilos et al., 2014) because of the absence of a control group when evaluating the intervention. Study quality scores were not reduced by the use of only single items from, or partial use of, validated illness perception questionnaires.

Three papers included in this review used the same cohort of 107 people who had functional weakness. Originally recruited by Stone et al (2010) in a case-controlled study examining the differences between people with functional weakness and neurological weakness, this same population was also used in Ludwig et al, 2015's study comparing illness perceptions in functional weakness and non-epileptic seizure patients, and in Whitehead et al, 2015's study of illness perceptions in both the patients and their relatives.

Researchers in the field of FNSD appear to be restricted to a small group: of the eight papers included in this review, one author (Sharpe) contributed to six studies, one author (Stone) to five studies, and five other authors, (Warlow, Walker, Carson, Whitehead and Reuber) to two studies.

Illness perception measures were either the IPQ, the IPQ-R, or in one case the Brief Illness Perception Questionnaire (B-IPQ, Broadbent, Petrie, Main et al, 2006) but six out of the eight studies adapted the measures to increase the neurological focus of the questions or only used a few, or one, of the questionnaire components. The one study that used the B-IPQ (Nielsen et al, 2016) only reported the total score.

The identity element of either the IPQ or the IPQ-R was only included in three out of the eight studies and specifically excluded in one study (Whitehead et al., 2015) because the authors did not consider the list relevant to functional neurological symptom disorder or neurological disease, despite the IPQ-R being adaptable to specific conditions.

Included studies used illness perceptions as predictive tools (Demartini, Batla et al, 2014; Sharpe et al., 2010), as measures of intervention effectiveness (Sharpe et al, 2011; Demartini, Petrochilos et al, 2014; Nielsen et al, 2016), as ways to inform treatment (Jackson et al, 2004; Stone et al, 2010; Saifee et al, 2012; Ludwig et al, 2015).

Table 16. Summary of the role of Illness Perceptions (IP) in studies of functional neurological symptom disorder (presented in chronological order of publication).

Study	Participants	Design	Study Aim	IP measures	Other outcome measures	Are IPs associated with psychological wellbeing?	Contribution of IPs to Study
Jackson et al. (2004)	New neurology (n=112) and cardiology (n=60) of whom MUS neurology (n=25) and MUS cardiology (n=16).	Cross sectional	Assess differences in satisfaction in two outpatient clinics and relationship of satisfaction with emotional distress and illness perceptions. MUS diagnosis post 6 months.	IPQ	The Satisfaction Questionnaire at 2 weeks post consultation HADS and HAQ before first consultation	No difference in IPs or HADS between clinic groups, but MUS overall had lower mood	No difference in IPs or HADS between clinic groups, but MUS overall had lower mood. Significant correlation between cause, consequences, timeline, cure and control, and satisfaction with health. Significant correlation between IPQ consequences and satisfaction with information. Higher number of symptoms (Identity) associated with lower satisfaction. But no differences between MUS and the organic disease groups.
Sharpe et al. (2010)	Neurology outpatients (n=1144)	1 year prospective cohort study.	To determine which patient characteristics predicted poor 1 year outcome	IPQ adapted: Only timeline and psychological causality.	HADS, Medical Outcomes Study, PHQ, Whitely Index (health anxiety), Clinical Global improvement. Improvement in Presenting Symptoms.	Yes. Poor self-rated outcome best predicted by IP belief about recovery and non-attribution to psychological factors. (also by receipt of health related financial benefits.) HADS did not predict poor outcome.	IPs (the two measured) were strong predictors of outcome along with social factors. (receipt of benefits). Demonstrated to be predictors of outcome.

Stone, Warlow & Sharpe. (2010)	Neurology outpatients with FW (n=107) and outpatients with Neurological Disease (ND)(n=46)	Cross-sectional	Comparing FW cases and ND controls.	IPQ adapted: plus more causes, specifically neurological causes.	SF-36 – health status. HADS.	Within case analysis showed that higher belief in stress as a cause was associated with having higher HADS and less physical disability on SF-36.	Cases LESS likely than controls to believe that illness permanent. Cases much more likely to believe that illness was a mystery. Cases less likely to agree that stress a cause. Cases less likely to endorse all causes. Cases less likely to choose psychological cause. Differentiates between FNSD and non FNSDs. Better understanding of how people with FNSD believe and also possibly diagnostic and help interventions
Sharpe et al. (2011)	Neurology FNSD outpatients, usual care (n=63) usual care +CBT based Guided Self-help (n=63).	2-arm parallel group randomized controlled trial	Comparing usual care for FNSD and usual care plus CBT based Guided self-help. Measured at 3m and at 6m.	IPQ adapted: Only timeline/consequences and coherence.	PHQ, Medical Outcomes Short form Scale, HADS, Whiteley Index (partial)	No intervention effects on IP at 3 months, at 6 m consequences difference significant.	The intervention aimed at changing how people with FNSD view their condition, so surprising that a full assessment of IP not undertaken. Did not use IP very effectively
Saifee et al. (2012)	Patients with FNSD (n=32)	2-year retrospective self-report follow up	Long term effect of inpatient treatment	IPQ adapted: Only cause component	Work and Social Adjustment Scale, info questionnaire,	Yes. Significant correlation between those who agreed that emotional state and stress were causative and those who reported a benefit from the inpatient programme.	Non-attribution of symptoms to psychological factors was correlated with poor outcome. May be useful in allocating expensive and rationed inpatient resources.

Demartini, Batla et al. (2014)	Inpatients at a multidisciplinary treatment centre for FNSD (n=61).	Prospective short and long term evaluation of an inpatient intervention.	Aim to determine short and long term efficacy of treatment and determine predictors of good outcome. Admission, Discharge and 12-months post.	IPQ-R	Clinician rated: HoNOS, COPM. Patient: HADS, Fear Questionnaire, PHQ-15, CGI,	Significant changes between <u>admission</u> and <u>discharge</u> on timeline acute/chronic, illness coherence, and <u>emotional representations</u> and consequences. (significant changes on emotional but small effect - same for HADS). After a year, timeline acute/chronic, coherence and emotional rep. changes still significant with smaller effect.	IPQ-R: admission to discharge (n=61): timeline acute/chronic, coherence, emotional representation, all significantly improved. IPQ-R: admission to 12-month post discharge(n=36), coherence and emotional representation significantly improved. IP did not predict outcome. (only HoNOS did). No measures predicted which patients would benefit.
Ludwig et al. (2015)	Patients with FW (n=107) and neurological disease (n=46) compared with each other and with patients with epilepsy (n=34) and non-epileptic seizures (n=40)	Cross sectional	Differences in IPs between patients with NES and FW	IPQ-R adapted -excluding the Identity subscale and adding 18 possible causes).	HADS	No. No differences in HADS between two groups (functional and organic). Both functional groups tended to reject psychological causes, but more so in FW.	IPs can inform interventions, highlighting differences in acceptability of psychological causation between FW and NES.

Whitehead et al (2015)	112 pairs of FNSD patients and their relatives and 60 pairs of ND patients and relatives.	Cross sectional	Differences in relatives' and patients' IPs in FNSD compared to neurological disease.	IPQ-R adapted -excluding coherence subscale and identity subscale.	HADS	Both relatives of FNSD and ND felt condition had >emotional impact on patient than patient did.	FNSD relatives see psychological factors as more relevant than the patients do. Could contribute to FNSD treatment planning by getting relatives on board first as more open to psychological causation.
Nielsen et al (2016)	29 functional motor symptoms participants and 28 functional motor symptoms controls (TAU)	Randomised controlled feasibility study	Determine feasibility of specialist physiotherapy intervention	B-IPQ total score (causality not described)	HADS; SF36; WSAS	Participants excluded if clinically depressed or anxious. No significant change in psychological outcomes but intervention group reported >good outcome.	Used as a measure of health threat, the intervention group's total B-IPQ score change suggests that this intervention's effect on patients' understanding and movement control is mediated by illness perceptions.

Abbreviations: B-IPQ: Brief Illness Perceptions Questionnaire; CBT: cognitive behavioural therapy; CGI: Clinical Global Impressions Questionnaire; COPM: Canadian Occupational Performance Measure; FNSD: functional neurological symptoms disorder; HADS: Hospital Anxiety and Depression Scale; HAQ: Health Assessment Questionnaire; HoNOS: Health of the Nation Outcome Scales; IPQ: Illness Perception Questionnaire; IPQ-R: Illness Perception Questionnaire Revised; MUS: medically unexplained symptoms; ND: neurological disease; PHQ-15: Patient Health Questionnaire; SF-36: Short Form Health Survey; WSAS: Work and Social Adjustment Scale

Table 17. The Role of Illness Perceptions in included studies

	Study aim	Effectiveness	Effect (only significant results reported)
IPs used as: Predictive tools			
Demartini, Batla et al, 2014	Comparing outcome from admission, discharge and 1 year follow up (55%) of an inpatient multidisciplinary intervention.	Mood improvement, and general health rating was improved long term. Only HoNos was predictive of outcome. No self-report measure predicted who would benefit from treatment	
Sharpe et al, 2010	To find predictors of outcome in new neurology outpatients whose symptoms were not at all or only somewhat explained by disease.	Beliefs - two items from IPQ: 1: permanence of symptoms question and 2: Non-attribution of symptoms to psychological factors were strong independent predictors of outcome.	1: $p < .001$; Adjusted OR for poor outcome (95%) = 2.04 (1.40-2.96) $p < 0.001$ 2: (95%) = 2.22 (1.51-3.26) < 0.001
Measures of intervention effectiveness			
Sharpe et al, 2011	Comparing CBT guided self-help intervention to usual care for functional neurological symptoms.	Beliefs, two items from the IPQ; 1: symptoms are permanent and 2: symptoms are a mystery.	No significant difference between the groups at 3 months, but at 6-months intervention group had significant less belief that symptoms were permanent.
Demartini, Batla et al, 2014	Comparing outcome from admission, discharge and 1 year follow up (55%) of an inpatient multidisciplinary intervention. Shows intervention can have long-term effect.	IPQ-R - Comparing admission and discharge scores – significant results shown in: 1. IPQ-R timeline acute/chronic; 2. IPQ-R consequences; 3. IPQ-R illness coherence; 4. IPQ-R emotional representation After 1 year follow up: significant effect found for: 5. Timeline acute/chronic; 6. Illness coherence; 7. Emotional representation.	Effect size (Cohen's d) 1: $d = 0.51, p < 0.001$, medium effect 2: $d = 0.26, p = 0.02$, small effect 3: $d = 0.84, p < 0.001$, large effect 4: $d = 0.32, p = 0.009$, large effect Effect size (partial eta squared) 5: 0.13, $p = 0.01$, small effect 6: 0.32, $p < 0.001$, medium effect 7. 0.11, $p = 0.03$, small effect

Ways to inform treatment

Jackson et al, 2004	Looking at differences in satisfaction, emotional distress and IP between physical disease and MUS in cardiology and neurology clinics.	Small effect sizes for any significant correlations between satisfaction scores and illness perceptions. 1: IPQ consequences with total satisfaction score; 2: IPQ consequences and satisfaction with health; 3: IPQ consequences and satisfaction with information; 4. IPQ cure and satisfaction with health.) No overall differences in satisfaction between the two groups (MUS and organic). No direct relationship between satisfaction of information and IP.	1: R=0.28, p<0.001, small effect 2: R=0.39, p=0.005, small effect 3. R=0.23, p=0.006, small effect 4. R=-0.24, p=0.004, small effect
Stone, Warlow, & Sharpe, 2010	Comparison of FW cases and neurological controls.	Differences between cases and controls: 1: cases less likely to believe that illness permanent; 2: cases more likely to believe that illness was a mystery. Analysis between distress and IP: 3: more likely to believe that stress is a cause and higher scores on HADS, 4: less physical disability on SF-36	Median scores cases, controls, (95%) confidence intervals, p; 1: 60, 77, (-23 to -10), p<0.0001; 2: 40, 60, (-28 to -16), p<0.0001 3: r=0.24, p=0.02, small effect 4: r=0.38; p=0.001, small effect
Saifee et al, 2012	Long term follow up to an inpatient multidisciplinary intervention for people with functional motor symptoms.	Significant correlation between patients who agreed that 1: emotional state 2: and stress were causative, and those that reported benefit from the intervention.	1: r= .40, p = .03, small effect 2: r= .37, p = .04, small effect
Ludwig et al, 2015	Looking at differences in IP between NES and FW, and neurological disease and epilepsy. Demonstrates that there are differences in how receptive FW and NES groups may be in accepting any psychological basis to cause and therefore treatment.	Effect sizes calculated where there were significant differences between groups. 1: The FW group was more likely than NES group to reject psychological causes. 2: The FW group was less likely to see stress as being a factor. 3: FW reported lower consequences on themselves and their families. 4: FW endorsed lower treatment effectiveness than NES. p<0.01.	1. d=0.49, p<.01, medium effect 2. d=0.56, p<.01, medium effect 3. d=0.44, p<0.01, small effect. 4. d=0.52, p<0.01, medium effect.

Whitehead et al, 2015	Compare IP of FNSD and IP of their relatives, and control pairs of neurological disease. And subgroups between weakness and seizures.	Only in FNSD pairs did relatives endorse 1: psychological or 2: stress cause more than patients.	1: $t=-4.1314$, $p<0.001$ 2: $t=-3.944$, $p<0.001$
Nielsen et al, 2016	To assess feasibility of physiotherapy intervention	Trial was effective: large treatment effect reported. 1. SF36 physical function. 2. CGI collapsed score 72% in intervention reported improved or much improved (18% in the control group).	1. $d=.70$, large effect

THE ROLE OF ILLNESS PERCEPTIONS IN STUDIES INCLUDING PEOPLE WITH FNSD

Three papers had illness perceptions as the primary outcome measure for their studies (Jackson et al, 2004; Ludwig et al, 2015; Whitehead et al, 2015). Four good quality papers examined the causal beliefs of people with functional symptoms: Saifee et al (2012) found that not attributing symptoms to psychological factors (emotional state and stress) was negatively correlated to patient-reported benefit following an inpatient intervention. Stone et al (2010) found that functional cases were less likely to endorse psychological factors as a cause and were less likely to endorse any of the suggested causes, in keeping with the belief that their condition was a mystery.

Ludwig's study found that people with functional weakness had a greater tendency to reject psychological causation than people with non-epileptic seizures. The results of Whitehead's study challenge the stereotype that relatives of people with functional disorders are barriers to change. Using the IPQ-R, they demonstrated that whilst relatives of people with FNSD were in the most part reluctant to endorse psychological causality for the symptoms, they were significantly less reluctant than the FNSD patients.

Using illness perceptions to differentiate between clinical groups:

No significant differences in IP were found between FNSD and organic neurological disease groups in Jackson et al (2004), but Stone, Warlow, & Sharpe (2010) found that people with FNSD were less likely than people with diagnosed neurological disease to believe that their illness was permanent, and they also were more likely to endorse that their illness was a mystery. Stone and colleagues also found that people with FNSD were less likely to endorse any of the suggested causes (i.e. environmental) and especially less likely to endorse causes that were psychological.

Ludwig et al (2015) also found that people with Functional Weakness were more likely to reject psychological causes and stress factors, and were more likely to

report lower consequences of their condition and lower treatment effectiveness, than people with non-epileptic seizures.

Illness perceptions predicting outcome of psychological interventions:

In a long-term follow-up of an inpatient multidisciplinary intervention for people with FNSD, Saifee et al (2012) found a significant correlation between patients who agreed that their emotional state and stress were causative and those who later reported benefit from the intervention. However, illness perceptions were not predictive of patient-rated improvement in Demartini, Batla et al's (2014) study of a group undergoing intensive intervention. In this medium quality paper, the only predictive measure was the clinician-rated outcome scale. Demartini and colleagues do not report analysis of the causality factor in the IPQ-R, and their group's endorsement of psychological causation is not known. Sharpe et al (2010) study investigating patient characteristics demonstrated that timeline and psychological causality beliefs were predictive of outcome, along with receipt of benefits.

Changes in illness perceptions after intervention:

Sharpe et al (2011) compared a Cognitive Behavioural Therapy guided self-help intervention to usual care for FNSD and found no significant differences in timeline and coherence at 3 months, but significantly lower belief in permanence at 6 months. Demartini, Batla et al (2014) demonstrated significant differences on discharge from their multidisciplinary inpatient intervention in IPQ-R timeline acute/chronic, consequences, illness coherence and emotional representation. The 1-year follow-up showed continued significant effect on timeline acute/chronic, illness coherence and emotional representation. The composite score of the B-IPQ was used to measure the level of threat patients' attached to their health condition and showed medium effect size change following a five day physiotherapy intervention compared to a treatment as usual control (Nielsen et al, 2016).

DISCUSSION

The studies included in this review have shown that some domains of illness perceptions in FNSD can be predictive of outcome (Sharpe et al, 2010), can measure

intervention effectiveness (Sharpe et al, 2011; Demartini, Batla et al, 2014), and can inform treatment (Jackson et al, 2004; Stone et al, 2010; Saifee et al, 2012; Ludwig et al, 2015, Whitehead et al, 2015). Changes to illness perceptions were shown to be associated with improved psychological well-being; illness perceptions were demonstrated to be modifiable following intervention, and may also be predictive of outcome after intervention. Illness perceptions may also mediate in the causal chain between trial arm and outcome.

These results are important as there is a lack of evidence to guide treatment that can improve the lives of people living with the disorder, and their families, and reduce the resulting health cost and social burden that FNSD carries. One small-scale intervention (Demartini, Batla et al, 2014) targeting illness perceptions, demonstrated that beliefs in FNSD can be modified with perceived long-term benefits for the person living with FNSD. However, this resource-intensive intervention targeted people who were already more accepting of psychological aetiology, and too costly to be scalable to the general population of people with FNSD.

While a CBT intervention for people with irritable bowel syndrome demonstrated that changes in cognitions rather than changes in anxiety and depression mediated the intervention effect on symptom severity and social adjustment at six months' follow-up (Chilcot & Moss-Morris, 2013), emotional expression may require intervention before mood and cognitive beliefs are addressed (Cameron & Jago, 2008; Bowers & Wroe, 2016).

Despite the introduction of the IPQ-R (Moss-Morris et al., 2002), which expanded the original questionnaire to include emotional representations, five out of the eight studies in this review had the IPQ as a measure and only one study used the full IPQ-R. The original IPQ cannot be a useful measure in a disorder that has at least partial psychological aetiology - as FNSD has been shown to frequently be associated with emotional trauma (whether concurrent with the onset of symptoms or in the patient's past), emotional processing dysfunction, and aversion to acceptance of

psychological causation, so examining only cognitive-based illness perceptions would not encompass the breadth of the patient's perceptions about their symptoms. Jackson et al.'s 2004 study discussed the introduction of the IPQ-R but persisted in using the original questionnaire in their study looking at IP, patient satisfaction and emotional distress.

The identity element of the IPQ-R was only used in Demartini's intervention study, and showed no significant change. It would have been interesting to examine differences between the identity scores of people with FNSD and neurological disease in future studies to evaluate any discriminatory value in this domain, and to inform interventions aimed at reducing the health care demands of people with FNSD. Fidler, Jackson, Kapur, Wells, & Creed (2004) found that the number of bodily symptoms (identity) in people with Somatic Symptom Disorder mediated the association between self-reported childhood adversity and frequent medical consultations.

There may also be diagnostic value in using the IPQ-R or B-IPQ by looking more at what is not endorsed as a cause rather than what is. As shown in the studies included in this review, people with FNSD have tended to not endorse psychological causation, and people with Functional Weakness even less than people with Non-Epileptic Seizures. Perhaps the marker of functional symptoms might lie more in the way any psychological causation is denied by the patient – this has been shown to differentiate the FNSD patient from the neurological disease patient (Stone et al, 2010). The stigma of mental health and the cumulative experience of suspicion amongst clinicians over the genuineness of the symptoms contribute to the patient's reluctance to admit to stress contributing to their disability (Stone et al, 2011).

However, if people with FNSD tend to misinterpret their symptoms, their evaluation of their coping and treatment outcome will also be compromised. The question must also be asked if people with FNSD can consciously identify their beliefs. Self-report of illness perceptions may not be straight forward for people with FNSD. The clue may be in the word *perception* – people with FNSD are experiencing symptoms at a

different level of consciousness and thus *perceive* their symptoms differently. It is interesting to note that the clinician-rated HoNOS (Wing, Beevor, Curtis, Park, Hadden, & Burns, 1998) was the only measure in Demartini's longitudinal study that was predictive of outcome.

Another route to perhaps clarifying and influencing the illness perceptions of people with FNSD was highlighted by Whitehead et al's (2015) study of IPs in FNSD and neurological disease patient and relative pairs, positing the possibility of engaging relatives of FNSD early on in treatment plans because the IPQ-R identified their greater acceptance of psychological factors in causation.

Limitations:

The difficulty with nomenclature and nosology of Functional Neurological Symptom disorder means that this systematic review may not have captured all the studies that describe FNSD and illness perceptions. This review included five studies conducted before the publication of DSM-5 (2013) so some of the included patients with Medically Unexplained Symptoms (Sharpe, Jackson) would probably not meet the modern criteria of functional neurological symptoms.

Despite a growing interest in this area, there continues to be a lack of evidence for treatment – as illustrated by the total number of participants with FNSD (excluding Non-Epileptic Seizures) included in this review (n=253) and the limited number of researchers investigating this common disorder.

Conclusion:

Illness perceptions may play a role in the aetiology, onset and maintenance of symptoms in Functional Neurological Symptom Disorder, and this review has demonstrated that they can be useful diagnostic markers, that they are indicative of rehabilitation potential, they may mediate the effects of interventions, and they may be intervention targets to increase patient engagement. Illness perceptions have been shown to be associated with wellbeing outcomes and symptom management. This systematic review has highlighted the paucity of FNSD studies that examine

illness perceptions, in particular randomised controlled studies, and more studies need to investigate the full range of illness perceptions to evaluate if people with FNSD hold significantly different beliefs, and if they report these perceptions differently to people without their condition.

If the Common-Sense Model adds to the understanding of FNSD, then examining individual illness perceptions domains should further inform management of this complex disorder, which is distressing and disabling for the individual and their families, demanding on limited healthcare resources, and perplexing for the people responsible for their treatment.

5914 words

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Pub.

Ariëns, G. A., van Mechelen, w., Bongers, P. M., Bouter, l. M., & van der Wal, g. (2001). Psychosocial risk factors for Neck pain: A systematic review. *American journal of industrial medicine*, 39(2), 180-193.

Bowers, H., & Wroe, A. (2016). Beliefs about emotions mediate the relationship between emotional suppression and quality of life in irritable bowel syndrome. *Journal of Mental Health*, 25(2), 154-158.

Broadbent, E., Petrie, K. J., Main, J., & Weinman, J. (2006). The brief illness perception questionnaire. *Journal of psychosomatic research*, 60(6), 631-637.

Cameron, L. D., & Jago, L. (2008). Emotion regulation interventions: A common-sense model approach. *British Journal of Health Psychology*, 13(2), 215-221.

Chilcot, J., & Moss-Morris, R. (2013). Changes in illness-related cognitions rather than distress mediate improvements in irritable bowel syndrome (IBS) symptoms and disability following a brief cognitive behavioural therapy intervention. *Behaviour research and therapy*, 51(10), 690-695

Christensen, S. S., Frosthalm, L., Ørnbøl, E., & Schröder, A. (2015). Changes in illness perceptions mediated the effect of cognitive behavioural therapy in severe functional somatic syndromes. *Journal of psychosomatic research*, 78(4), 363-370.

Deary V, Chalder T, and Sharpe M (2007). The cognitive behavioural model of medically unexplained symptoms: a theoretical and empirical review. *Clin Psychol Rev* 27:781-97

- Demartini, B., Batla, A., Petrochilos, P., Fisher, L., Edwards, M. J., & Joyce, E. (2014). Multidisciplinary treatment for functional neurological symptoms: a prospective study. *Journal of neurology*, 261(12), 2370-2377.
- Demartini, B., Petrochilos, P., Ricciardi, L., Price, G., Edwards, M. J., & Joyce, E. (2014). The role of alexithymia in the development of functional motor symptoms (conversion disorder). *Journal of Neurology, Neurosurgery & Psychiatry*, jnnp-2013.
- Department of Health. (2014). Medically unexplained symptoms/functional symptoms positive practice guide. Improving Access to Psychological Therapies. Retrieved from <http://www.iapt.nhs.uk/silo/files/medicallyunexplained-symptoms-positive-practice-guide-2014.pdf>
- Fiddler, M., Jackson, J., Kapur, N., Wells, A., & Creed, F. (2004). Childhood adversity and frequent medical consultations. *General hospital psychiatry*, 26(5), 367-377.
- Frostholm, L., Oernboel, E., Christensen, K. S., Toft, T., Olesen, F., Weinman, J., & Fink, P. (2007). Do illness perceptions predict health outcomes in primary care patients? A 2-year follow-up study. *Journal of psychosomatic research*, 62(2), 129-138.
- Gottschalk, J. M. G. G. B., Berking, K. M., & Rief, W. (2015). Extension of Cognitive Behavioral Therapy by Emotion Regulation Training in Patients with Multiple Somatoform Symptoms: Results of a Controlled Pilot Study.
- Hagger, M. S., & Orbell, S. (2003). A meta-analytic review of the common-sense model of illness representations. *Psychology and health*, 18(2), 141-184.
- Harrison, A. M., McCracken, L. M., Bogosian, A., & Moss-Morris, R. (2015). Towards a better understanding of MS pain: A systematic review of potentially modifiable psychosocial factors. *Journal of psychosomatic research*, 78(1), 12-24.
- Jackson, J., Kinsey, J., Fiddler, M., Creed, F., & Tomenson, B. (2004). Differences between out-patients with physical disease and those with medically unexplained symptoms with respect to patient satisfaction, emotional distress and illness perception. *British journal of health psychology*, 9(4), 433-446.
- Jones, C. J., Smith, H. E., & Llewellyn, C. D. (2015). A systematic review of the effectiveness of interventions using the Common Sense Self-Regulatory Model to improve adherence behaviours. *Journal of health psychology*, 1359105315583372.
- Knoop, H., Prins, J. B., Moss-Morris, R., & Bleijenberg, G. (2010). The central role of cognitive processes in the perpetuation of chronic fatigue syndrome. *Journal of psychosomatic research*, 68(5), 489-494.
- Leventhal, H., Phillips, L. A., & Burns, E. (2016). The Common-Sense Model of Self-Regulation (CSM): a dynamic framework for understanding illness self-management. *Journal of Behavioral Medicine*, 1-12.
- Ludwig, L., Whitehead, K., Sharpe, M., Reuber, M., & Stone, J. (2015). Differences in illness perceptions between patients with non-epileptic seizures and functional limb weakness. *Journal of psychosomatic research*, 79(3), 246-249.
- Moss-Morris, R., Weinman, J., Petrie, K., Horne, R., Cameron, L., & Buick, D. (2002). The revised illness perception questionnaire (IPQ-R). *Psychology and health*, 17(1), 1-16.

Moss-Morris, R., & Wrapson, W. (2003). Representational beliefs about functional somatic syndromes. *The self-regulation of health and illness behaviour*, 119-137.

Nielsen, G., Buszewicz, M., Stevenson, F., Hunter, R., Holt, K., Dudzic, M., ... & Edwards, M. J. (2016). Randomised feasibility study of physiotherapy for patients with functional motor symptoms. *J Neurol Neurosurg Psychiatry*, jnnp-2016.

Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., ... & Duffy, S. (2006). Guidance on the conduct of narrative synthesis in systematic reviews. *A product from the ESRC methods programme Version, 1*, b92.

Rimes, K. A., Ashcroft, J., Bryan, L., & Chalder, T. (2016). Emotional Suppression in Chronic Fatigue Syndrome: Experimental Study.

Saifee, T. A., Kassavetis, P., Parees, I., Kojovic, M., Fisher, L., Morton, L., ... & Edwards, M. J. (2012). Inpatient treatment of functional motor symptoms: a long-term follow-up study. *Journal of neurology*, 259(9), 1958-1963.

Sharpe, M., Stone, J., Hibberd, C., Warlow, C., Duncan, R., Coleman, R., ... & Matthews, K. (2010). Neurology out-patients with symptoms unexplained by disease: illness beliefs and financial benefits predict 1-year outcome. *Psychological medicine*, 40(04), 689-698.

Sharpe, M., Walker, J., Williams, C., Stone, J., Cavanagh, J., Murray, G., ... & Carson, A. (2011). Guided self-help for functional (psychogenic) symptoms A randomized controlled efficacy trial. *Neurology*, 77(6), 564-572.

Stone, J., Sharpe, M., Rothwell, P. M., & Warlow, C. P. (2003). The 12 year prognosis of unilateral functional weakness and sensory disturbance. *Journal of Neurology, Neurosurgery & Psychiatry*, 74(5), 591-596.

Stone, J., Carson, A., Duncan, R., Roberts, R., Warlow, C., Hibberd, C., ... & Cavanagh, J. (2010). Who is referred to neurology clinics?—the diagnoses made in 3781 new patients. *Clinical neurology and neurosurgery*, 112(9), 747-751.

Stone, J., Warlow, C., & Sharpe, M. (2010). The symptom of functional weakness: a controlled study of 107 patients. *Brain*, 133(5), 1537-1551.

Stone, J., Warlow, C., & Sharpe, M. (2011). Functional weakness: clues to mechanism from the nature of onset. *Journal of Neurology, Neurosurgery & Psychiatry*, jnnp-2011.

Weinman, J., Petrie, K. J., Moss-Morris, R., & Horne, R. (1996). The illness perception questionnaire: a new method for assessing the cognitive representation of illness. *Psychology and health*, 11(3), 431-445.

Whitehead, K., Stone, J., Norman, P., Sharpe, M., & Reuber, M. (2015). Differences in relatives' and patients' illness perceptions in functional neurological symptom disorders compared with neurological diseases. *Epilepsy & Behavior*, 42, 159-164.

Wing, J. K., Beevor, A. S., Curtis, R. H., Park, S. B., Hadden, S., & Burns, A. (1998). Health of the Nation Outcome Scales (HoNOS). Research and development. *The British Journal of Psychiatry*, 172(1), 11-18

Appendix D1

SEARCH STRATEGIES

Cochrane, Embase, Medline, CINAHL, PsychInfo & Web of Science August 2015

FNSD search terms:

1. functional neurological
2. functional n3 neuro*
3. functional neurological symptom*
4. functional somatic symptom*
5. functional somatic syndrome
6. "functional weakness"
7. functional motor
8. functional psychogenic movement disorder
9. psychogenic movement disorder
10. dissociative motor disease
11. conversion disorder
12. hysteria
13. medically unexplained symptoms

Illness perception search terms:

1. IPQ
2. Illness perception*
3. Illness belief*
4. Illness representation*
5. Health belief*/
6. Perception/

Appendix C: Sample Search

Embase Time limit 1996 (publication of original Illness Perception Questionnaire) until present day (August 22, 2015).

Search 1 = 4 papers appropriate for title screening

1. Health belief
2. Functional neurological symp*.af.
3. Illness (adj 3 perception).ab.
4. 1 or 3
5. 2 and 4

Search 2 = 0 papers appropriate (1 rejected)

1. illness rep* = 456 papers
2. functional weakness = 0
3. functional somatic syndrome = 106
4. 1 and 3 = 0
5. illness (adj 3) perception =1314

6. combined 3 and 5 = 0
7. Health beliefs = 2265
8. Combined 3 and 7 = 1

Search 3

= 45 papers appropriate (10 rejected)

1. conversion disorder = 35
2. conversion disorder and illness perception = 2
3. conversion disorder and IPQ = 0
4. dissociative motor disease and Illness perception = 0
5. dissociative (adj 3) motor and illness perception = 0
6. medically unexplained and illness perception = 13
7. medically unexplained and IPQ = 5
8. psychogenic movement disorder and illness perception = 0
9. psychogenic movement and IPQ = 0

Electronic searching resulted in total of

Medline = 131

CINHAL = 226

PsychINFO = 465

Web of Science = 16

Cochrane = 3

Total = 841

After title screen by 1 researcher

237 abstracts reviewed

Appendix D2
Quality Assessment
Study Author/date:
Date:

Rater name:

(All Items scores as 0 = not present or 1 = present) Scoring 0-15: ≤8 (53%) Poor; 9-12 (≥60-≤80%) Medium; 13-15 (≥86.6%) Good.

Rationale -Aims	1. Positive if the objective of the study was sufficiently described.	
Demographic variables	2. Positive if information was reported on participants' gender, age, diagnosis, comorbidities (at least 3 of these).	
Suitability of the design to answer the research question	3. Positive if appropriate research design was used, eg. Ie controls, correlations, qualitative. 4. Positive if control group was equivalent in age, sex, and socioeconomic status.	
The Sample	5. Positive if the source of the participant is stated. 6. Positive if response/participation rate relative to non-participation was stated (ie how many responded to questionnaires). 7. Positive if sample size was justified in relation to a power/calculation and/or the number of independent variables utilised (a recognised rule of thumb is 10 times the number of IVs within a regression analysis: including control and psychological factors).	
Statistical analysis	8: Positive if appropriate statistical methods of analysis were used for the data (specific to the context of the studies aims). 9. Positive if an appropriate statistical adjustment was performed on confounders. 10. Positive if the authors stated if normality distributions were met, and if not, whether data transformation was conducted prior to analysis (if required).	
Presentation of the analysis	11: Positive if the graphs and tables were easy to understand, e.g. presenting a table for regression analyses including R ² values and β weights. 12: Positive if confidence intervals or p values were given for the main results.	
Measures used	13: Positive if all the questionnaires used were standardized, defined as questionnaires that had been validated and published or psychometric properties of new measures were presented. Single items from or partial questionnaires permitted.	
Conclusions	14: Positive if the conclusions were justified based on the research findings	
Total Score and Quality Range		

Quality tool adapted from Mechelen, v., W, Ariens, G. A. M., Bongers, P. M., Bouter, L. M., & Wal, v. d., G. (2001). Psychosocial risk factors for neck pain: A systematic review. *American Journal of Industrial Medicine*, 39(2), 180-193. doi:10.1002/1097-0274(200102)39:2<180::AID-AJIM1005>3.0.CO;2-

