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The role of experiential avoidance and effectiveness of a formulation and brief Acceptance and Commitment Therapy intervention for Functional Neurological Disorder

by

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Thesis for the degree of Doctor in Clinical Psychology

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Abstract

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This thesis explored the role of experiential avoidance (EA) and effectiveness of a formulation and brief Acceptance and Commitment Therapy (F-ACT) intervention for people with Functional Neurological Disorder (FND). The first chapter includes a systematic review and meta-analyses reporting on levels of experiential avoidance in adults with FND. Studies frequently reported elevated levels of EA in FND. Significantly higher levels of EA were only found in FND in comparison to the healthy controls, but not in comparison to neurological controls. Therefore, EA may play a transdiagnostic role in FND. However, EA processes may be accounted for by other comorbid psychiatric diagnoses. The second chapter includes an empirical paper reporting on the acceptability and effectiveness of the F-ACT intervention for people with FND using a withdrawal/reversal single case experimental design. This intervention was safe and well accepted by people with FND (n = 4). It was effective at reducing levels of FND symptom related distress. Following the intervention participants were able to engage more in meaningful activities and symptom reduction was observed during the intervention. The majority of participants reported significant reliable change in improved psychological health and emotional processing, following the ACT phase. Therefore, formulation and ACT, even when used briefly, can result in improved outcomes for people with FND. ACT may be the active component that facilitates change. This thesis suggests that ACT processes play a role in FND and can be successfully targeted by brief ACT interventions.

Keywords: FND, ACT, formulation, experiential avoidance, treatment

Table of Contents

Table of Tables

Chapter 1

Chapter 2

Table of Figures

Chapter 1

Chapter 2

Research Thesis: Declaration of Authorship

Print name: Irma Konovalova

Title of thesis: The role of experiential avoidance and effectiveness of a formulation and brief Acceptance and Commitment Therapy intervention for Functional Neurological Disorder

I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. None of this work has been published before submission

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Abbreviations

AAQ-II ..... Acceptance and Action Questionnaire-II

ACT ..... Acceptance and Commitment Therapy

BIPQ..... Brief Illness Perception Questionnaire

CBT ..... Cognitive Behaviour Therapy

CD ..... Conversion Disorder

CMA..... Comprehensive Meta-Analysis Software

COPE ..... Coping Orientation to Problems Experienced

CORE-OM..... Clinical Outcomes in Routine Evaluation – Outcome Measure

EA ..... Experiential Avoidance

EPS..... Emotional Processing Scale

F-ACT ..... Formulation and Brief Acceptance and Commitment Therapy

FND..... Functional Neurological Disorder

FMD ..... Functional Motor Disorder

FS ..... Functional Seizures

MEAQ ..... Multidimensional Experiential Avoidance Questionnaire

RCT ..... Randomised Controlled Trial

RCI ..... Reliable Change Index

SCED ..... Single Case Experimental Design

SQAC..... Standard Quality Assessment Criteria

QoL ..... Quality of Life

WSAS ..... Work and Social Adjustment Scale

Chapter 1

Experiential avoidance in adults with Functional Neurological Disorder: A systematic review and meta-analyses

This chapter is written as a manuscript, excluding the formal title page, for the Journal of Neuropsychiatry and Clinical Neurosciences (see Appendix A for author guidelines)

Abstract

Background: Psychological theories and explanations postulate the role of avoidance in functional neurological disorder (FND) predisposition and maintenance. Studies have reported elevated levels of experiential avoidance (EA) in FND subtypes. However, a comprehensive review bringing FND subtypes together is lacking. Aims: To systematically review and critically appraise the evidence of EA in adults with FND, and to explore whether levels of EA differ in those with FND compared to the general population and those with neurological conditions. Method: We searched PsychInfo, Medline and Web of Science up to November 2022, including grey literature databases, combining terms of FND and EA. The findings were synthesised qualitatively and where possible EA scores were included in meta-analyses. Results: Twenty-five studies were eligible (FND *n* = 1830), most commonly case-control. Elevated levels of EA were frequently reported in FND. Significantly higher levels of EA were only found in FND in comparison to the healthy controls (*g* = .65, 95% CI 0.134 to 1.159, I^2 = 84%), but not in comparison to neurological controls. Conclusion: Our findings suggest that EA may play a transdiagnostic role in FND. However, EA processes may be accounted for by other comorbid psychiatric diagnoses. More robust studies, that are inclusive of all FND subtypes and using validated measures of EA, are needed in order to draw conclusions.

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Introduction

Functional neurological disorder (FND), also termed conversion disorder (CD), is a neuropsychiatric condition that presents with genuinely experienced distressing and debilitating symptoms in motor, sensory or cognitive domains, which are primarily associated with changes in the brain network function, rather than structural abnormalities (1). FND could be seen as an umbrella term that describes a heterogenous group of syndromes: functional seizures (FS), also termed psychogenic non-epileptic seizures or dissociative seizures, functional movement disorder (FMD), functional cognitive disorder and speech related difficulties. FND frequently co-occurs with other neurological (2) and psychiatric (3) conditions.

Psychological theories and explanations have postulated the role of avoidance in FND subtype predisposition and maintenance. Recently, MacGillivary and Lidstone (4) proposed the role of avoidance in predisposing, precipitating and perpetuating FMD in their biopsychosocial conceptualisation. Psychodynamic explanations suggest that FND may serve a secondary gain of avoidance of unwanted tasks and associated stress (5, 6). Similarly, cognitive behavioural explanations propose that FND symptoms may serve a function to avoid perceived threat (6) or as a safety behaviour that maintains FS (5). Based on this premise, the first large psychotherapy randomised controlled trial (RCT) targeting avoidance in FS has been conducted (7).

Despite the psychological explanations emphasising the role of avoidance in FND and therapy trials targeting this process, attempts at systematically studying and reviewing this is limited. The only meta-analysis that explored avoidance in adults with FS found avoidance to be significantly higher in FS compared to epilepsy and healthy controls (8). However, the findings from this meta-analysis cannot be generalised to the

wider FND population. Additionally, the reviewed studies included participants under the age of 18, further limiting the conclusions for adults with FND.

Experiential avoidance (EA) is described as unwillingness to be present with difficult, unwanted private experiences (thoughts, emotions, memories, sensations, etc.) and behaviour aimed at changing or getting rid of such experiences or events that evoke them (9). Common processes of EA include cognitive and emotional suppression, denial, distraction, alcohol and substance use, avoidance coping and dissociation (10, 11). A recent meta-analysis found elevated levels of dissociation in FND compared to healthy and neurological controls, associated with poorer quality of life and more severe FND symptoms (12).

EA is a well-established transdiagnostic and transcultural process in a variety of psychological presentations commonly present in adults with FND (3), such as anxiety, depression and posttraumatic stress disorder (13). Since EA has not been systematically reviewed in FND as a core condition, rather than in its singular syndromes, the purpose of this systematic review and meta-analyses was to update and summarise the available evidence relating to EA in adults with FND, as a symptom or potential transdiagnostic process. The primary aim was to systematically review and critically appraise the evidence of EA in adults with FND. The secondary aim was to explore whether levels of EA differ in those with FND compared to the general population, as well as those with a neurological condition.

Method

Protocol registration

A protocol for this review was registered on PROSPERO on 13/12/2022 (ref CRD42022371154).

Search strategy

The following databases were searched on 14 November 2022: PsychINFO, Medline and Web of Science Core Collection. Grey literature was searched on 28 November 2022, on Open Grey and ProQuest databases. Reviews of references in relevant systematic reviews were completed for further identification of potential articles.

The following search terms were used for FND (“Functional Neurological Disorder*” OR “Conversion Disorder*” OR "Non*epileptic" OR “Functional Neurological” OR “Functional movement disorder” OR “Functional Motor Disorder” OR “Unexplained Neurological” OR Pseudoseizure* OR “Dissociative Seizure*”) and EA ("experiential avoidance" OR "emotion suppress*" OR “Emotion control” OR Avoid* OR “Thought Suppress*” OR “Avoid* coping” OR “Psychological inflexibility” OR “drug use” OR “drug misuse” OR “alcohol use” OR “alcohol misuse” OR “drug consumption” OR “alcohol consumption” OR ruminat* OR distraction OR dissociation OR denial OR disengagement OR "cognitive control"). Subject medical headings were included where appropriate and Boolean Operators (for full search terms see Appendix B). All terms were searched for in the title and abstract.

Eligibility criteria

Studies were eligible for inclusion if they reported EA in FND adult populations, published or translated into English.

The study inclusion criteria were: (a) Reported on EA, and its processes: emotion/thought suppression or control, avoidance, avoidant coping, psychological inflexibility, drug/alcohol use/misuse/consumption, rumination, distraction, denial, disengagement and cognitive control, (b) Participants with FND diagnosis (Conversion Disorder, Non-epileptic/ Psychogenic/Dissociative Seizures, Functional movement/motor disorder, unexplained neurological symptoms), (c) Human participants aged ≥18 years old, (d) Quantitative and qualitative studies.

The following exclusion criteria were applied: (a) Studies with FND participants with a comorbid neurological diagnosis (e.g. epilepsy), (b) Participants under 18 years of age, (c) Reviews and meta-analyses, (d) Conference posters, abstracts, proposals, consensus statements, expert opinions, letters, news, and commentary. Dissociation was excluded, as a meta-analysis covering dissociation in FND was published in due course (12).

Study Screening

After removing duplicates, all titles and abstracts were screened by the first author (IK), 10% of randomly selected abstracts were screened by another reviewer (CL), any that did not meet eligibility criteria were excluded. Only one paper resulted in disagreement and was addressed by another author (WD). Obtained full text papers were screened for eligibility by one author (IK); exclusion reasons were documented.

Data extraction

For included studies, the following information was extracted where available: study authors and publication date, location, FND and control sample characteristics (type, sample size, average age, gender ratio), type of EA, EA measure, summary of key findings. For studies that used outcome measures, means and standard deviations were extracted. Data extraction was completed by one author (IK). To check the accuracy, 20% of randomly selected papers were checked by another reviewer (CL).

Quality Appraisal

Studies were evaluated for quality and risk of bias by one author (IK) using Standard Quality Assessment Criteria (SQAC) for Evaluation Primary Research Papers (14). Since the studies were heterogenous in their design, this tool lent itself well to evaluate qualitative (See Appendix C) and quantitative study (See Appendix D) designs. All of the studies included met the cut-off criteria for inclusion (>55% total score) based on the SQAC tool. Nineteen studies were above the 75% cut-off for inclusion and 6 studies were in the range from 55% to 75% cut-off. Examples of some sources of bias included the following: hospital based samples (k = 15), either small sample sizes or no report of power calculations, lack of control groups, and inadequate control for confounding variables.

Synthesis Method

Studies included within the qualitative synthesis were screened for appropriateness of meta-analysis with either healthy or neurological controls as comparison groups. Studies were included if they reported mean and standard deviation for a validated measure of EA or a process of EA, for both FND and comparison groups. Studies with missing data were not included in the meta-analysis. Standard errors were converted to standard deviations as per Cochrane recommendations (15).

The meta-analyses used a random-effects model when calculating experiential avoidance with Hedges' g effect size metrics using the Comprehensive Meta-Analysis (CMA) package (16) with guidance. To assess the risk of bias, funnel plots were generated.

Results

The study selection process and the results are shown in a PRISMA (17) diagram (Figure 1). Forty-one full-text studies were screened for eligibility and 25 studies were included in the qualitative synthesis. A summary of findings and study characteristics are provided below.

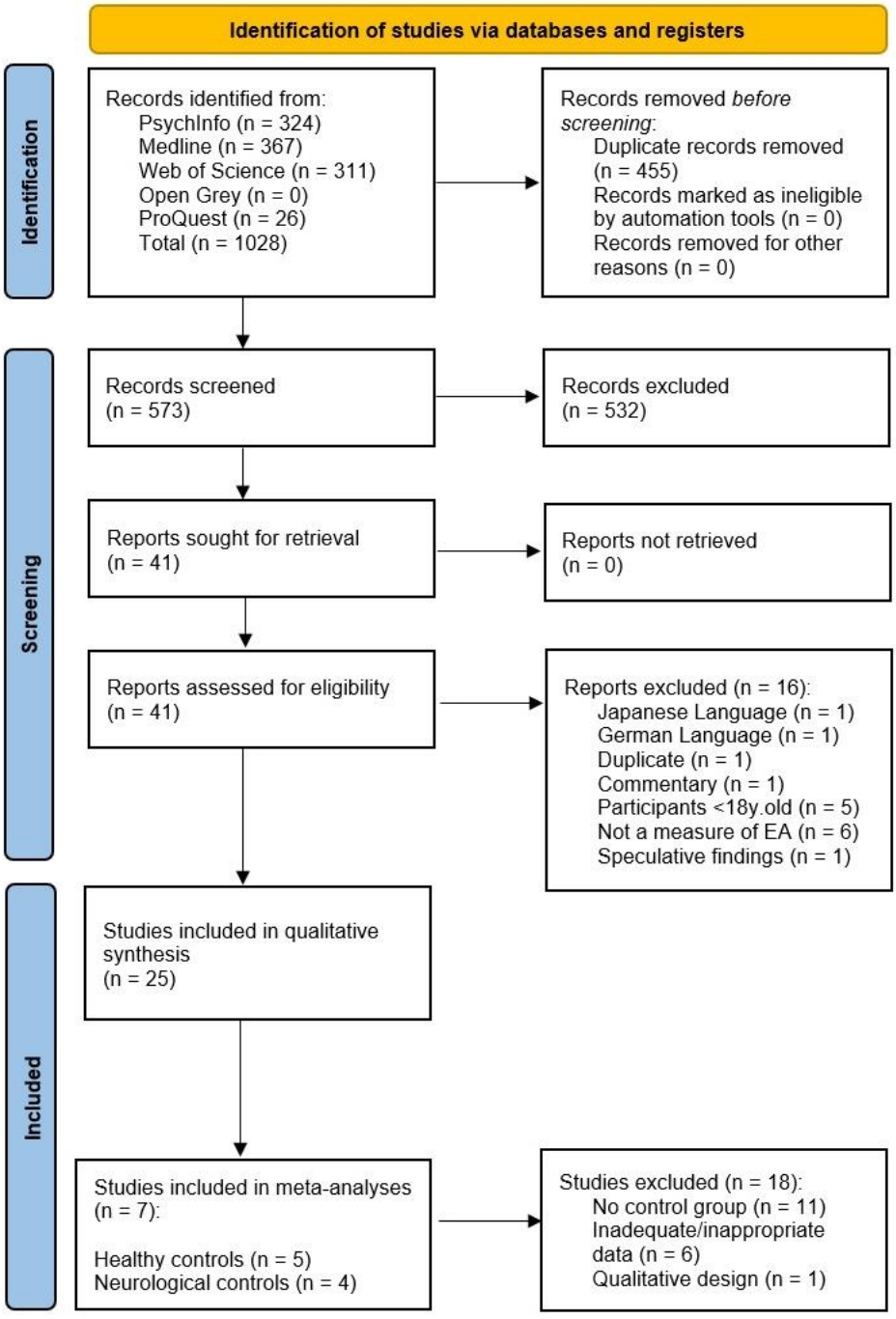


Figure 1 PRISMA flow diagram

Study characteristics

Study characteristics (location, design, participant characteristics, EA measures and key findings) are presented in Table 1. Included studies were published between 1997 and 2021. Case control studies were the most common (*k* = 14), followed by cohort design (*k* = 6), case study designs (*k* = 3), an observational design and a single qualitative study. There were a total of 1830 FND participants, of which 1605 were described as having FS (*k* = 21) and 225 as having CD (*k* = 4). The most common comparison groups were epilepsy samples (*k* = 7), followed by healthy control samples (*k* = 6). The mean age of FND participants ranged from 27.25 to 44.9 years, with the oldest reported age range from 61 to 80 years. The percentage of female FND participants ranged from 15.2% to 92.5%. Majority of the studies were conducted in the USA (*k* = 10) and UK (*k* = 9), two studies in Turkey, and singular studies from Sweden, Canada, Pakistan and one multi-national study.

Outcome measures

A variety of questionnaires were used to measure EA and its processes in FND populations. Eleven studies used non-validated or self-devised self-report questionnaires to measure EA process (18-27). Sixteen studies used validated self-report questionnaires (19, 28-42). However, only four studies utilised questionnaires that measure EA as a construct (28, 30, 32, 33). These included the Acceptance and Action Questionnaire-II, AAQ-II (43) and Multidimensional Experiential Avoidance Questionnaire, MEAQ (44). Another four studies inferred avoidance from measuring avoidant coping (34, 38, 39) using The Ways of Coping Questionnaire (45) and The Coping Inventory for Stressful Situations(46), avoidance of situations (35) was measured via a Fear Questionnaire (47).

Other EA processes included denial measured via Illness Behaviour Questionnaire (48), rumination using the Perseverative Thinking Questionnaire (49), thought suppression measured via the White Bear Suppression Inventory (50) and emotion suppression measured using Affective Style Questionnaire (51) and The Emotion Regulation Questionnaire (52).

Coping Orientation to Problems Experienced (COPE) Inventory (53) and brief COPE (54) were used to measure multiple aspects of EA, such as distraction, denial, substance use and behavioural and mental disengagement.

Experiential Avoidance

Levels of EA have been found to be above the clinical cut-off or within the mean of a psychiatric population (28, 30, 33) in FND, when assessed as a construct using validated questionnaires (43, 44). However, direct comparisons to the general population or clinical controls have not been made. One study that included comparison groups, found higher levels of EA in people with FS compared to non-clinical and epilepsy controls (32).

Higher degrees of EA have been found in people with FS with altered responsiveness (i.e. not responding verbally during seizure episodes), compared to those who are responsive during episodes (28). However, this study was confounded by comorbid epilepsy, which was not controlled for. Cullingham et al (30) found an association between higher levels of EA and greater negative impact of FS on people's lives in a large multi-national sample (*n* = 285). Whereas another study reported a strong correlation between levels of EA and self-reported FS frequency (32).

Avoidance

Some studies inferred avoidance from questionnaires that measure avoidant coping and avoidance of situations. Myers et al (38) reported significantly higher levels of

cognitive and behavioural avoidant coping in males with FS compared to females. Similarly, above the average score of avoidant coping was reported in a case study of a male with FS (39), who's scores increased to very much above the average following a psychodynamic therapy. Another study that compared FS to non-clinical controls found significantly higher levels of avoidant coping in FS (34).

Goldstein et al (35) found significantly higher levels of agoraphobia in FS, within the clinical range, compared to epilepsy controls. They concluded that higher levels of agoraphobia suggest higher levels of avoidance behaviour. Although both of the studies (34, 35) had small group sizes. Similarly, using a locally devised questionnaire, but in a larger sample of FS (*n* = 368), researchers found that people with FS were more avoidant of situations and activities than of people. This occurred because they feared seizure occurrence. Such avoidance was higher in male participants, however after multiple comparison adjustments this difference was not significant (20).

Results from a qualitative study with individuals with FS (*n* = 30) who engaged in cognitive behavioural therapy for FS reported that emotional or behavioural avoidance may have been a barrier to engaging in therapy tasks. Three participants identified emotional disconnectedness that authors interpreted as emotional avoidance. There were also reports of avoidance of traumatic memories (25). Similarly, Brough (18) concluded that FS may serve a function of avoidance or reduction in stress following a Multiple Sequential Functional Analysis (*n* = 3).

Denial

While Binzer et al (29) found high levels of denial of life problems in both CD and neurological control groups, there was no significant difference between the groups. They also reported a negative correlation between denial and depression severity. Similarly, Evershed et al (19) found no significant difference between FS and epilepsy groups on

denial of life stress. However, when assessing denial with a non-validated measure, they reported that FS group had higher levels of anxiety and depression denial before diagnosis compared to an epilepsy group. This difference was no longer present after diagnosis.

Evershed et al (19) also reported that people with FS had higher levels of total denial (i.e. denial of anxiety and depression symptoms combined) before diagnosis compared to post-diagnosis. Another study reported denial of any stressors or psychosocial problems in 9 out of 45 participants with FS (22), and that this had a significant association with seizure occurrence in the 3 to 5.5 months after receiving a diagnosis. However, the method for measuring this was unclear.

Emotion and Thought Suppression

Emotion suppression refers to active attempts to inhibit emotion-expressive behaviour (55), whereas thought suppression refers to an attempt to control or ignore unwanted thoughts (56). One study reported significantly higher levels of emotion suppression in people with FS compared to healthy controls (36), however they did not address the group difference in that FS group reported comorbid psychiatric diagnoses which were not matched for in the control group. Whereas a study that compared FS to FS with mixed epilepsy found no significant difference in emotion suppression (31). However, the group sizes were unequal, with a substantially larger FS-only group (n = 206 v n = 18).

Similar to emotion suppression, Özdemir et al (40) found significantly higher scores of thought suppression in people with CD when compared to healthy controls. However, this difference was only observed for people with CD with significantly high depression scores. Thought suppression was significantly correlated with number of common bodily sensations and severity of depressive symptoms among CD patients.

Rumination

One study that used a validated questionnaire to assess rumination found higher levels of rumination in FS compared to people with epilepsy. They reported that FS were independently associated with repetitive negative thinking (42). Another study that operationalised rumination as higher frequency of thinking about a stressful life event, found higher levels of rumination in FS compared to people with epilepsy, as well (27). However, in contrast to the previous study (42), once life stress was controlled for, this effect was no longer observed. Both studies included small samples and unequal groups.

Multiple Factors

Two studies used the COPE inventory (53) and looked at multiple processes of EA: distraction, denial, substance use and behavioural and mental disengagement. Testa et al (41) found no significant differences in coping between FS and epilepsy and healthy controls. However, they found that higher levels of negative life event distress were associated with increased levels of denial and mental disengagement in FS.

While not using a comparison group, Kairys (37) found a negative correlation between the percentage of events involving loss of awareness during FS and the use of self-distraction. People who experienced more loss of awareness events during a FS were less likely to use distraction to cope with FS.

Substance and Alcohol Use

Small numbers of substance (.5%) and alcohol (.5%) dependence and substance (.2%) and alcohol (1.3%) abuse were reported in a larger FS cohort *(n* = 368) (20). In contrast, LaFrance et al (23) reported higher levels of alcohol and substance use in a veteran FND sample. Of veterans who were assessed in the clinic (*n* = 16) 56.3% reported current and 68.8% reported past substance abuse, while 25% reported illicit drug and

marijuana use, and 31.3% reported current alcohol use. Similarly, of veterans who were assessed via telehealth (*n* = 56) 42.9% reported current and 64.3% reported past substance abuse, as well as 35.7% reported current alcohol use. Illicit drug use and marijuana use was reported by 16% and 14.2% participants.

While Massot-Tarrús et al (24) found the same use of marijuana in epilepsy and FS, Slocum et al (26) found that people with CD were less likely to report alcohol or illicit drug use compared to a control group from a psychiatric service. Alcohol use was reported by 0% and illicit drug use was reported by 4.8% of CD group (*n* = 21).

Güleç et al (21) compared alcohol and drug use across CD patients who have either attempted a suicide or not. Risky alcohol use (reported by 30.3%) was the best predictor of suicide attempts in CD and significantly more present in the suicide attempt group than in no suicide-attempt and healthy control groups. Drug abuse did not differ across groups.

Summary

While lacking in control groups to draw comparisons, some studies have reported high levels of EA in FND that are within the clinical cut-off. Similarly, heightened avoidant coping has been reported in FS, as well as avoidance of situations and places, resembling agoraphobic behaviours. There is also emerging qualitative evidence to support the notion of higher avoidance in FND. Although it is important to note that all studies have used different outcome measures and at times unvalidated measures to infer avoidance behaviours.

Studies that assessed processes of EA have less consistent findings. The majority of studies reported no difference in levels of denial between FND and neurological controls. However, when differences were found they were assessed using non-validated

questionnaires and accounted for by other factors, like pre and post diagnosis. Similarly, studies exploring emotion suppression and rumination yielded mixed findings and higher levels of thought suppression in FND were accounted for by higher levels of depression.

Generally, small numbers of alcohol and substance use have been reported in FND. However, alcohol and substance use were higher in veterans with FND and those people who have attempted suicide. It became apparent that increased levels of EA were associated with other factors: depression, psychiatric comorbidity, life stress. Additionally, findings differed between the studies that used validated and those that used unvalidated measures.

Meta-analyses of Experiential Avoidance

Two random-effects meta-analyses were conducted using CMA software (16).

Experiential avoidance: FND versus healthy controls

Figure 2 displays results of the random-effects model investigating EA in all samples with FND (FS and CD, *n* = 242) compared with healthy controls (*n* = 223), combining data from 5 studies. The FND group showed a significant effect towards increased EA compared with healthy controls (*g* = .65, 95% CI 0.134 to 1.159, I^2 = 84%), Z = 2.473, *p* = .013, the prediction interval is -1.236 to 2.529. Heterogeneity Q = 25.42, df = 4, *p* < .001, Tau^2 = .282. A funnel plot (see Appendix E) of data shows asymmetry, which could indicate publication bias.

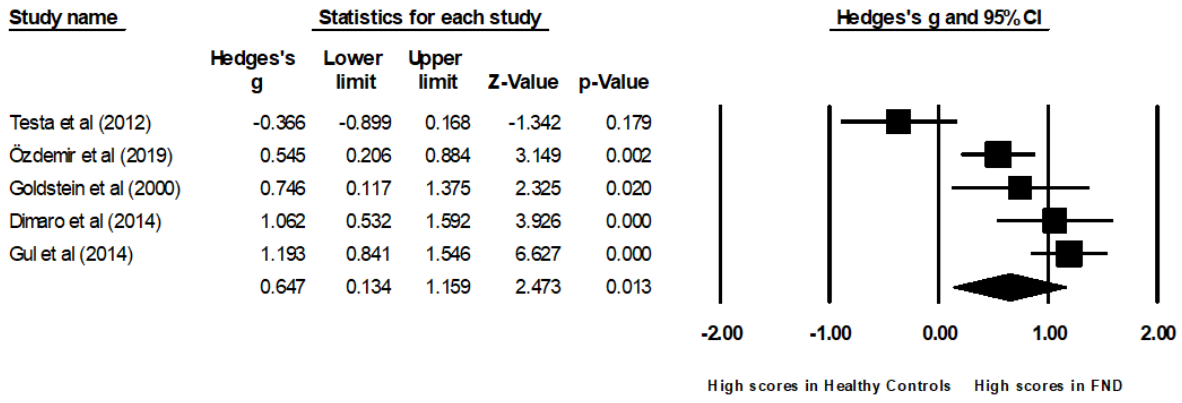


Figure 2 Experiential avoidance scores in FND compared with healthy controls.

Experiential avoidance: FND versus neurological controls

Figure 3 displays results of the random-effects model investigating experiential avoidance scores in FND (functional seizures, *n* = 121) compared with neurological controls (*n* = 93), combining data from 4 studies (Figure 3). The FND group did not show a significant difference in experiential avoidance scores compared to neurological controls (*g* = .45, 95% CI -0.122 to 1.021, I^2 = 76%), Z = 1.541, *p* = .123, the prediction interval is -2.076 to 2.974. Heterogeneity Q = 12.73, df = 3, *p* = 0.005, Tau^2 = 0.259. A funnel plot (see Appendix F) of data shows asymmetry, which could indicate publication bias.

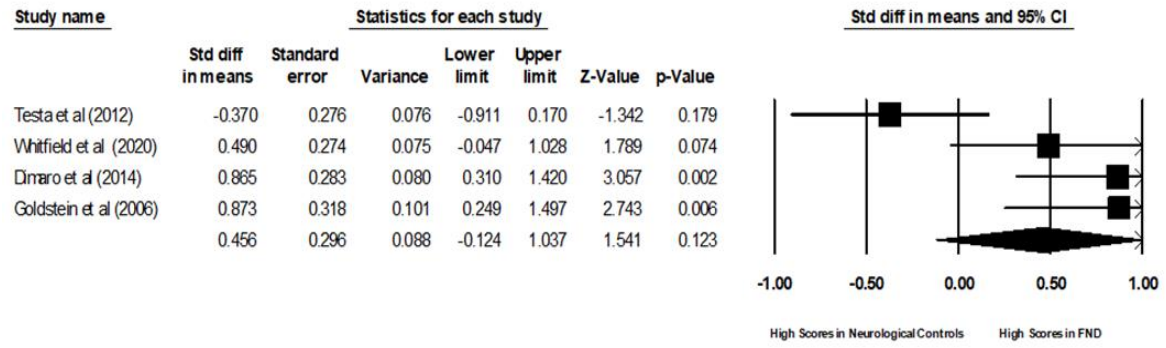


Figure 3 Experiential avoidance scores in FND compared with neurological controls.

Discussion

The primary aim of this systematic review was to provide a qualitative synthesis and critical appraisal of the empirical evidence in this field. The secondary aim was to compare levels of EA in FND with healthy and neurological populations. The findings from two meta-analyses revealed significantly higher levels of EA in FND when compared to a healthy sample only. There was no difference between FND and neurological populations, comprising of FS and epilepsy controls. These findings only partially support the previous meta-analysis that found higher avoidance in FS compared to healthy and epilepsy controls (8).

The latter findings may suggest that the mechanisms behind distress may be similar across disorders, despite the type of diagnosis one receives. Studies that used validated measures of EA as a construct, rather than its processes, observed the same levels of EA in FND as seen in psychiatric populations (28, 30, 32). This may suggest that EA is a transdiagnostic process in FND, similarly like in anxiety, depression and PTSD (13). EA has been found to relate to FS frequency (32) and the impact on life (30). Only one study found higher levels of EA in FS than epilepsy, using a validated EA measure (32). On the other hand, the lack of significance between FS and epilepsy controls in a meta-analysis may be accounted for by the heterogeneity of measures used across the studies. All of the studies measured different process of EA, such as EA as a unitary construct (30), agoraphobia (33), denial (41) and rumination (42).

Nonetheless, a qualitative synthesis of studies suggests that avoidance may be an important factor in FS. Goldstein et al (35) found higher levels of agoraphobia in FS than in epilepsy, meeting a diagnostic threshold. Males with FS displayed more avoidant behaviours (38), and avoidance of situations and activities may be more common than avoidance of people in FS (20). Similarly, avoidant coping is more predominant in FS than

in a non-clinical group (34). These findings may support the proposition that avoidance maintains FS (5), people engage in avoidance of situations and places due to a fear of having seizures. However, based on the current evidence, we cannot generalise this to the wider FND population.

While there is substantial evidence for higher levels of EA and more behavioural avoidance in FND, when we break down EA into its processes the findings are less consistent. Levels of denial do not appear to differ between FND and control groups (19, 29, 41), but they have been found to be associated with other factors such as depression (29) and diagnosis reception (19). Similarly, thought suppression was associated with increased levels of depression in CD (40). While emotion suppression was higher in FS than healthy controls (36), it was not in a mixed epilepsy and FS group (31). Rumination was the only process independently associated with FS and found to be higher than in epilepsy (42).

Similar mixed findings have been reported for substance and alcohol use related behaviours. Some found no difference (21, 24) or low numbers of substance use in FND (20, 26), unless it has been associated with other factors such as suicide (21). Higher levels of substance misuse have been reported in veterans with FND (23). Multiple studies demonstrated that depression (29, 40), distress as a result of negative life events (41), higher levels of stress (27) and suicidality (21) were associated with heightened levels of EA in FND subtypes. However, further investigation is required using appropriate statistical methods (e.g. mediation) to determine the specific nature of these relationships. Therefore, it is important to consider other comorbidities when interpreting the findings and working clinically with this group of people. In addition these comorbidities that are associated with EA in FND, are also commonly observed in

neurological disorders (57, 58). Therefore, this might explain the lack of significant difference between FND and neurological disorders.

While most studies measuring EA through validated questionnaires indicated high levels of EA in FND, at times above the clinical cut-off scores, the majority of studies measuring or describing processes of EA reported mixed findings. Such variance in EA levels may be accounted for by the general heterogeneity of a FND population or the variety of measures used. Thirteen different measures were used, of which only two were measuring EA as a construct (43, 44). There is a clear need for a more unanimous way of measuring EA, with robust and valid measures, the two most common measures are the AAQ-II (43) and MEAQ (44). Multiple theoretical models postulate the role of avoidance in FND maintenance (4-6); however this appears to be based on somewhat questionable evidence.

Further limitations may affect the generalisability of this systematic review and meta-analyses. The majority of studies had small sample sizes, with potentially biased samples recruited from similar hospital sites. More robust future studies are required, with larger sample sizes that explore the role of other possible mediating factors, such as comorbidities and other transdiagnostic processes. Eighty-four percent of studies focused on FS, which is a subtype of FND. The meta-analyses were based on a small number of studies with high heterogeneity, limiting the interpretation of the findings. There is a future need to explore EA in different FND subtypes, with adequate control groups.

In conclusion, this systematic review reported higher levels of EA in FND, especially in comparison to healthy controls. There is some evidence to suggest that EA may play a transdiagnostic role in FND which could be targeted by psychotherapy. However, more robust research, inclusive of all FND subtypes using validated measures of EA, are needed for more conclusive evidence.

References

1. Hallett M, Aybek S, Dworetzky BA. Functional neurological disorder: new subtypes and shared mechanisms (vol 21, pg 537, 2022). Lancet Neurol. 2022;21(6):E6-E.

2. Stone J, Carson A, Duncan R, Roberts R, Coleman R, Warlow C, et al. Which neurological diseases are most likely to be associated with "symptoms unexplained by organic disease". Journal of Neurology. 2012;259(1):33-8.

3. Patron VG, Rustomji Y, Yip C, Jenkins LM. Psychiatric comorbidities in functional neurologic symptom disorder. Practical neurology (Fort Washington, Pa). 2022;21(3):71.

4. MacGillivray L, Lidstone SC. The Biopsychosocial Formulation for Functional Movement Disorder. Functional Movement Disorder: An Interdisciplinary Case-Based Approach: Springer; 2022. p. 27-37.

5. Carson A, Ludwig L, Welch K. Psychologic theories in functional neurologic disorders. Hand Clinic. 2016;139:105-20.

6. Raynor G, Baslet G. A historical review of functional neurological disorder and comparison to contemporary models. Epilepsy & Behavior Reports. 2021;16.

7. Goldstein LH, Mellers JDC, Landau S, Stone J, Carson A, Medford N, et al. COgnitive behavioural therapy vs standardised medical care for adults with Dissociative non-Epileptic Seizures (CODES): a multicentre randomised controlled trial protocol. Bmc Neurol. 2015;15.

8. Cullingham T, Kirkby A, Sellwood W, Eccles FJR. Avoidance in nonepileptic attack disorder: A systematic review and meta-analyses. Epilepsy & Behavior. 2019;95:100-11.

9. Hayes SC, Wilson KG, Gifford EV, Follette VM, Strosahl K. Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. J Consult Clin Psych. 1996;64(6):1152-68.

10. Chapman AL, Gratz KL, Brown MZ. Solving the puzzle of deliberate self-harm: The experiential avoidance model. Behav Res Ther. 2006;44(3):371-94.

11. Chawla N. Experiential avoidance as a functional dimensional approach to psychopathology: An empirical review. Journal of Clinical Psychology. 2007;63(9):871-90.

12. Campbell MC, Smakowski A, Rojas-Aguiluz M, Goldstein LH, Cardena E, Nicholson TR, et al. Dissociation and its biological and clinical associations in functional neurological disorder: systematic review and meta-analysis. BJPsych Open. 2022;9(1):e2.

13. Akbari M, Seydavi M, Hosseini ZS, Krafft J, Levin ME. Experiential avoidance in depression, anxiety, obsessive-compulsive related, and posttraumatic stress disorders: A comprehensive systematic review and meta-analysis. J Context Behav Sci. 2022;24:65-78.

14. Kmet LM, Cook LS, Lee RC. Standard quality assessment criteria for evaluating primary research papers from a variety of fields. 2004.

15. Higgins J, Li T, Deeks J, Thomas J, Chandler J, Cumpston M, et al. Obtaining standard errors from confidence intervals and P values: absolute (difference) measures. Cochrane Handbook for Systematic Reviews of Interventions. 2017.

16. Borenstein M, Hedges, L., Higgins, J., & Rothstein, H. . Comprehensive Meta-Analysis Version 4. Englewood, NJ: Biostat; 2022.

17. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. International journal of surgery. 2021;88:105906.

18. Brough JL. Using multiple sequential functional analysis (msfa) to identify potential developmental pathways of non-epileptic attack disorder (nead). Ann Arbor: University of Lincoln (United Kingdom) PP - England; 2016.

19. Evershed K. An investigation of illness perceptions and beliefs in people with non-epileptic attack disorder pre- and post-diagnosis, in comparison to individuals with epilepsy. Ann Arbor: The University of Manchester (United Kingdom) PP - England; 2007.

20. Goldstein LH, Robinson EJ, Mellers JDC, Stone J, Carson A, Chalder T, et al. Psychological and demographic characteristics of 368 patients with dissociative seizures: data from the CODES cohort. Psychological medicine. 2021;51(14):2433-45.

21. Güleç MY, Ýnanç L, Yanartaþ Ö, Üzer A, Güleç H. Predictors of suicide in patients with conversion disorder. Comprehensive psychiatry. 2014;55(3):457-62.

22. Kanner AM, Parra J, Frey M, Stebbins G, Pierre-Louis S, Iriarte J. Psychiatric and neurologic predictors of psychogenic pseudoseizure outcome. Neurology. 1999;53(5):933-8.

23. LaFrance WC, Jr, Ho WLN, Bhatla A, Baird G, Altalib HH, Godleski L. Examination of Potential Differences in Reporting of Sensitive Psychosocial Measures via Diagnostic Evaluation Using Computer Video Telehealth. The Journal of neuropsychiatry and clinical neurosciences. 2020;32(3):294-301.

24. Massot-Tarrús A, McLachlan RS. Marijuana use in adults admitted to a Canadian epilepsy monitoring unit. Epilepsy & behavior : E&B. 2016;63:73-8.

25. Read J, Jordan H, Perdue I, Purnell J, Murray J, Chalder T, et al. The experience of trial participation, treatment approaches and perceptions of change among participants with dissociative seizures within the CODES randomized controlled trial: A qualitative study. Epilepsy & behavior : E&B. 2020;111:107230.

26. Slocum S, Holroyd S. Conversion Disorder in an Appalachian Community. Southern medical journal. 2016;109(8):450-3.

27. Tojek TM, Lumley M, Barkley G, Mahr G, Thomas A. Stress and other psychosocial characteristics of patients with psychogenic nonepileptic seizures. Psychosomatics. 2000;41(3):221-6.

28. Baslet G, Tolchin B, Dworetzky BA. Altered responsiveness in psychogenic nonepileptic seizures and its implication to underlying psychopathology. Seizure. 2017;52:162-8.

29. Binzer M, Eisemann M, Kullgren G. Illness behavior in the acute phase of motor disability in neurological disease and in conversion disorder: A comparative study. Journal of Psychosomatic Research. 1998;44(6):657-66.

30. Cullingham T, Kirkby A, Eccles FJR, Sellwood W. Psychological inflexibility and somatization in nonepileptic attack disorder. Epilepsy & Behavior. 2020;111.

31. Dautoff RJ. Exploring predictors of treatment efficacy in patients with psychogenic non-epileptic seizures: ProQuest Information & Learning; 2018.

32. Dimaro LV, Dawson DL, Roberts NA, Brown I, Moghaddam NG, Reuber M. Anxiety and avoidance in psychogenic nonepileptic seizures: the role of implicit and explicit anxiety. Epilepsy & behavior : E&B. 2014;33:77-86.

33. Foley C, Eccles F. Exploring the Experience of Stigma in Functional Neurological Disorder and Mindfulness for Functional Seizures. Ann Arbor: Lancaster University (United Kingdom) PP - England; 2021.

34. Goldstein LH, Drew C, Mellers J, Mitchell-O'Malley S, Oakley DA. Dissociation, hypnotizability, coping styles and health locus of control: characteristics of pseudoseizure patients. Seizure. 2000;9(5):314-22.

35. Goldstein LH, Mellers JDC. Ictal symptoms of anxiety, avoidance behaviour, and dissociation in patients with dissociative seizures. Journal of neurology, neurosurgery, and psychiatry. 2006;77(5):616-21.

36. Gul A, Ahmad H. Cognitive deficits and emotion regulation strategies in patients with psychogenic nonepileptic seizures: a task-switching study. Epilepsy & behavior : E&B. 2014;32:108-13.

37. Kairys AE, Grigsby J. Characterization of Subjective Seizure Semiology in Patients with Psychogenic Nonepileptic Seizures: A Mixed Methods Approach. Ann Arbor: University of Colorado at Denver PP - United States -- Colorado; 2019.

38. Myers L, Trobliger R, Bortnik K, Lancman M. Are there gender differences in those diagnosed with psychogenic nonepileptic seizures? Epilepsy & behavior : E&B. 2018;78:161-5.

39. Myers L, Zaroff C. The Successful Treatment of Psychogenic Nonepileptic Seizure Using a Disorder-Specific Treatment Modality. Brief Treatment and Crisis Intervention. 2004;4(4):343-52.

40. Ozdemir P, Kirli U, Isik M, Tapan S. The role of thought suppression in conversion disorder in relation to depression, symptom interpretation and sleep hygiene: a case-control study. ARCHIVES OF CLINICAL PSYCHIATRY. 2020;47(3):59-64.

41. Testa SM, Krauss GL, Lesser RP, Brandt J. Stressful life event appraisal and coping in patients with psychogenic seizures and those with epilepsy. Seizure. 2012;21(4):282-7.

42. Whitfield A, Walsh S, Levita L, Reuber M. Catastrophising and repetitive negative thinking tendencies in patients with psychogenic non-epileptic seizures or epilepsy. Seizure. 2020;83:57-62.

43. Bond FW, Hayes SC, Baer RA, Carpenter KM, Guenole N, Orcutt HK, et al. Preliminary psychometric properties of the Acceptance and Action Questionnaire–II: A revised measure of psychological inflexibility and experiential avoidance. Behavior therapy. 2011;42(4):676-88.

44. Gámez W, Chmielewski M, Kotov R, Ruggero C, Watson D. Development of a measure of experiential avoidance: the Multidimensional Experiential Avoidance Questionnaire. Psychological assessment. 2011;23(3):692.

45. Ways of coping questionnaire [Internet]. APA PsycTests. 1988.

46. Endler N, Parker JD. Coping inventory for stressful situations. 2008.

47. Cox BJ, Swinson RP, Shaw BF. Value of the Fear Questionnaire in differentiating agoraphobia and social phobia. The British Journal of Psychiatry. 1991;159(6):842-5.

48. Pilowsky I, Spence ND. Patterns of illness behaviour in patients with intractable pain. Journal of psychosomatic Research. 1975;19(4):279-87.

49. Ehring T, Zetsche U, Weidacker K, Wahl K, Schönfeld S, Ehlers A. The Perseverative Thinking Questionnaire (PTQ): Validation of a content-independent measure of repetitive negative thinking. Journal of behavior therapy and experimental psychiatry. 2011;42(2):225-32.

50. Wegner DM, Zanakos S. Chronic thought suppression. Journal of personality. 1994;62(4):615-40.

51. Hofmann SG, Kashdan TB. The affective style questionnaire: development and psychometric properties. Journal of psychopathology and behavioral assessment. 2010;32:255-63.

52. Spaapen DL, Waters F, Brummer L, Stopa L, Bucks RS. The emotion regulation questionnaire: validation of the ERQ-9 in two community samples. Psychological Assessment. 2014;26(1):46.

53. Carver CS, Scheier MF, Weintraub JK. Assessing coping strategies: a theoretically based approach. Journal of personality and social psychology. 1989;56(2):267.

54. Carver CS. You want to measure coping but your protocol'too long: Consider the brief cope. International journal of behavioral medicine. 1997;4(1):92-100.

55. Gross JJ, Levenson RW. Emotional suppression: physiology, self-report, and expressive behavior. Journal of personality and social psychology. 1993;64(6):970.

56. Wegner DM. White bears and other unwanted thoughts: Suppression, obsession, and the psychology of mental control: Penguin Press; 1989.

57. Alejos M, Vázquez-Bourgon J, Santurtún M, Riancho J, Santurtún A. Do patients diagnosed with a neurological disease present increased risk of suicide? Neurología (English Edition). 2022.

58. Conroy SK, Brownlowe KB, McAllister TW. Depression comorbid with stroke, traumatic brain injury, Parkinson's disease, and multiple sclerosis: Diagnosis and treatment. Focus. 2020;18(2):150-61.

Appendix A [Author Guidelines for the Journal of Neuropsychiatry and Clinical Neuroscience]

Manuscript Organization and Format

All parts of the manuscript, including case reports, quotations, references, and tables, must be **double-spaced** throughout. The manuscript should be arranged in the following order, with each item beginning a new page: 1) title page, 2) abstract, 3) text, 4) references, and 5) tables and/or figures. All pages must be numbered.

REPORTING GUIDELINES (see Appendix G)

Reporting guidelines have been developed for different study designs; examples include CONSORT for randomized trials, STROBE for observational studies, PRISMA for systematic reviews and meta-analyses, and STARD for studies of diagnostic accuracy. The Journal encourages authors to follow these guidelines because they help authors describe the study in enough detail for it to be evaluated by editors, reviewers, readers, and other researchers evaluating the medical literature. Authors of review manuscripts are encouraged to describe the methods used for locating, selecting, extracting, and synthesizing data; this is mandatory for systematic reviews. Good sources for reporting guidelines are the EQUATOR Network and the NLM's Research Reporting Guidelines and Initiatives.

TITLE PAGE (*Formal title page is not included in Chapter 1)

The number of words, tables, and figures in the submitted manuscript and the telephone number and e-mail address of the corresponding author should be typed in the upper right corner of the title page. At least three keywords that describe the content of the submission should be typed in the lower right corner of the page.

Title. The title should be informative but brief, avoiding declarative sentences:

ABSTRACT

Abstracts are sent to various archiving and indexing services and aid in your article's discoverability by providing more detail than would a simple listing of just citation information. The abstract is a single paragraph no longer than 250 words in the active voice and third person.

TEXT

Use the active voice and first person; headings and subheadings should be inserted at reasonable intervals. Footnotes to text may not be used, and summaries are usually unnecessary.

Research Design and Statistics. The following information regarding research design should be included: 1) a clearly stated hypothesis, 2) the names of the statistical tests used, 3) whether tests were one- or two-tailed, and 4) what test was used for each set of data. Reporting of standard deviations, rather than standard errors of the mean, is required. Statistical tests that are not well known should be referenced. All significant and important nonsignificant results must include the test value, degree(s) of freedom, and probability. For example, "The analysis of variance indicated that those who abstained from coffee had significantly higher course grades than those who did not abstain (F=4.32, df=3,17, P=0.05)." Reviewers will evaluate the appropriateness of the analyses.

Abbreviations. Spell out all abbreviations (other than those for units of measure) the first time they are used. Idiosyncratic abbreviations should not be used.

Drugs. Generic rather than trade names of drugs should be used. Trade or manufacturers' names are used only if the drug or equipment is experimental, unavailable in this country, or if such information is crucial to the evaluation of the results or replication of the study.

Top | Journal Home

References are numbered and listed by their order of appearance in text; the text citation is followed by the appropriate reference number in parentheses. Do **not** arrange the list alphabetically. References should be restricted to pertinent material. **Accuracy of citation is the author's responsibility.** References should conform exactly to the original spelling, accents, punctuation, etc. Authors should be sure that all references listed have been cited in the text.

Personal communications, unpublished manuscripts, manuscripts submitted but not yet accepted, and similar unpublished items should not appear in the reference list. Such citations may be noted in the text. It is the author's responsibility to obtain permission to refer to another individual's unpublished observations. Manuscripts that are actually "in press" (that is, accepted for

publication) may be cited as such in the reference list; the name of the journal or book publisher must be included.

Type references in the style shown below, **double-spaced throughout.** List up to three authors, designate one or more authors past the third as “et al.” Journal names should be abbreviated as they appear in *Index Medicus;* journals not currently indexed there should not be abbreviated.

1. Howieson DB, Lezak MD: The neuropsychological evaluation, in The American Psychiatric Press Textbook of Neuropsychiatry, 2nd edition, edited by Yudofsky SC, Hales RE. Washington, DC, American Psychiatric Press, 1992, pp 127-150
2. Robinson RG, Lipsey JR, Rao K, et al: Two-year longitudinal study of poststroke mood disorders: comparison of acute-onset with delayed-onset depression. Am J Psychiatry 1986; 143:1238-1244
3. Keitner GI (ed): Depression and Families: Impact and Treatment. Washington, DC, American Psychiatric Press, 1990
4. Guy W (ed): ECDEU Assessment Manual for Psychopharmacology (publication ADM 76-338). Washington, DC, US Department of Health, Education, and Welfare, 1976

Top | Journal Home

Tables and Figures

The *Journal* does not publish tables or figures that have appeared in other English-language publications. Tables and figures that duplicate 1) material in text or 2) each other will not be used. Authors will be asked to delete tables and figures that contain data which could be given succinctly in text. Each table and figure should be understandable without reference to the text; a descriptive, concise title should be included and units of measure should be specified.

Tables. Tables should appear at the end of the uploaded article file, after References and any figure captions. Do not embed tables within the main narrative text, and do not submit tables in a separate file.

Tables are reserved for presentation of numerical data and should not be used as lists or charts. Values expressed in the same unit of measurement should read down, not across; when percentages are given, the appropriate numbers must also be given. Abbreviations used must be defined, and when mean scores are presented, footnotes explaining the scoring rubric are encouraged for interpretability.

In preparing the tables, each cell should contain only one item of data to aid in formatting for print and online display. In rows, subcategories should be in

separate cells; in columns, Ns and %s, Means and SDs, and ORs and CIs should each be in separate cells, with no numerical data listed within parentheses in the same cell. All columns, including the leftmost, need a heading. For optimal readability and presentation, tables should not exceed 120 characters in width.

Sample table formats

Sample Table 1

Sample Table 2

Figures. Figures express trends or relationships between data. Consult recent issues of the *Journal* and the following guidelines for format. Figures that contain numerical data which could be expressed more succinctly or clearly in tabular form should be converted to tables. Submission of previously published figures is discouraged. Multiple figures for the same article should be prepared as a set, consistent in color and size across all figures.

Submission

1. A copy of each figure must accompany the manuscript.
2. Figure titles and footnotes should be provided within the text of the manuscript.
3. If figures have been previously adapted from an earlier publication, the author must secure written permission from the holder of copyright for use in the *Journal*. The author should submit a copy of the permission release and credit lines if the manuscript is accepted for publication.

Format

1. Specific file formats are required for different types of figure images. **For photos or brain scans**, high resolution (300 dpi) raster images in .jpg, .png, or .tiff formats are preferred. **For charts and graphs**, scalable and editable vector images in .eps, .pdf, or .svg formats should be provided. We can also accept native files for charts and graphs created in Word, PowerPoint, or Adobe Illustrator.
2. Definitions of symbols appearing in the figure should be presented in a key within the figure, rather than in the title or footnotes.
3. Except for the key, avoid using internal type (e.g., placing statistical values within a graph).
4. Two-dimensional graphs should not be represented in three dimensions.
5. Color figures will be considered for publication only when the use of color makes a significant contribution to the figure. Because of the high production cost, color figures will be kept to a minimum.

Content

1. Each complete figure (including titles and footnotes) should be understandable without reference to the text.

2. Figures should represent data visually rather than numerically.
3. If error bars are included, standard deviations, rather than standard errors of the mean, should be used.
4. Only the most widely recognized abbreviations may be used.
5. In a graph comparing different groups of subjects, the number of subjects in each group should appear with the name of the group—in the key, in the headings below the horizontal axis, or in the title.
6. Ordinary footnotes should be cited with lower-case superscript letters. Footnote citations may be given in both the title and the body of the figure; within the body of the figure, they should proceed from left to right.
7. For statistical comparisons noted in figures, provide complete statistical data in footnotes. If numerous analyses are presented, simple p values may be given in the footnotes, in which case the footnotes should be indicated by single asterisk, double asterisk, etc.

SPECIAL ARTICLES

Manuscripts of this type include narrative reviews, systematic reviews, and conceptual works that represent the scholarship of integration on topics relevant to neuropsychiatry and the clinical neurosciences. Typical lengths for manuscripts of this type are about 7,500 words, including an abstract of 250 words or less and not including references (which generally number 100 or fewer). Tables and figures, each counted as 300 words per half-page, may be submitted but should not exceed 5; the need for their inclusion in the published manuscript is subject to peer review. The *Journal* will consider longer initial submissions provided that the accompanying cover letter outlines the reasons for doing so and with the understanding that accepted manuscripts may be edited to a length more typical of this manuscript type.

*Current word count exceeds word count by 633 words due to the large summary table for a systematic review. A cover letter will be provided explaining this.

Appendix B [Full Search Terms]

Database	Subject and Key Terms
PsychInfo	**Subject term:** FND DE “Conversion Disorder”, Experiential avoidance DE “experiential avoidance” (“Functional Neurological Disorder*” OR “Conversion Disorder*” OR "Non*epileptic" OR “Functional Neurological” OR “Functional movement disorder” OR “Functional Motor Disorder” OR “Unexplained Neurological” OR Pseudoseizure* OR “Dissociative Seizure*”) **AND** ("experiential avoidance" OR "emotion suppress*" OR “Emotion control” OR Avoid* OR “Thought Suppress*” OR “Avoid* coping” OR “Psychological inflexibility” OR “drug use” OR “drug misuse” OR “alcohol use” OR “alcohol misuse” OR “drug consumption” OR “alcohol consumption” OR ruminat* OR distraction OR dissociation OR denial OR disengagement OR "cognitive control")
Medline	**Mesh Heading:** MH “Conversion Disorder” (“Functional Neurological Disorder*” OR “Conversion Disorder*” OR "Non*epileptic" OR “Functional Neurological” OR “Functional movement disorder” OR “Functional Motor Disorder” OR “Unexplained Neurological” OR Pseudoseizure* OR “Dissociative Seizure*”) **AND** ("experiential avoidance" OR "emotion suppress*" OR “Emotion control” OR Avoid* OR “Thought Suppress*” OR “Avoid* coping” OR “Psychological inflexibility” OR “drug use” OR “drug misuse” OR “alcohol use” OR “alcohol misuse” OR “drug consumption” OR “alcohol consumption” OR ruminat* OR distraction OR dissociation OR denial OR disengagement OR "cognitive control")
Web of Science	“Functional Neurological Disorder*” OR “Conversion Disorder*” OR "Non*epileptic" OR “Functional Neurological” OR “Functional movement disorder” OR “Functional Motor Disorder” OR “Unexplained Neurological” OR Pseudoseizure* OR “Dissociative Seizure*” (Abstract and Title) **AND** "experiential avoidance" OR "emotion suppress*" OR “Emotion control” OR Avoid* OR “Thought Suppress*” OR “Avoid* coping” OR “Psychological inflexibility” OR "alcohol use“ or “alcohol misuse” or “alcohol consumption” or “drug misuse” or “drug abuse” or "drug use" or ruminat* or distraction OR dissociation OR denial OR disengagement OR "cognitive control" (Abstract and Title) #2 AND #3
Open Grey	FND, Conversion Disorder, PNES, avoidance, experiential avoidance
ProQuest	NOFT(“Functional Neurological Disorder*” OR ("conversion disorder") OR "Non*epileptic" OR “Functional Neurological” OR “Functional movement disorder” OR “Functional Motor Disorder” OR “Unexplained Neurological” OR Pseudoseizure* OR “Dissociative Seizure*”) **AND** NOFT("experiential avoidance" OR "emotion suppress*" OR “Emotion control” OR Avoid* OR “Thought Suppress*” OR “Avoid* coping” OR “Psychological inflexibility” OR “drug use” OR “drug misuse” OR “alcohol use” OR “alcohol misuse” OR “drug consumption” OR “alcohol consumption” OR ruminat* OR distraction OR dissociation OR denial OR disengagement OR "cognitive control") Doctoral Theses only

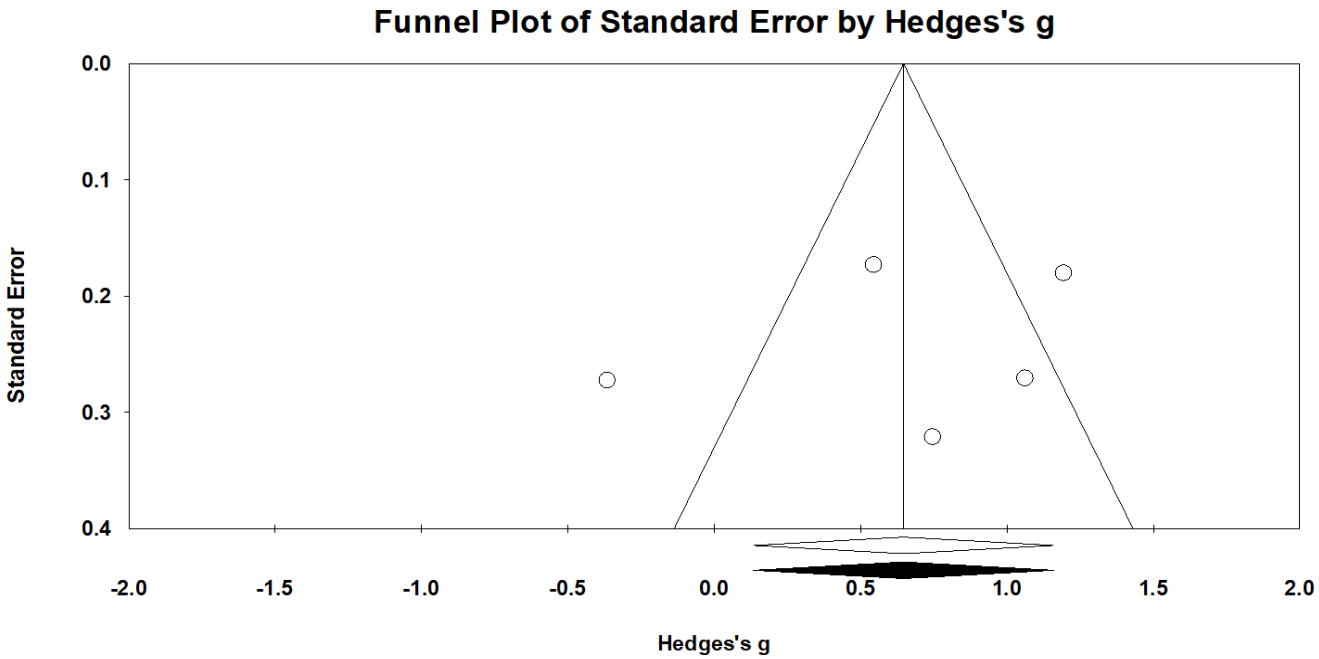
Appendix C [Quality Appraisal of Qualitative studies]

	Brough (2016)	Read et al (2020)
Question/Objective sufficiently described	2	2
Study design evident and appropriate	2	1
Context for the study clear	2	2
Connections to a theoretical framework/wider body of knowledge	1	2
Sampling strategy described, relevant and justified	1	2
Data collection methods clearly described and systematic	2	2
Data analysis clearly described and systematic	2	2
Use of verification procedure(s) to establish credibility	1	1
Conclusions supported by the results	1	2
Reflexivity of the account	0	1
Summary Score	0.7	0.85

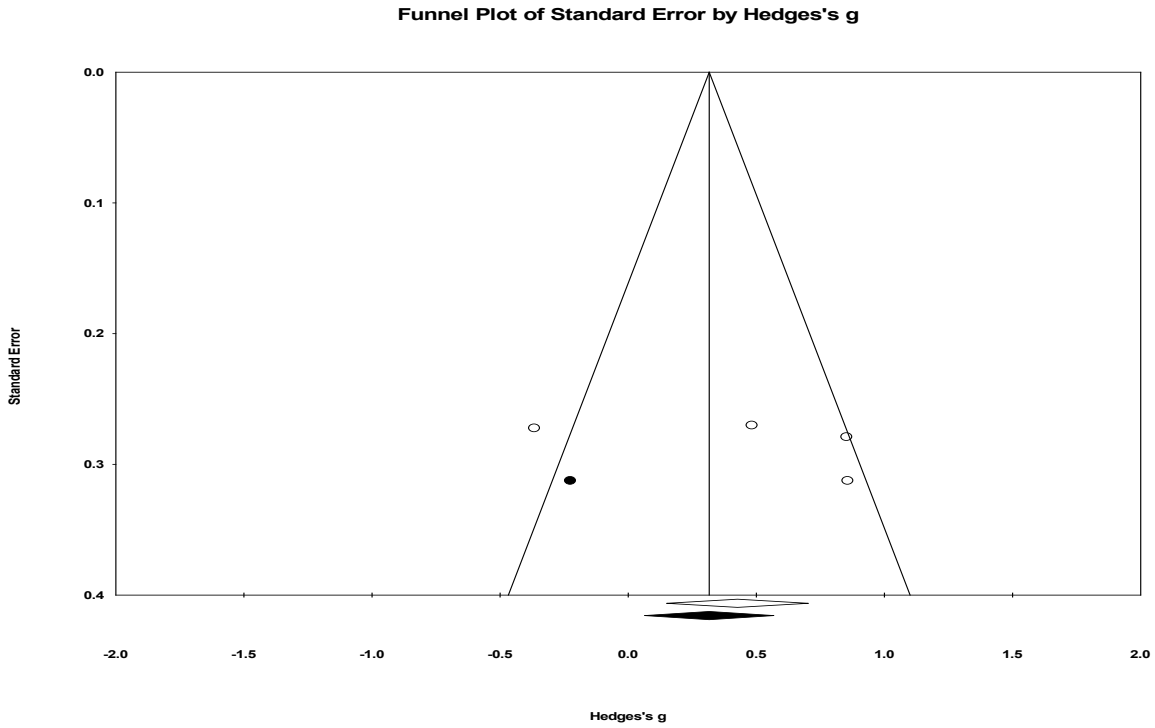
Appendix D [Quality Appraisal of Quantitative studies]

	Baslet, Tolchin & Dworetzky (2017)	Binzer, Eisemann & Kullgren (1997)	Cullingham, Kirkby, Eccles & Sellwood (2020)	Dautoff (2018)	Dimaro et al (2014)	Evershed (2007)	Foley (2012)	Goldstein et al (2000)	Goldstein and Mellers (2006)	Goldstein et al (2020)	Gul & Ahmad (2014)	Gulec et al (2014)	Kairys (2019)	Kanner et al (1999)	LaFrance et al (2020)	Massot-Tarrus & McLachlan (2016)	Myers et al (2018)	Myers & Zaroff (2004)	Slocum & Holroyd (2016)	Testa et al (2012)	Tojek et al (2000)	Whitfield et al (2020)	Özdemir et al (2019)
Question/objective sufficiently described	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2
Study design evident and appropriate	1	1	2	2	1	2	2	1	1	2	1	2	1	1	2	1	1	2	2	1	1	1	2
Method of subject /comparisson group selection or source of information/input variables described and appropriate	2	2	1	1	2	2	2	1	1	2	2	1	1	1	1	1	1	N/A	1	1	1	1	1
Subject (and comparisson group, if applicable) characteristics sufficiently described	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
If interventional and random allocation was possible, was it described	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If interventional and blinding of investigators was possible, was it reported	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If interventional and blinding of subjects was possible, was it reported	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Outcome and (if applicable) exposure measure(s) well defined and robust to measurement/misclasification bias? Means of assessment reported	2	1	2	2	2	1	2	2	2	2	2	2	2	1	2	1	2	N/A	2	2	1	2	2
Sample size appropriate	1	1	2	1	1	1	2	1	1	2	1	1	1	1	1	1	2	N/A	1	1	1	1	2
Analytic methods described/justified and apporpriate	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	N/A	2	2	1	2	2
Some estimate of variance is reported for the main results	2	2	2	2	2	2	N/A	0	1	2	2	0	N/A	0	2	2	2	N/A	1	2	1	2	2
Controlled for confounding	1	2	N/A	1	2	1	N/A	2	1	N/A	2	1	N/A	N/A	N/A	N/A	1	N/A	1	2	2	2	2
Results reported in sufficient detail	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	2	2	1	2	2
Conclusions supported by results	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	0	0	2	2	0	2	2
Summary Score	0.86	0.86	0.95	0.86	0.91	0.86	1.00	0.73	0.77	1.00	0.91	0.77	0.78	0.65	0.85	0.80	0.73	0.70	0.82	0.86	0.59	0.86	0.95

Appendix E [Funnel Plot of studies comparing EA in Healthy Control and FND groups]



Appendix F [Funnel Plot for Studies Comparing EA in Neurological Control Controls and FND groups]



Appendix G [PRISMA for Systematic Reviews and Meta-Analyses]

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	P19
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	P20
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	P21- P22
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	P22
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	P24
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	P23
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	P52
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	P24
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	P24 - P25
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	P25
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	P25
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	P25, P53-P54
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	P25 – P26
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	P25

Section and Topic	Item #	Checklist item	Location where item is reported
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	P25
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	P25, P27
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	P25 - P26
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	P25
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	P25
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	P25 – P26
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	P27
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	P27
Study characteristics	17	Cite each included study and present its characteristics.	P60 – P68 results section
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	P53-54
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	P60 – P68
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	P25
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	P34 - P35
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	P34 - P35
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	P55 – P56
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	

Section and Topic	Item #	Checklist item	Location where item is reported
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	P36 - 38
	23b	Discuss any limitations of the evidence included in the review.	P36 – 38
	23c	Discuss any limitations of the review processes used.	P38
	23d	Discuss implications of the results for practice, policy, and future research.	P37 – P38
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	P23
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	P23
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	P24
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	N/A
Competing interests	26	Declare any competing interests of review authors.	N/A
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	N/A

Table 1 *Results summary table showing study characteristics, sample characteristic, measures of EA and key findings*

Study	**Location**	**Design**	**FND sample (*n*)**	**Control Group (*n)***	**Type of EA**	**EA Measure**	**Analytic Design**	**Key findings**
Baslet, Tolchin & Dworetzky (2017)	Boston, USA	Case control	FS with altered responsiveness (*n* = 47), 42 female, 5 male, age mean = 38.15, SD 11.23	FS with intact responsiveness (*n* = 24), 22 female, 2 male, age mean = 39.13, SD 14.26	Experiential Avoidance	The Acceptance and Action Questionnaire-II (AAQ-II)	ANOVA	The AAQ-II scores were significantly higher in the altered responsiveness compared to the intact responsiveness group**.**
Binzer, Eisemann & Kullgren (1998)	Sweden	Case control	Conversion disorder (*n* = 30), 18 female, 12 male, age mean = 38.8, SD = 12.93	Neurological controls with organic lesions in the nervous system (*n* = 30), 21 female, 9 male, age mean = 33.8, SD = 12.19	Denial	Illness Behaviour Questionnaire (IBQ), subscale measuring denial	Chi-square tests and Mann-Whitney U test	Denial of life problems was high in both groups, with no significant difference. A negative correlation between denial and affect (degree of depression) was found. CD group rejected psychological perspective, especially females, and focused on somatic problems.
Brough (2016)	UK	Case study	FS, *n* = 3, two females and a male, ages 30, 31 & 62	None	Avoidance	No measure, the author completed a Multiple Sequential Analysis of interviews	Multiple Sequential Analysis	All three participants' FS appear to serve to reduce intolerable demands/experiences. FS are suggested to be a strategy for suppressing emotional expression.
Cullingham, Kirkby, Eccles &	United Kingdom, USA,	Cross-sectional study	FS, *n* = 285, 247 female, 34 male, 4 non-binary, age	None	Experiential Avoidance	The Acceptance and Action	Correlation and regression	EA did not correlate with or predict FS frequency. Higher levels of EA predicted a

Sellwood (2020)	Australia, Canada		mean = 38.16, SD = 12.03			Questionnaire-II (AAQ-II)		greater negative impact of FS on life. EA, somatization, higher FS frequency were independent predictors of impact on life.
Dautoff (2018)	Boston, USA	Case control	FS (*n* = 206), 16.5% male, 83.5% female, age mean = 38.99, SD = 14.53	Mixed FS and Epilepsy (*n* = 18), 11.1% male, female 88.9%, age mean = 39.22, SD = 10.90	Concealment or suppression of affect	Affective Style Questionnaire - concealing subscale	*t* – tests and ANCOVA	No significant difference between affect concealment. FS group demonstrated perceived better ability to manage, adjust and work with emotions compared to mixed epilepsy.
Dimaro et al (2014)	Sheffield, UK	Case control	FS (*n* = 30), 22 females, 8 males, age mean = 40.87, SD = 12.88	Epilepsy (*n* = 25), 16 females, 9 males, age mean 39.40, SD = 16.49 Nonclinical controls no seizures (*n* = 31), 21 females, 10 males , age mean 42.97, SD = 13.93	Experiential Avoidance	Multidimensional Experiential Avoidance Questionnaire (MEAQ)	MANOVA and ANOVA	There was a significant difference between the three groups on EA, those with FS reported higher levels of EA compared to epilepsy controls. Avoidance was strongly correlated with self-reported seizure frequency in the group with FS.
Evershed (2007)	UK	Case Control	FS pre-diagnosis (*n*= 17), 5 males and 12 females, age mean 35.8, SD = 12,54: FS post-diagnosis (*n* = 20), 5 males and 15	Epilepsy pre-diagnosis (*n* = 28), 14 males and 14 females, age mean = 32.2, SD = 11.45; Epilepsy post-diagnosis (*n* = 32), 17 males and 15	Denial	IBQ, Denial of Life stress subscale, non-validated 3 question questionnaire.	Fishers exact test, Mann-Whitney U and ANOVA	No group difference on the denial of life stresses subscale. FS group were higher deniers, on both total (anxiety and depression) and anxiety denial alone

			females, age mean = 40.4, SD = 15.47)	females, age mean = 39.3, SD = 14.26				compared to epilepsy. There was no group difference post diagnosis. FS in pre-diagnosis group had higher total denial and anxiety denial scores compared to post-diagnosis FS group.
Foley (2021)	Lancaster, UK	Single Case Experimental Design (Thesis)	Functional Seizures (*n* = 5), 4 females, 1 male, age range 22 -44	None	Experiential Avoidance	AAQ-II	Visual analyses, trend detection, percentage exceeding the median analysis, reliable change index and clinically significant change	Three individuals scored above the cut-off. Two showed reliable and clinically significant change in reduced EA.
Goldstein et al (2000)	London, UK	Case control	FS (*n* = 20), female = 16, male 4, age mean = 34.35, SD = 12.40,	Non-clinical population (*n* = 20), male = 11, female = 9, age mean = 35.95, SD = 8.46,	Avoidant Coping	The Ways of Coping Questionnaire, Escape-avoidance coping	Analyses of variance and correlations	FS patients scored significantly higher than the control group in their use of escape-avoidance as a coping technique.
Goldstein & Mellers (2006)	London, UK	Case control	Functional Seizures (*n* = 25), 19 female, 6 male, age mean = 35.52, SD = 13.49	Epilepsy (*n* = 19), 14 female, 5 male, age mean = 35.84, SD = 10.81	Avoidance of situations	Fear questionnaire	ANOVA or Mann-Whitney U test, and ANCOVA	FS group showed significantly higher scores on the agoraphobia (meeting disorder criteria) subscale than the epilepsy group. Higher avoidance behaviour in

								FS than in epilepsy. The social phobia scores in FS met criteria for panic disorder.
Goldstein et al (2021)	United Kingdom	Cross-sectional	FS (*n* = 368), 266 female, 102 male, age mean = 37.5, SD = 14.3,	None	Behavioural Avoidance	Avoidance of People, Places, and Situations	Formal group comparisons were completed with *t*-test or Wilcoxon rank-sum test	Scores were slightly higher for avoidance of situations and activities than of people, due to fearing seizure occurrence. Males had higher levels of avoidance behaviour, not significant after multiple testing corrections.
Gul & Ahmad (2014)	Pakistan	Case control, experimental design	FS (*n* = 72), 37 female, 35 male, age mean = 28.36, SD = 3.93	Healthy controls (*n* = 72), 40 female, 32 male, age mean = 23.93, SD = 3.09	Emotion Suppression	The Emotion Regulation Questionnaire	ANOVA	Patients with FS scored higher on emotion suppression than healthy controls.
Güleç et al (2014)	Turkey	Case Control	Conversion disorder, Suicide Attempt (*n* = 33), female 84.8% , male 15.2%, age mean = 30.03, SD = 10.71, No suicide attempt (*n* = 61), female 85.2%, male 14.8%, age mean = 30.82, SD = 10.83	Healthy Controls (*n* = 50), female 70%, male 30%, age mean = 34.64, SD = 11.94	Substance Use	Self-report	ANOVA and logistic regression model	Risky alcohol use was the best predictor of suicide attempts in CD. Drug abuse was found to be the same in all groups, risky alcohol use was significantly more prevalent in the suicide attempt group than in the no suicide-attempt and healthy control groups.
Kairys (2019)	Colorado, USA	Cohort study	FS (*n* = 34), 71.8% female, 28.2%	None	Coping - denial, mental and	Brief Coping Orientation to	Correlation	Percentage of events involving loss of awareness was negatively correlated with the

			male, age mean = 44.9, SD = 11.5		behavioural disengagement and emotional suppression	Problems Experienced (COPE)		Brief COPE self-distraction subscale. Thus, patients with more loss of awareness events were less likely to distract themselves from their illness.
Kanner et al (1999)	Chicago, USA	Cohort study	FS (*n* = 45), 11 men and 34 females, age mean = 30.4, SD = 11.2 years,	None	Denial	Denial of any stressors or psychosocial problems - unsure how it was measured	Logistic regression	Denial of stressors/psychosocial problems was associated significantly with recurrence of FS during 6 months after diagnosis (only during the second observation period).
LaFrance et al (2020)	USA, across the country	Cross-sectional	FS (*n* = 72); seen in clinic (*n* = 16), 11 male, 5 female, age mean = 51.4, 95% CI [44.9, 57.8], via telehealth (*n* = 56), 47 male, 9 female, age mean = 48.3, 95% CI [44.7, 51.7]	None	Alcohol and drug use	No questionnaire used, self-report	Generalised linear modelling, group comparisons – nonparametric Fisher's exact test	No conclusions were drawn about substance abuse or alcohol use. Approximately half of the participants reported past and current substance abuse (ranging from 42.9% to 68.8%).
Myers and Zaroff (2004)	New York, USA	Case Study	A patient with FS, male	None	Avoidant coping, use of distraction and social diversion	The Coping Inventory for Stressful Situations (CISS)	Descriptive statistics	Following treatment for FS, patient's avoidance scores increased from slightly above average to very much above the average

Myers,Trobliger, Bortnik & Lancman (2018)	New orkYork, USA	Cohort	FS (*n* = 148), 51 males (age mean = 34.35, SD =13.43) and 97 females (age mean = 37, SD = 13.29)	None	Avoidant Coping	The Coping Inventory for Stressful Situations (CISS)	Logistic regression	Men endorsed significantly higher use of avoidance behaviours when attempting to cope with stress compared to females.
Massot-Tarrús & McLachlan (2016)	Canada	Observation, Cross-sectional	FS (*n* = 64)	Epilepsy (*n* = 190)	Marijuana use	Self-report	Pearson correlation ir Fishers exact test	The use of marijuana in epilepsy compared with that in FS was the same overall, for ongoing use, and for duration of use in years, but patients with epilepsy were more likely to be daily users and report marijuana being used to treat their condition.
Read et al (2020	United Kingdom	Qualitative	FS (*n* =30), 21 women, 9 men, age range at interview 18-80	None	Behavioural and emotional avoidance	N/A, interview and qualitative analysis	Thematic Framework Analysis	Participants found it challenging to engage in therapy tasks, often due to emotional or behavioural avoidance. Three said they now understood how they had previously been more emotionally cut-off or disconnected from their own emotions - suggesting emotional avoidance. Avoidance of traumatic memories.

Slocum & Holroyd (2016)	Rural Appalachia, US	Retrospective study/ Case Control	Conversion Disorder (*n* =21), 85.7% female, 14.3% male, age mean = 27.5, SD = 15.7	Psychiatric patients (*n* = 42), mean age 45.5, SD = 19.1, gender not reported	Alcohol and drug use	No questionnaire used, self-report	Chi-squared, *t* – test, Fisher exact test, ANOVA, logistic regression	Patients diagnosed as having CD were less likely to report alcohol or illicit drug use. It is interesting that our patients reported significantly lower alcohol and illicit drug use rates than our controls.
Testa et al (2012)	Baltimore, USA	Case Control	FS (*n* = 40), 3 male, 37 female, age mean = 36.67, SD = 11.17	Epilepsy (*n* =20), 9 male, 11 female, age mean = 36.60, SD = 12.52 Healthy (*n* = 40), 7 male, 33 female, age mean = 39.65, SD = 11.32	Coping - denial, mental and behavioural disengagement and emotional suppression	COPE questionnaire	MANCOVAs	Higher levels of negative life event distress were associated with increased levels in denial and mental disengagement in FS. Patients with epilepsy reported more denial than healthy controls.
Tojek et al (2004)	Detroit, USA	Case Control	FS (*n* = 25), 88% female (*n* = 22, 3 male), age mean = 43.56, SD = 13.23	Epilepsy (*n* = 33), 30 female , 3 male, age mean = 39.60, SD = 9.03	Rumination	Life Events Checklist - thinking about a stressful life event - higher scores indicative of rumination (author's interpretation)	Logistic regression	The FS patients reported that they currently thought about stressful events more often than did epileptic patients. However, current thinking about stress was not related to FS, once the effects of life stress was controlled for.
Whitfield, Walsh, Levita & Reuber (2020)	Sheffield, UK	Case control	FS (*n* = 26), 15 female, 11 male, age mean = 38.2, SD = 12.5,	Epilepsy (*n* = 29), 17 female, 12 male, age mean = 43.7, SD = 15.4	Rumination	Perseverative Thinking Questionnaire	Hierarchical multiple linear regression	Participants with FS were found to report higher levels of RNT and catastrophising compared to People with Epilepsy. FS diagnosis was

								independently associated with repetitive negative thinking.
Özdemir, Kirli, Isik & Tapan (2020)	Turkey	Case control	Conversion Disorder (*n* = 80), 18 male, 62 female, age mean = 27.25, SD = 9.5	Healthy Controls (*n* = 60), 21 male, 39 female, age mean = 24.91, SD = 6	Thought suppression	White Bear Suppression Inventory (WBSI)	Chi-squared and t-tests, logistic regression and structural equation model	CD patients had significantly higher scores of thought suppression in comparison with the control group. Patients with CD in isolation (without high depression scores) showed no significantly higher scores of thought suppression. Thought suppression was significantly correlated with number of common bodily sensations and severity of depressive symptoms among CD patients.

Chapter 2

Formulation and Brief Acceptance and Commitment Therapy Intervention for Functional Neurological Disorder: a single case experimental design

This chapter is written as a manuscript excluding the formal title page, for the Journal of Neuropsychological Rehabilitation (see Appendix A for author guidelines)

Abstract

Functional Neurological Disorder (FND) often presents with psychiatric comorbidities and psychological factors involved in the development and maintenance of this condition. Therefore, a transdiagnostic approach that can address the heterogeneity of psychological processes is needed. This study aimed to investigate the effectiveness and acceptability of a formulation and brief Acceptance and Commitment (ACT) intervention for people with FND, using a withdrawal/reversal (A_1 B A_2 C A_3) single case experimental design. Routine outcome measures included symptom frequency, distress and impact on engagement in meaningful activities. Emotional processing, quality of life, psychological inflexibility, illness perception and psychological health were measured at baseline, after formulation, ACT intervention and at 4 week follow-up. This intervention was safe and well accepted by people FND (n = 4). It was effective at reducing levels of FND symptom related distress. Following the intervention participants were able to engage more in meaningful activities and symptom reduction was observed during the intervention. The majority of participants reported significant reliable change in improved psychological health and emotional processing following the ACT phase. Therefore, formulation and ACT, even when used briefly, can result in improved outcomes for people with FND. ACT may be the active component that facilitates change.

Keywords: FND, ACT, formulation, intervention, single case experimental design

Abstract word count: 198

Main text word count (including tables and figures): 7526

Introduction

What is Functional Neurological Disorder?

Functional Neurological Disorder (FND) is a common neuropsychiatric condition that affects approximately 50, 000 to 100, 000 people in the community in the UK (1). FND presents as a complex group of heterogenous syndromes that can mimic the symptoms of neurological diseases, such as tremors and spasms, functional seizures (FS) that can include abnormal movements and/or episodes of altered or loss of consciousness, or cognitive difficulties (2). For some individuals these symptoms can be very mild, whereas for others they are often severe and chronic (3) with a significant impact on people's functioning and quality of life (4, 5). Additionally, FND is associated with high healthcare use and economic costs, that are inflated by avoidable medical investigations at the cost of FND tailored treatment (6).

How is FND understood and explained?

While FND cannot be explained by a known underlying organic pathology, there is growing evidence for a potential neurobiological mechanism whereby altered functioning in brain networks and nervous system reactivity may account for symptom expression and development (7-9). While there is no one model that can explain FND and account for symptom heterogeneity, the use of a biopsychosocial framework has been advocated when explaining FND (8, 10). This framework can encapsulate a holistic and individualistic explanation of FND: by formulating the underlying neuropsychiatric/biological engine that together with individual's psychosocial environment can create a vulnerability that results in altered nervous system reactivity and brain network functioning, producing FND symptoms (8).

Some known predisposing factors that create a vulnerability to FND include medical illnesses, genetics, low socioeconomic status, difficulties in interpersonal relationships, trauma, modelling of symptoms, and certain personality traits, such as perfectionism (8, 10-12). These vulnerabilities can become aggravated by additionally challenging circumstances, also known as precipitating factors or triggers. These may include physical injury, psychosocial stress, medical illness, drug/vaccine exposure, recent medical intervention. However, they may not always be immediately obvious or identifiable. Factors that maintain FND include comorbid ongoing medical and mental illness, ongoing psychosocial stress, seeking alternative medical explanations, isolation, avoidance and altered emotional processing (8, 10-12). FND often presents with other symptoms, such as headaches, fatigue, memory difficulties (13).

Psychological factors in FND

The proposed biopsychosocial explanations for FND and its subtypes demonstrate that while psychological factors in isolation cannot explain the cause of FND, they are implicated in the development and maintenance. Therefore, it is important to address the psychological processes, such as avoidance (14), emotional processing difficulties (e.g. deficits in emotional awareness, emotion regulation, alexithymia) (10), endurance behaviour that may influence chronification of FND symptoms as well as the symptom burden (15). Additionally, there is a high prevalence of mental health comorbidities (e.g. anxiety, depressive disorders, trauma, personality presentations) in people with FND (16, 17). Therefore, there is a clear need for transdiagnostic approaches to address the heterogeneity of psychological process involved in FND.

Psychological Treatment for FND

Despite the emergence of studies evaluating psychotherapy for FND, there is still a lack of consensus of an effective treatment (18). A recent systematic review (19) concluded that Cognitive Behavioural Therapy (CBT) and psychodynamic therapies for FND offer some benefits, including improvements in quality of life, mental and physical health, and functioning. However, they do not result in FND symptom reduction. This emphasises the need for a multidisciplinary approach to FND treatment. Psychoeducation based interventions have mixed findings in relation to FS reduction, however they resulted in improved psychosocial aspects and FND understanding (20).

While the use of formulation in FND treatment has been advocated (8), evidence exploring its effectiveness is still limited. Stone et al (21) concluded that for some people explanation of FND can be therapeutic on its own, however for most it is an important facilitator to engagement in therapy. Recently, Gutkin et al (22) completed an open-label trial of a Shared Individual Formulation Therapy lasting five sessions for adults with FND, that encompassed psychoeducational and psychodynamic therapy elements. This intervention was not only feasible, but it also resulted in improvements in quality of life and seizure frequency reduction (22). Therefore, this seminal study provided evidence that formulation can result in meaningful improvements for people with FND.

It is not possible for psychotherapy alone to reduce FND symptoms. Therefore, instead of focusing on symptom reduction, we should consider therapies that promote personally meaningful, value based functioning despite the symptom presence. This is the overarching goal of Acceptance and Commitment Therapy (ACT) that is achieved via increasing awareness, openness and acceptance of difficult internal experiences (23). The emerging evidence for ACT in FND demonstrated improvements in symptom interference, mood and psychological flexibility, ability to engage in meaningful activities despite of

experienced distress (24-26). Although these studies have been limited to case study or series designs, there is strong evidence for ACT efficacy in similar chronic conditions, such as fibromyalgia, chronic pain and fatigue (27, 28). There has been an identified need for better quality studies exploring psychotherapy effectiveness in FND (19, 20).

Despite the recent recommendations that FND treatment should include a clear explanation of the diagnosis, accompanied by a biopsychosocial formulation, and a multidisciplinary approach, including psychology (2, 8), this does not reflect the current reality in FND service provision. There is a clear inequity in care that people with FND receive (24). Depending on where people live, treatment pathways might not be available or accessible at all. FND is still under-resourced and poorly recognised in the NHS (29). This is reflected by the scarcity of FND services and care provision in NHS England.

Aim

Based on the reviewed evidence and recent recommendations for FND treatment, there is a clear need to investigate the effectiveness of a biopsychosocial formulation and a more transdiagnostic therapy that may be able to address the heterogeneity of FND. Additionally, considering the lack of resources in the NHS and the scarcity of FND care provision, it is important to explore the effectiveness of brief treatments. Therefore, the aim of this study was to assess the effectiveness and acceptability of a formulation and a brief ACT (F-ACT) intervention for adults with FND using a withdrawal/reversal single-case experimental design (SCED). This design allows high quality research to be conducted in clinical settings with small and heterogenous populations (30).

Objectives

The primary objectives were to establish the effect of a F-ACT intervention on symptom interference, measured as distress and impact on engagement in daily activities, and psychological health, emotional processing, quality of life, psychological inflexibility and understanding of FND.

The secondary objective was to examine if the intervention benefits FND illness symptom reduction, specific to patient presentation.

Materials and Methods

Design

A withdrawal/reversal (A_1 B A_2 C A_3) SCED was used. A_1 was the 4 week baseline, B was the first intervention phase including clinical interview and formulation, A_2 was a 2 week withdrawal period, C was the second intervention period including 3 sessions of ACT, and A_3 was a 4 week follow-up period. Blinding and randomisation were not used.

Participants

Patients with FND were recruited from the Adult Neuropsychology service at a local NHS trust. Inclusion criteria were: (a) adults aged 18 and above, (b) capable of giving informed consent, (c) with FND diagnosis confirmed by a neurologist, (d) sufficient English to engage in therapy, (e) not currently engaged in another psychotherapy or FND treatment. Exclusion criteria were (a) primary diagnosis of intellectual disability, (b) severe mental ill health requiring inpatient treatment or potentially affecting trial participation (e.g., suicidality, acute psychosis, active or extensive self-harm) or (c) a diagnosis of a complex regional pain syndrome, dissociative identity disorder, or posttraumatic stress disorder of high severity with significant dissociation.

Seven patients were approached based on incoming referrals, six (one male) of which expressed a wish to participate in the study. One participant dropped-out after baseline period and the second participant was discharged after the initial assessment due to increased risk. The final sample included 4 female participants, see Table 1 for demographic information.

Table 1

Demographic information of study participants

Participant	**1**	**2**	**3**	**4**
Sex	Female	Female	Female	Female
Age	35	32	22	47
Ethnicity	White British	White British	White British	White British
Education Level	A-levels	NVQ, Level 3	University, BA	College
Marital Status	Single	Married	Single	Single
Occupational Status	Unable to work	Unable to work	Employed	Unable to work
FND Type	Functional Seizures	Motor Functional Seizures	Motor Functional Seizures	FND Functional Seizures
Months since diagnosis	24	3	6	60

Measures and Materials

The outcome measure selection was based on recent recommendations proposed by Pick et al's (31) review and the Core Outcome Measures in Effectiveness Trials (COMET) collaboration recommendations: to assess the core outcome domains (core symptoms, life impact and adverse events) using measures that have been validated in FND or similar conditions (32).

Routine Measures

Routine outcomes were collected using three questions devised for this study to measure FND symptoms, distress as a result of these symptoms, and impact on their ability to engage in meaningful activities. They were rated on a 10-point Likert scale ranging from 0 (no symptoms/distress/impact on engagement) to 10 (many severe symptoms/extreme distress/impact on engagement). Participants were asked to answer these questions every two days throughout the period of the study: "Over the last few days: (1) how often have you experienced the symptoms of your illness, (2) how distressed have you felt as a result of your illness, (3) how much has your illness impacted your ability to engage in activities and things that are important to you?".

Psychometric battery

The following questionnaires were completed at baseline, following the formulation intervention, following the ACT based intervention and at the end of the follow-up period.

Quality of life (QoL) was measured using the Work and Social Adjustment Scale - WSAS (33), a recommended measure in FND (31). It is a 5-item self-report scale of functional impairments in daily life attributable to an identified problem. Higher scores indicate higher impairment. This scale has been shown to have good internal consistency and test-retest reliability (34).

The Emotional Processing Scale, EPS, (35) was used to measure emotional processing. This 25-item questionnaire consists of 5 subscales (suppression, signs of unprocessed emotion, controllability of emotion, avoidance and emotional experience). Higher scores indicate greater difficulties in emotional processing (on a scale from 0 to 9). This scale has excellent internal consistency and good test-retest reliability (36). It has been validated in a FS sample and demonstrated an excellent reliability for total scores (37).

Psychological health was measured using a 34-item Clinical Outcomes in Routine Evaluation – Outcome Measure, CORE-OM (38). This is a pan-theoretical and pan-diagnostic measure, with good internal consistency and test-retest reliability (39). Higher scores indicate a higher level of distress or symptom severity.

Psychological inflexibility was measured using the Acceptance and Action Questionnaire, AAQ-II (40), a 7 item self-report scale. Higher scores indicate higher levels of psychological inflexibility and less acceptance. This measure has good internal consistency and test-retest reliability (40). It is the most widely used instrument to measure the effectiveness of ACT.

Brief Illness Perception Questionnaire, BIPQ, (41), self-rated 9 item scale, was used to measure illness perception and understanding of their condition. It is a widely used measure that has good psychometric properties (42). Higher scores indicate a more threatening view of the illness.

Similar to routine outcome measures, we asked participants to rate symptom frequency, distress and symptom impact on engagement in meaningful activities over a two week period as well. The 10-point Likert scale was used.

Materials

Participants were recommended to download the ACT Companion application (43) to practice experiential exercises at home. They received values bull's-eye, dropping anchor and self-compassion handouts (23).

Context

Ethical approval was received from the Ethics and Research Governance at University of Southampton (ID 70341) and the NHS Health Research Authority (ID 311583). The study was conducted

face-to-face in a local community clinic, except for one participant who completed majority of the sessions online. Follow-up sessions were completed online. Participants signed an informed consent sheet (see Appendix C) during the initial appointment. Consent was provided each time they completed a survey and verbal assent was obtained at the beginning of each session.

Intervention

The intervention consisted of two parts (see Table 2). The first part included development of a collaborative biopsychosocial formulation with the participant, to help them gain a better understanding of their illness, following a clinical interview (44), referred to throughout as the formulation intervention. The biopsychosocial formulation model considered predisposing vulnerabilities, precipitating and perpetuating factors, across biological, psychological and social domains (45). The formulation was presented graphically (12).

The second part included three ACT sessions, based on three functional units (Triflex) that aim to increase psychological flexibility (23), referred to throughout at as the ACT intervention. The first session was based on "doing what matters", connecting with one's values, beginning life-enhancing actions. The second session focused on "opening up", providing people with skills to separate from their thoughts and feelings, and allowing them to make room for them. Finally, the third session focused on self-compassion and brought the other processes together. The third process of "being present", engaging and paying attention to the here and now, was practiced throughout all sessions and modelled by the therapist.

The whole intervention was provided by a 3rd year Trainee Clinical Psychologist trained in ACT. They received ACT supervision from a Clinical Neuropsychologist. A third of the sessions were randomly recorded, listened to and rated on the ACT Fidelity Measure (46) by the supervisor.

Table 2

Overview of the Formulation and Brief ACT session content

Session number	Content	Experiential exercises	Homework exercises
1	Clinical Interview	N/A	N/A
2	Biopsychosocial Formulation	N/A	N/A
3	Value exploration, selection of core values, committed action in relation to values	Value card sorting, value bull's eye to determine which life area needs most focus	Noticing towards (acting in line with values) and away moves (acting away from valued living), flavouring and savouring values, exploring ACT companion app
4	Introducing acceptance and defusion	Dropping anchor and defusion exercises "naming the mind, I am having the thought", scrunching paper	Practicing dropping anchor and defusion techniques, handouts and audio materials shared
5	Self-compassion and overview of previous sessions	Noticing/naming/describing thoughts and feelings, compassionate hand exercise	Compassionate hand exercise, encouraged to practice the skills from the sessions

Procedure

A summary of the procedure is provided in Figure 1. First, a Consultant Clinical Neuropsychologist screened incoming referrals based on inclusion and exclusion criteria. Patients who met the inclusion criteria were informed about the study and invited to meet the researcher to discuss participation. After signing the informed consent sheet, participants completed baseline psychometric battery via Qualtrics, an online survey platform, and were set-up with routine measure surveys, which they had to complete every 2 days throughout the length of the study. Participants received an automated email reminder to complete the routine measure surveys. If participants missed the survey completion, they received another email reminder.

After a 4 week baseline period, the formulation intervention period commenced: participants attended the clinic for a clinical interview which lasted approximately 2 hours and was used to gather information to inform the formulation. A week later participants attended a formulation session, which involved sharing a bespoke formulation and some psychoeducation to support their understanding of

FND. The following day participants were emailed a survey link to complete the post-formulation psychometric battery. Participants also received a formulation letter via post. A 2 week withdrawal period then began. At week 9, the brief ACT intervention commenced. Participants attended the clinic for weekly 1h sessions and were asked to practise skills at home. At the end of week 11, participants completed the psychometric battery again, before beginning a follow-up period of 4 weeks. At the end of week 15, participants met the researcher online for a follow-up session, completed the psychometric battery via Qualtrics, were debriefed, and discharged from the service. Each participant received a discharge letter with a summary of the skills practised in therapy sessions with future recommendations.

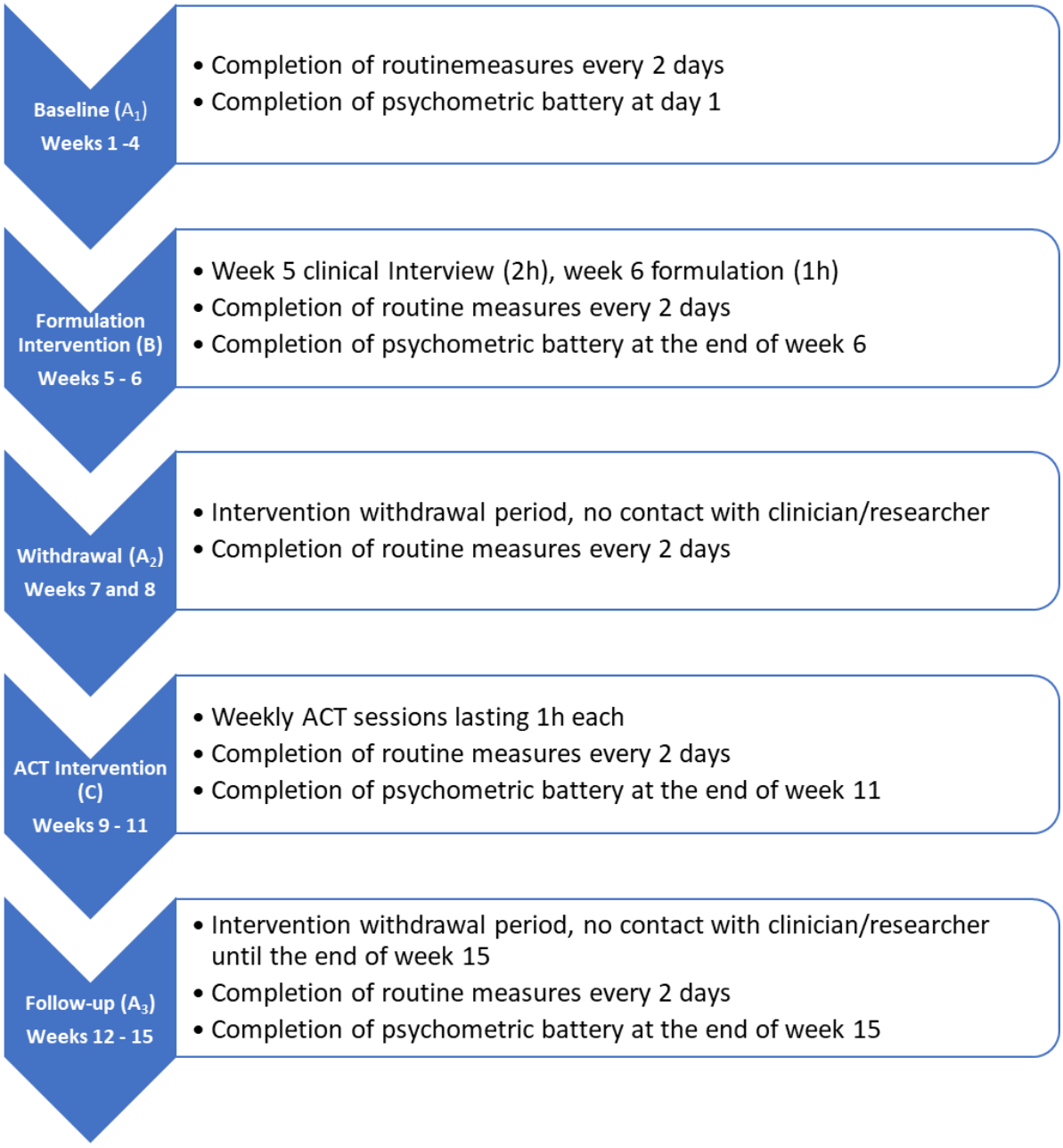


Figure 1

Summary flow-chart of intervention procedure

Analysis

Feasibility, safety and acceptability were evaluated by inspecting descriptive data. To assess effectiveness, routine measures (FND symptoms, distress, impact on engagement) were displayed graphically using Microsoft Excel, with vertical lines representing phase change and horizontal lines representing the mean in each phase, as recommended by Krasny-Pacini and Evans (30). The phases were separated into baseline A_1 (from the introductory session to the day before assessment), phase B – formulation intervention (from the day of assessment to the day of formulation session), withdrawal A_2 (from the day after the formulation to the day before the first ACT session), phase C – ACT intervention (from the day of the first ACT session to the last ACT session), follow-up A_3 (from the day after the last ACT session to the day of follow-up session). Visual analysis was completed by detecting changes in central tendency (47).

To further assess the effectiveness by calculating the overlap between phases, a Tau-U (48) statistical analysis was conducted for routine outcome measures using the Tau-U online calculator (49). The intervention is deemed to have an effect if there is no overlap between two phases. Tau-U is robust against outliers, skewed data and controls for baseline trend (48). Baseline trends were checked using the Tau-U calculator, no adjustments were needed. Seven comparisons were made: baseline vs formulation intervention, baseline vs ACT intervention, baseline vs follow-up, baseline vs formulation and ACT combined, formulation intervention vs ACT, ACT vs follow-up and interventions combined vs follow-up. Weighted averages for each comparison, creating omnibus effect sizes across all study participants were calculated for routine outcomes.

Reliable change index, RCI, (50) was calculated using FND sample means and standard deviations (SD) from previous research (37, 41, 51, 52) for individual participants for QoL, emotional processing, psychological health, psychological inflexibility and illness perception measures. Four comparisons were made: baseline vs formulation intervention, baseline vs ACT intervention, formulation vs ACT, and baseline vs follow-up.

Results

Feasibility

All participants completed all 5 sessions and attended online follow-up. However, 3 participants rescheduled between 44% to 55% of appointments due to FND symptom or migraine flare-ups. As a result, every participant's timeline differed. No participant had a 100% response rate for routine measures, despite regular reminders. The response rate ranged between 76.9% to 92%.

Safety

Participant 2 developed FS following the formulation phase; however these were not confirmed by a neurologist. Otherwise, no adverse events were reported. One participant was discharged from the study due to increased risk, which they did not disclose at the clinical interview.

Acceptability

All participants provided positive feedback at the follow-up session and reported to be using the skills that they learned during ACT sessions. No participants dropped out once they started the therapy, suggesting the intervention was acceptable. All participants indicted that they would have liked this intervention to be longer and to have had more ACT sessions.

Effectiveness

Phase characteristics for routine measures are reported in Table 3. Visual analyses and Tau-U statistic are reported for each participant individually, together with graphs for the routine measures and psychometric battery scores, followed by RCI findings.

Table 3

Phase characteristics including number of measurements (N), mean and standard deviation (SD) of repeated outcome measures: symptom frequency, distress as a result of symptoms, impact on engagement in meaningful activities

	Participant 1	**Participant 2**	**Participant 3**	**Participant 4**
	N, Mean (SD)	*N, Mean (SD)*	*N, Mean (SD)*	*N, Mean (SD)*
Symptom Frequency				
Baseline	9, 6.33 (1.41)	8, 9.63 (.74)	8, 6.38 (2.50)	11, 8.36 (1.57)
Formulation	5, 7.80 (1.48)	6, 10 (0)	4, 4.25 (2.22)	4, 8.5 (1.29)
Withdrawal	5, 6.4 (1.67)	6, 10 (0)	6, 3.17 (1.17)	3, 8.33 (1.53)
ACT intervention	6, 5.0 (1.55)	8, 10 (0)	4, 1.75 (.5)	5, 8.0 (1.0)
Follow-up	7, 5.57 (1.72)	10, 10 (0)	8, 6.25 (1.28)	7, 6.57 (.79)
Distress				
Baseline	9, 6.0 (2.12)	8, 9.88 (.35)	8, 5.25 (2.66)	11, 8.27 (1.56)
Formulation	5, 7.2 (1.79)	6, 10 (0)	4, 3.0 (1.83)	4, 8.75 (1.89)
Withdrawal	5, 5.8 (1.3)	6, 10 (0)	6, 2.17 (.75)	3, 6.33 (3.21)
ACT intervention	6, 4.0 (1.79)	8, 10 (0)	4, 1.25 (.5)	5, 7.0 (3.0)
Follow-up	7, 3.71 (1.38)	10, 10 (0)	8, 4.75 (1.58)	7, 5.29 (1.98)
Impact on Engagement				
Baseline	9, 9.33, (1.32)	8, 9.75 (.46)	8, 4.13 (3.09)	11, 8.27 (1.68)
Formulation	5, 9.4 (.89)	6, 10 (0)	4, 2.75 (1.71)	4, 7.0 (2.58)
Withdrawal	5, 8.6 (.55)	6, 10 (0)	6, 2.17 (.98)	3, 7.0 (3.0)
ACT intervention	6, 6.83 (1.83)	8, 10 (0)	4, 1.75 (1.5)	5, 8.2 (1.79)
Follow-up	7, 7.57 (1.40)	10, 10 (0)	8, 4.38 (1.41)	7, 4.43 (2.07)

Participant 1

Participant 1 completed the intervention online as the severity of migraines and FND symptoms prevented her from attending the clinic. The whole study phase took 16 weeks (w): baseline 4w, formulation 3.5w, withdrawal 2.5w, ACT 3w, follow-up 3w.

She presented with severe and frequent migraines (suspected functional overlay), occurring daily at the start of the intervention, which decreased in severity and frequency as the intervention progressed. Her presenting symptoms included FS, dissociation, right sided spasms, pain, speech and movement disturbances, and tinnitus. She had a history of anorexia nervosa, depression and anxiety, difficulties with relationships and emotional abuse.

This person experienced distress due to lack of treatment for FND and stigma. We hypothesised the following maintaining factors: fear of seizures/migraines, avoidance, emotional suppression, rumination, anxiety and hypervigilance.

Visual Analyses. Visual analysis of psychometric battery scores (Figure 2 and Figure 3) indicates a decreasing trend across the validated outcome measures up to the follow-up period. The scores for symptom frequency, distress and impact on engagement measured over a 2 week period reflect the scores of the same measures taken at every two day intervals.

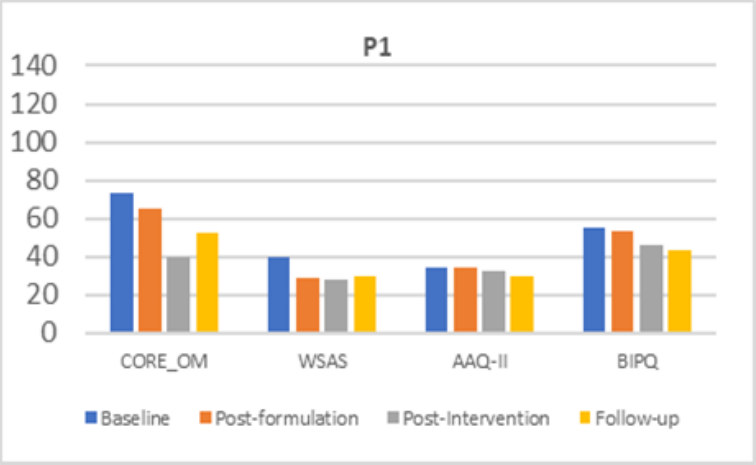


Figure 2

Psychometric battery scores for psychological health, QoL, psychological inflexibility and illness perception at baseline post-formulation, post-ACT intervention and at follow up for Participant 1

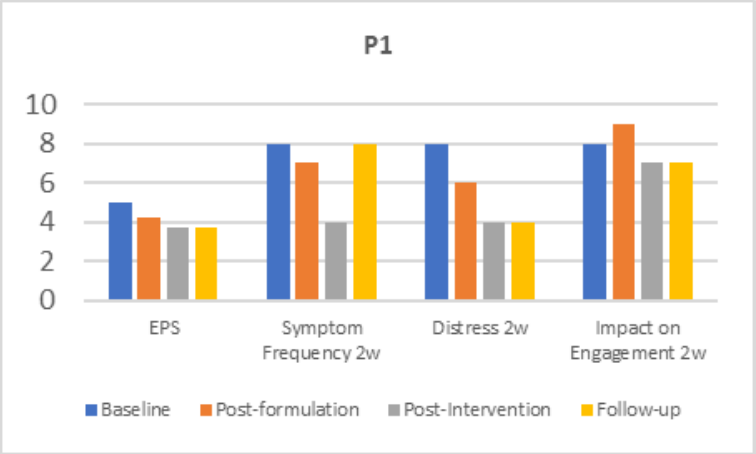


Figure 3

Emotional processing, symptom frequency, distress and impact on engagement scores (over a 2 week period) at baseline, post-formulation, post-ACT intervention and at follow up for Participant 1

Visual analyses show high levels of symptom frequency (Figure 4) throughout the study period, with a trend indicating decrease in symptom frequency between the formulation intervention, phase B, and ACT intervention, supported by statistically significant reduction in symptom frequency (u = -.8, z = -2.19, p = .02). However this was not maintained at follow-up or at other points of comparison (p > .05).

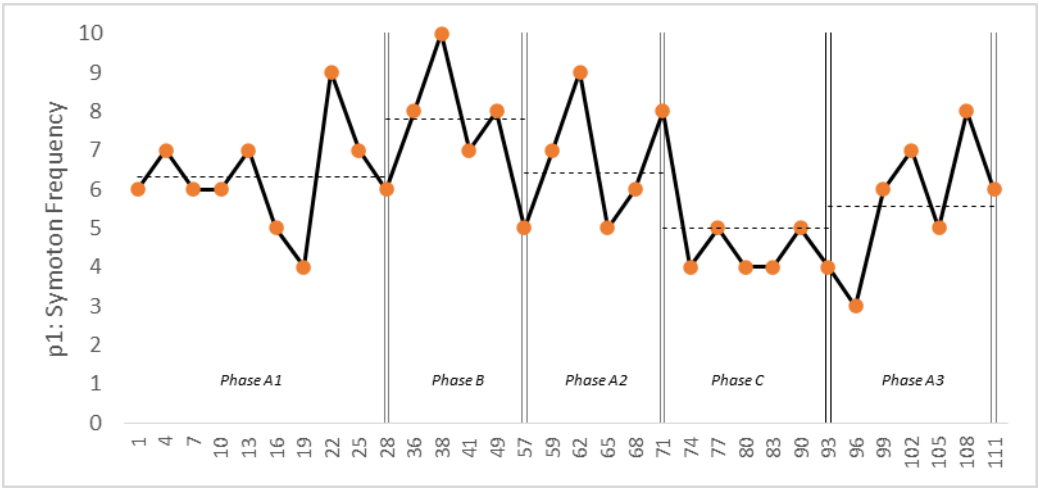


Figure 4

Visual representation of symptom frequency for the study period for Participant 1

Similarly, Participant 1 reported high levels of distress (Figure 5) as a result of FND symptoms, with a trend indicating a decrease in distress between the formulation intervention and ACT intervention phases, but not at follow-up. There was significant decrease in distress between formulation and ACT intervention (u = -.8, z = -2.19, p = .02) and baseline versus follow-up (u = -.63, z = -2.11, p = .03), suggesting decreases in distress following the ACT intervention, the effects of intervention were maintained at follow-up.

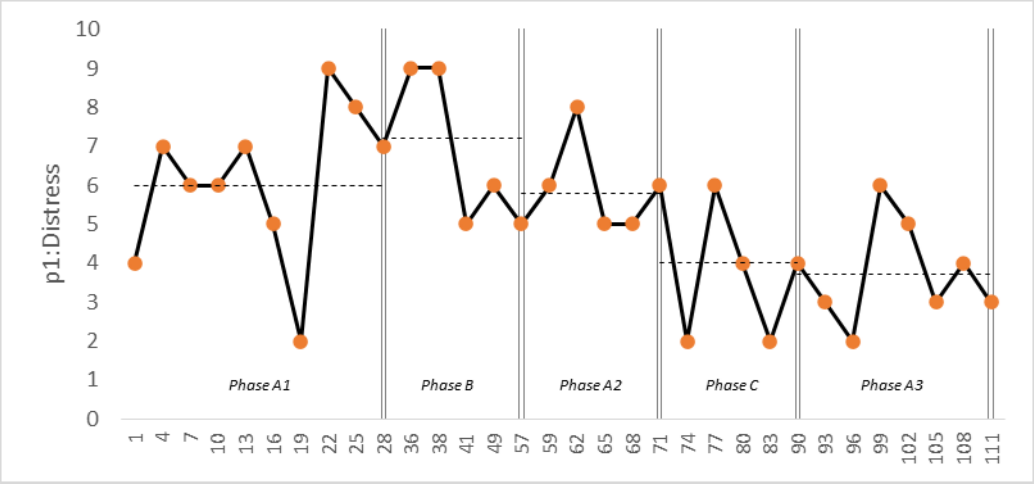


Figure 5

Visual representation of distress as result of FND symptoms for the study period for Participant 1

High levels of symptom impact on engagement (Figure 6) in meaningful activities were observed throughout, with a trend indicating a decrease following the formulation intervention. There was a significant decrease of symptom impact on engagement between formulation and ACT intervention (u = -.83, z = -2.28, p = .02), between baseline and ACT intervention (u = -.81, z = -2.59, p = .009), and between baseline and follow-up (u = -.74, z = -2.48, p = .01), suggesting lesser impact of FND symptoms on engagement in meaningful activities following the ACT intervention.

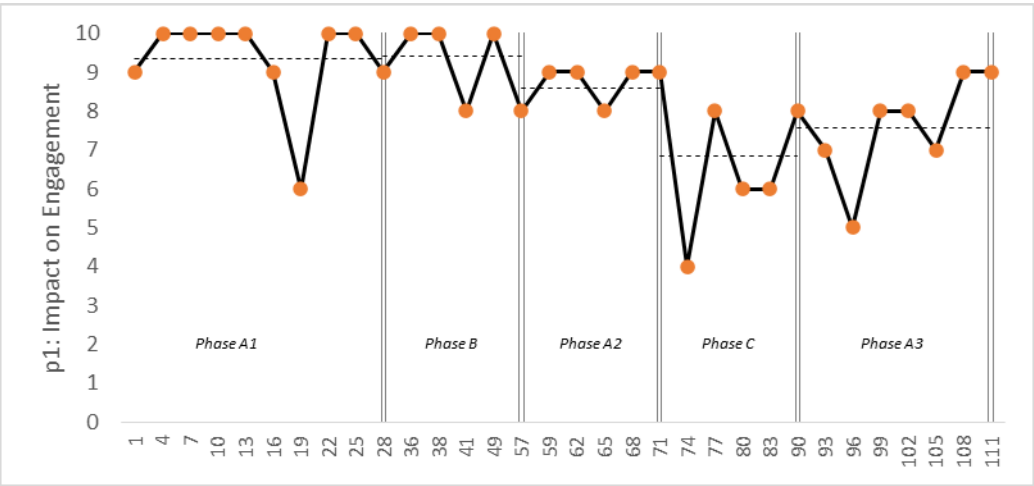


Figure 6

Visual representation of FND symptom impact on engagement in meaningful activities for the study for Participant 1

Participant 2

This 32-year-old female had recently received the diagnosis of FND, alongside hemiplegic migraines. Her presenting symptoms included right sided weakness, self-reported cognitive difficulties, and other motor symptoms. Throughout the course of intervention she began to experience FS. She had a history of anxiety and depression, gynaecological problems and difficulties at school (adjustment, bullying). At the follow-up session the participant disclosed recent emotive, life-changing events. The whole study phase took 16 weeks (w): baseline 3.5w, formulation 2w, withdrawal 3w, ACT 4w, follow-up 3w.

We hypothesised the following maintaining factors: ongoing medical investigations, anxiety, worry, difficulties tolerating emotions, avoidance, isolation, overdoing and loss of identity.

Visual Analyses. Visual analyses of psychometric battery scores (Figure 7 and Figure 8) indicate a decreasing trend across the validated outcome measures. Additionally, it can be seen that Participant 2 was experiencing high levels of distress at baseline period and difficulties with emotional processing. The scores for symptom frequency, distress and impact on engagement measured over a 2 week period reflect the scores of the same measures taken at every two day intervals.

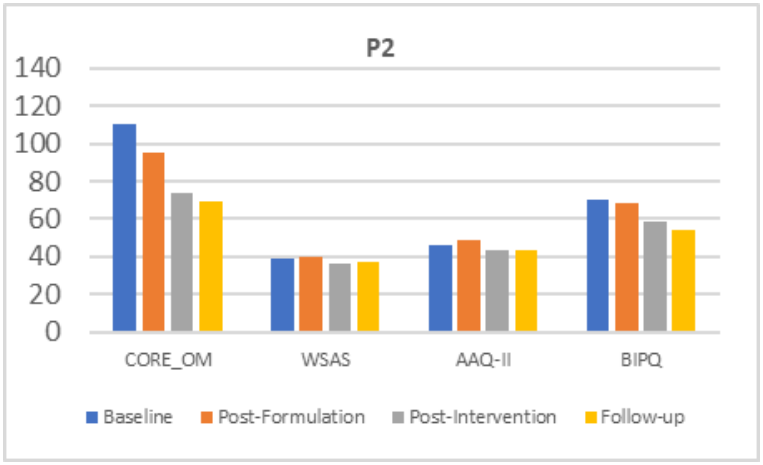


Figure 7

Psychometric battery scores for psychological health, QoL, psychological inflexibility and illness perception at baseline, post-formulation, post-ACT intervention and at follow up for Participant 2

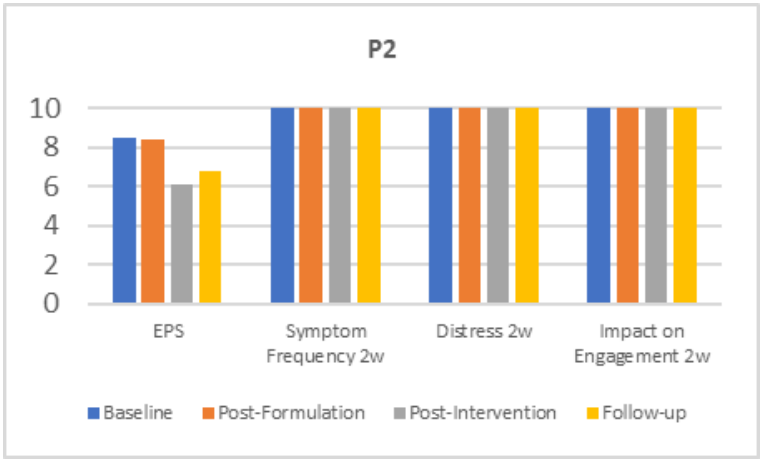


Figure 8

Emotional processing, symptom frequency, distress and impact on engagement scores (over a 2 week period) at baseline, post-formulation, post-ACT intervention and at follow up for Participant 2

Visual analyses show high levels of symptom frequency (Figure 9) that remained unchanged. There were no statistically significant changes between phases ($p > .05$), suggesting no improvement in symptom frequency.

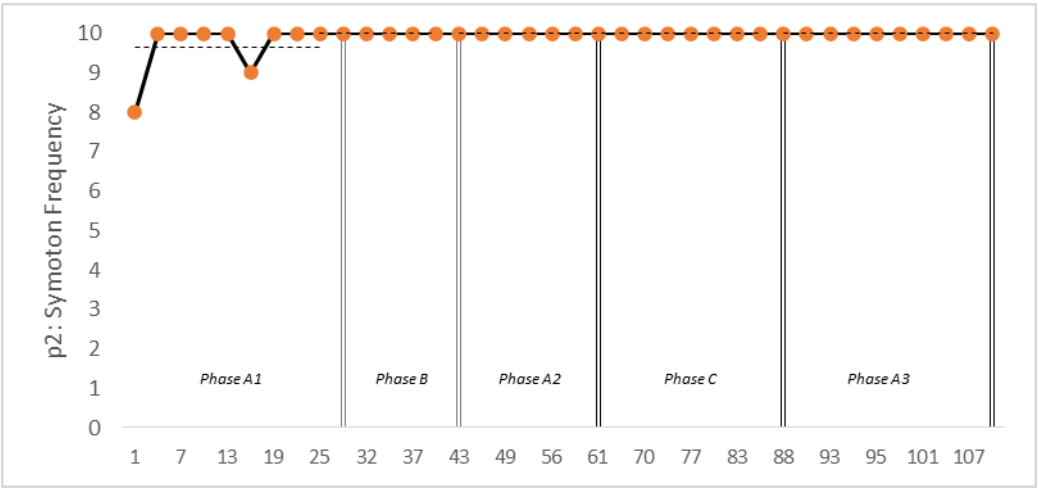


Figure 9

Visual representation of symptom frequency for the study period for Participant 2

Visual analyses show high levels of distress due to FND symptoms (Figure 10) that remained unchanged. There were no statistically significant changes between phases ($p > .05$), suggesting no improvement in levels of distress.

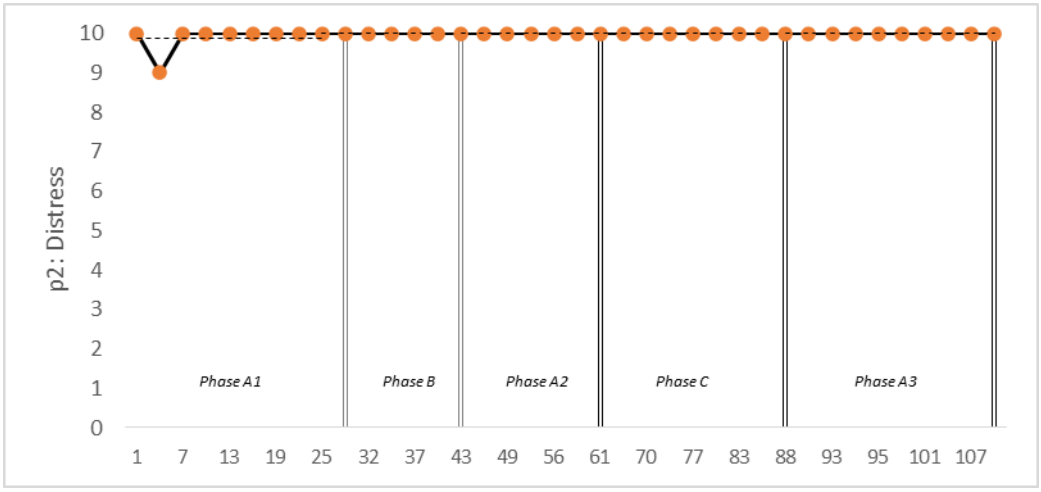


Figure 10

Visual representation of distress as result of FND symptoms for the study period for Participant 2

Visual analyses show high levels of symptom impact on ability to engage in meaningful activities (Figure 11) that remained unchanged. There were no statistically significant changes between phases ($p > .05$), suggesting no improvement in ability to engage in meaningful activities.

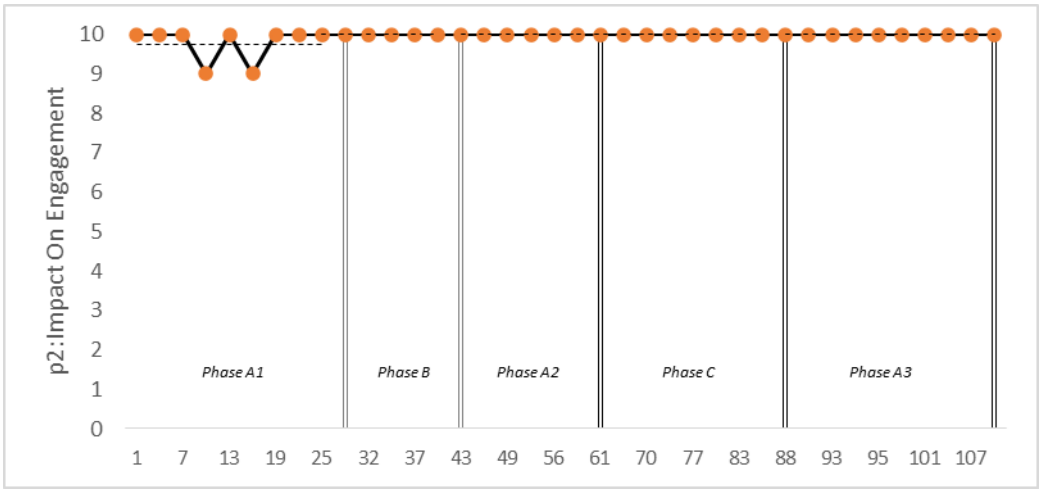


Figure 11

Visual representation of FND symptom impact on engagement in meaningful activities for the study for Participant 2

Participant 3

This 22-year-old female had also recently received an FND diagnosis. She reported a history of binge-purge bulimic behaviours, migraines of unexplained severity and frequency, and vasovagal syncope. She also has a diagnosis of ADHD. This person did not report any adverse life experiences and reported difficulties with understanding and accepting the FND diagnosis. The whole study phase took 15 weeks (w): baseline 4w, formulation 2w, withdrawal 3w, ACT 2w, follow-up 4w.

We hypothesised the following factors involved in symptom maintenance: over-exertion, anxiety, inability to relax, emotion processing difficulties, difficulties with experiencing any uncomfortable emotions/feelings and avoidance.

Visual Analyses. Visual analyses of psychometric battery scores (Figure 12 and Figure 13) indicate that scores on validated outcome measures remained largely unchanged, with some increase in psychological distress during the intervention. The scores for symptom frequency, distress and impact on engagement measured over a 2 week period reflect the scores of the same measures taken at every two day intervals.

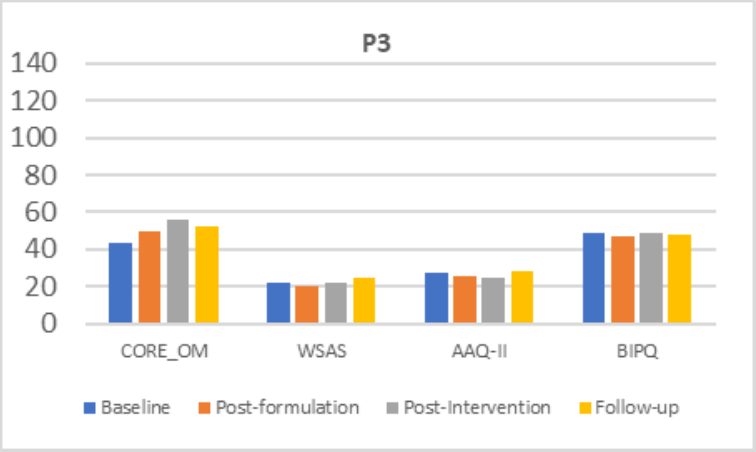


Figure 12

Psychometric battery scores for psychological health, QoL, psychological inflexibility and illness perception at baseline, post-formulation, post-ACT intervention and at follow up for Participant 3

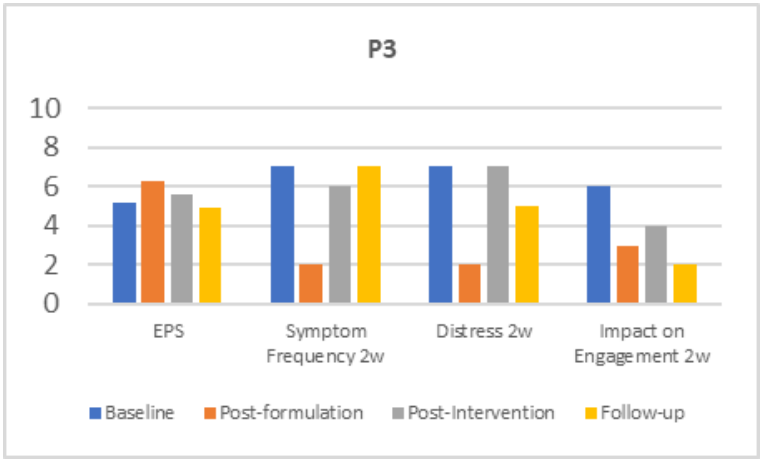


Figure 13

Emotional processing, symptom frequency, distress and impact on engagement scores (over a 2 week period) at baseline, post-formulation, post-ACT intervention and at follow up for Participant 3

Visual analyses show a trend of decreasing levels of symptom frequency (Figure 14) throughout the intervention followed by an increase in symptom frequency throughout the follow-up. There was a significant decrease in symptom frequency between baseline and ACT intervention (u = -.90, z = -2.46, p = .01) and between baseline and both interventions combined (u = -.70, z = -2.36, p = .01). The levels of symptom frequency significantly increased at follow-up (u = 1, z = 2.71, p = .006) compared to ACT and both interventions combined (u = .78, z = 2.62, p = .008). There was no significant difference between baseline and follow-up, the two intervention phases, or baseline and formulation intervention (p > .05). Therefore, the intervention may have been effective at reducing symptom frequency, however this was not maintained at follow-up.

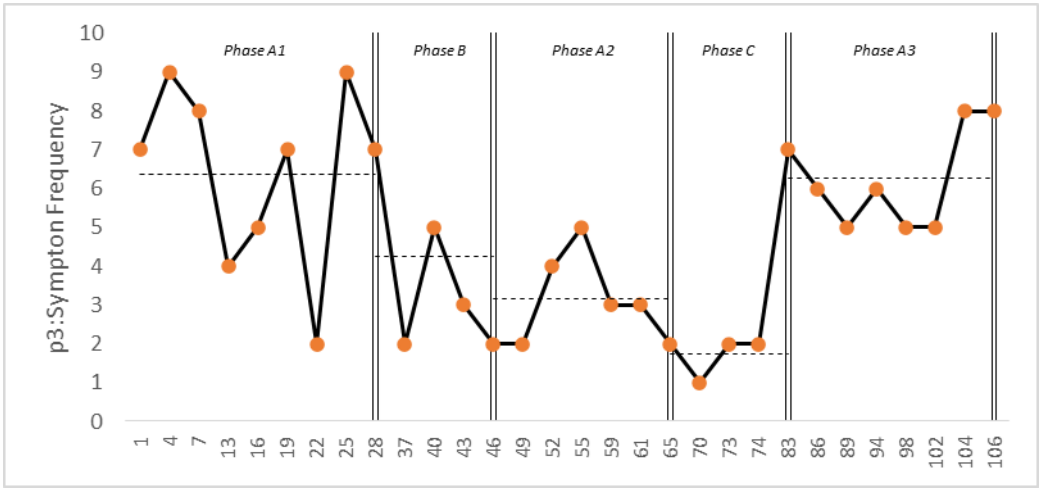


Figure 14

Visual representation of symptom frequency for the study period for Participant 3

Visual analyses show a decreasing trend in levels of distress due to FND symptoms (Figure 15) throughout the intervention period followed by an increase in distress throughout the follow-up phase.

The only significant difference for a decrease in distress was between the formulation intervention and ACT intervention phases (u = -.93, z = -2.54, p = .01). The levels of distress significantly increased comparing ACT and follow-up (u = .96, z = 2.63, p = .008) and both intervention phases combined (u = .75, z = 2.52, p = .01). No significant difference was observed for any other comparisons (p > .05). The findings suggest that ACT intervention was effective at reducing distress while in therapy, however this was not maintained at follow-up.

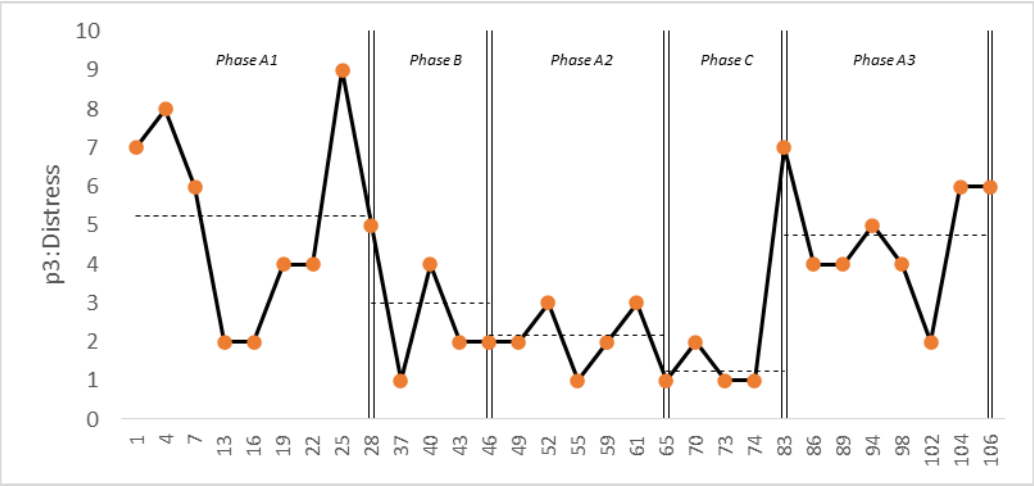


Figure 15

Visual representation of distress as result of FND symptoms for the study period for Participant 3

Visual analyses show a decreasing trend in levels of symptom impact on ability to engage in meaningful activities (Figure 16) throughout the intervention period followed by an increase in symptom impact on engagement throughout the follow-up phase. The symptom impact on engagement was significantly lower throughout the intervention phase combined (formulation and ACT) than at follow-up (u = -.68, z = -2.31, p = .02), the symptom impact on engagement increased significantly at follow-up phase compared to ACT intervention phase (u = .81, z = 2.20, p = .02), suggesting that the positive effects of intervention were not maintained at follow-up.

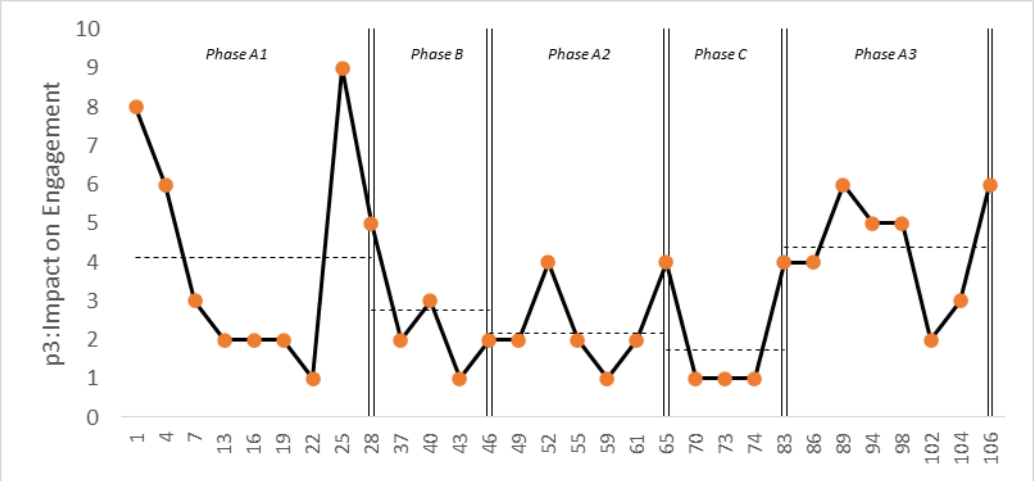


Figure 16

Visual representation of FND symptom impact on engagement in meaningful activities for the study for Participant 3

Participant 4

This 47-year-old woman had a longstanding diagnosis of FND and has become a wheelchair user following a spinal fusion. Her presenting symptoms included right-sided weakness, cognitive and speech difficulties, and functional seizures. She had a historical functional stroke (symptoms that mimic a stroke but are not caused by a stroke). This woman reported a history of complex trauma and abuse. She presented with complex social history, high levels of emotional distress and expressed thoughts of suicide. The whole study phase took 15 weeks (w): baseline 5w, formulation 1w, withdrawal 4w, ACT 2w, follow-up 3w.

We hypothesised the following factors involved in symptom maintenance: sleep difficulties, trauma symptoms, rumination, social isolation, difficulties with emotion regulation and interpersonal relationships, pain, fatigue, complex social situation, lack of meaningful activities.

Visual Analyses. Visual analyses of psychometric battery scores (Figure 17 and Figure 18) indicate a decrease in the majority of outcome measures compared to baseline . Additionally, Participant 4 displayed high levels of distress and difficulties in emotional processing at baseline. The scores for symptom frequency, distress and impact on engagement measured over a 2 week period reflect the scores of the same measures taken at every two day intervals.

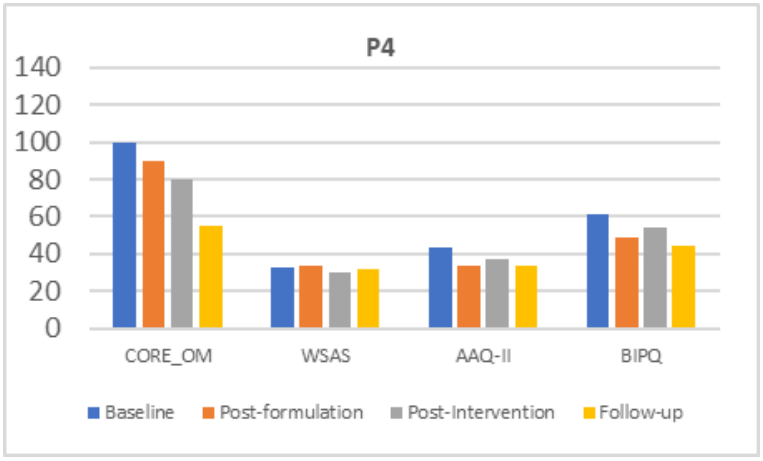


Figure 17

Psychometric battery scores for psychological health, QoL, psychological inflexibility and illness perception at baseline, post-formulation, post-ACT intervention and at follow up for Participant 4

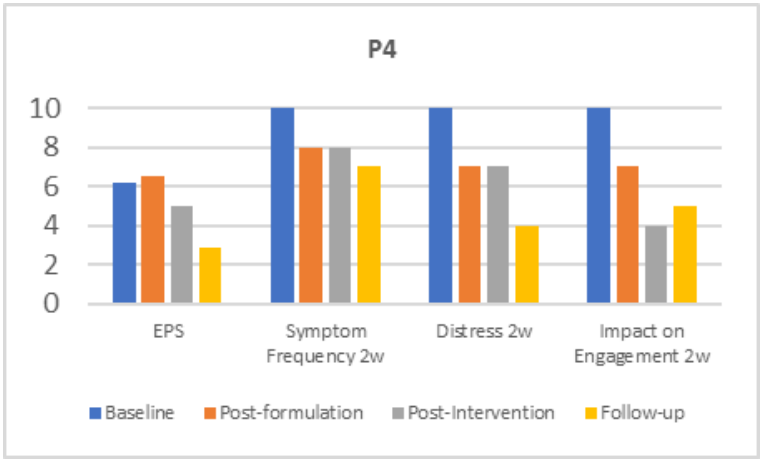


Figure 18

Emotional processing, symptom frequency, distress and impact on engagement scores (over a 2 week period) at baseline, post-formulation, post-ACT intervention and at follow up for Participant 4

Visual analyses show high levels of symptom frequency (Figure 19) that have maintained fairly stable throughout, with a trend indicating decrease throughout ACT intervention and follow-up phases. There was a significant decrease in symptoms between ACT intervention and follow-up (u = -.71, z = -2.03, p = .04), both interventions combined and follow-up (u = -.76, z = -2.54, p = .01) and between baseline and follow-up (u = -.61, z = -2.12, p = .03). However, there was no significant difference between baseline and the interventions alone or combined (p > .05). The findings suggest that the intervention may have contributed to the decrease in symptom frequency.

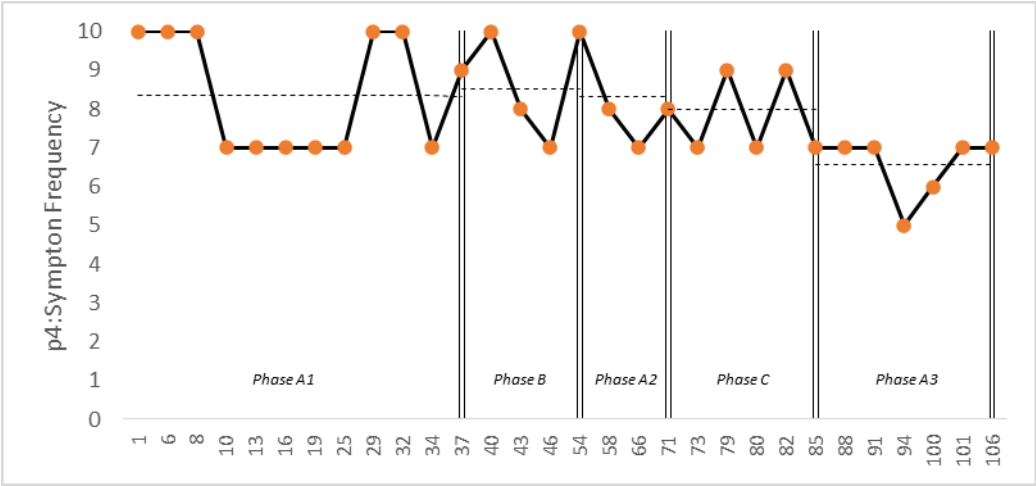


Figure 19

Visual representation of symptom frequency for the study period for Participant 4

Visual analyses show high levels of distress due to FND symptoms (Figure 20) and high variability throughout the study period. The decrease in distress was only significant when comparing baseline and follow-up (u = -.70, z = -2.44, p = .01), this suggests a potential delay in intervention benefits for distress reduction.

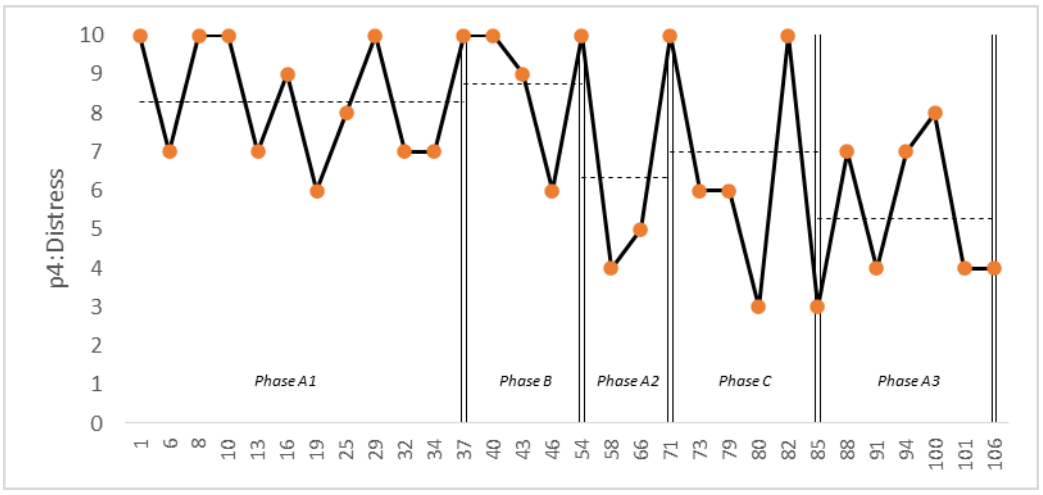


Figure 20

Visual representation of distress as result of FND symptoms for the study period for Participant 4

Visual analyses show high levels of symptom impact on ability to engage in meaningful activities (Figure 21), with a trend indicating a decrease in symptom impact on engagement during the formulation intervention, withdrawal and follow-up phases. There was a significant decrease between baseline and follow-up phases (u = -.87, z = -3.03, p = .002), this was also observed between ACT and follow-up phases (u = -.85, z = -2.43, p = .01). However, the symptom impact on engagement was significantly higher during both intervention phases compared to follow-up (u = .73, z = 2.43, p = .01), suggesting that symptom impact on engagement may have reduced as a result of ACT.

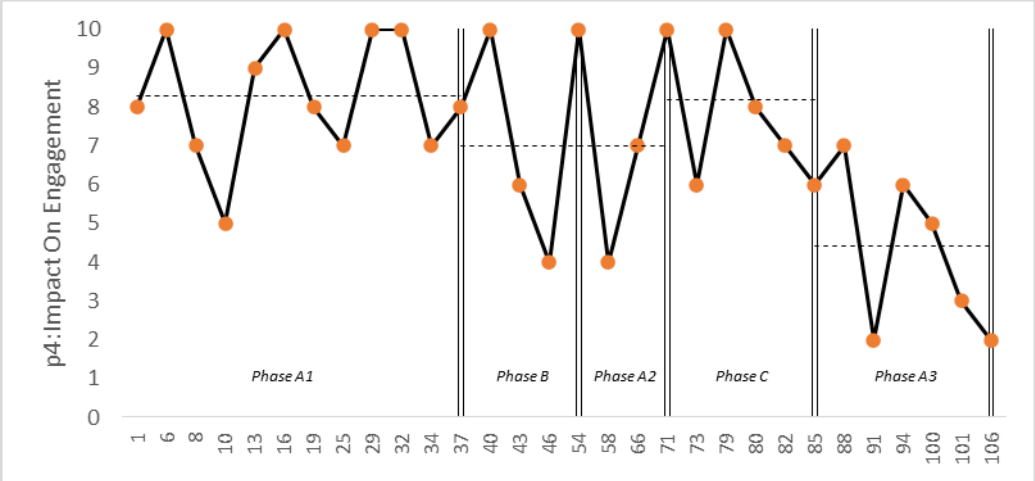


Figure 21

Visual representation of FND symptom impact on engagement in meaningful activities for the study for Participant 4

Summary for weighted average

Symptom Frequency

Weighted average comparisons showed a significant difference for reductions in symptom frequency when comparing formulation and ACT intervention phases only (u = -.44, z = -2.29, p = .02, 95%CI [-0.818,-0.064]).

Distress

Weighted average comparisons showed a significant difference for reduction in distress levels between baseline and ACT intervention (u = -.39, z = -2.40, p = .01, 95%CI [-0.712, -0.072]), between formulation and ACT interventions (u = -.41, z = -2.14, p = .03, 95%CI [-0.789,-0.035]), and between baseline and follow-up (u = -.29, z = -2.02 p = .04, 95%CI [-0.586,-0.009]). Therefore, the full intervention, formulation and brief ACT, was successful at reducing levels of distress as a result of FND symptoms and the effects were maintained at 3 to 4 week follow-up.

Engagement

Weighted average comparisons showed a significant difference for reductions in symptom impact on engagement between baseline and follow-up phases (u = -.29, z = -1.99, p = .04, 95%CI [-.577, .005]). Therefore, at follow-up participants were able to engage in meaningful activities more despite their FND symptoms.

Reliable Change Index

See Table 4 for RCI scores.

Psychological Health

Reliable change was observed in decreases on CORE-OM for Participants 1, 2 and 4 after ACT intervention and at follow-up when compared to baseline, and for Participants 1 and 2 CORE-OM scores decreased after ACT intervention when compared to formulation intervention. For the majority of participants improvements in psychological health were observed following ACT intervention and maintained at follow-up.

Quality of Life

A reliable change in quality of life improvement was observed only for Participant 1 when comparing ACT to baseline. There was no reliable change for any other participants and any points.

Psychological Inflexibility

Reliable change on AAQ-II was observed for Participant 3 at three different time points. Improvements in psychological inflexibility were maintained at follow-up. For Participant 2 a reliable change in increased psychological flexibility was observed when comparing the formulation intervention and ACT intervention only and not maintained at follow-up.

Illness Perception

The scores of the BIPQ did not change for the majority of participants. For Participant 4 a reliable change was observed when comparing baseline to follow-up, indicating that following intervention they perceived their illness as less threatening.

Emotional Processing

Reliable change in improved emotional processing styles was observed for Participant 2 and 4, after the ACT intervention compared to the formulation intervention and maintained at follow-up when compared to baseline scores. For Participant 2 improvement was observed when comparing ACT to baseline as well.

Table 4

Mean scores and Reliable Change Index for outcome measures

	Participant 1	Participant 2	Participant 3	Participant 4
CORE-OM				
Baseline-Formulation	73 – 65 (-.83)	110 – 95 (-1.56)	43 – 50 (.73)	100 – 90 (-1.04)
Formulation-ACT	65 – 40 (-2.60)*	95 – 74 (-2.18)*	50 – 56 (.62)	90 – 80 (-1.04)
Baseline-ACT	73 – 40 (-3.43)*	110 – 74 (-3.74)*	43 – 56 (1.35)	100 – 80 (-2.08)*
Baseline-Follow-up	73 – 52 (-2.18)*	110 – 69 (-4.26)*	43 – 52 (.94)	100 – 55 (-4.68)*
WSAS				
Baseline-Formulation	40 – 29 (-1.91)	39 – 40 (.17)	22 – 20 (-.35)	33 – 34 (0.17)
Formulation-ACT	29 – 28 (-.17)	40 – 36 (-0.69)	20 – 22 (.35)	34 – 30 (-0.69)
Baseline-ACT	40 – 28 (-2.08)*	39 – 36 (-.52)	22 – 22 (0)	33 – 30 (-0.52)
Baseline-Follow-up	40 – 30 (-1.74)	39 – 37 (-.35)	22 – 25 (.52)	33 – 32 (-0.17)
AAQ-II				
Baseline-Formulation	34 – 34 (.00)	46 – 49 (1.00)	27 – 28 (.33)	43 – 34 (-3.00)*
Formulation-ACT	34 – 32 (-.67)	49 – 43 (-2.00)*	26 – 25 (-.33)	34 – 37 (1.00)
Baseline-ACT	34 – 32 (-.67)	46 – 43 (-1.00)	27 – 25 (-.67)	43 – 37 (-2.00)*
Baseline-Follow-up	34 – 30 (-1.33)	46 – 43 (-1.00)	27 – 28 (.33)	43 – 34 (-3.00)*
BIPQ				
Baseline-Formulation	55 – 53 (-.23)	70 – 68 (-.23)	49 – 47 (-.23)	61 – 49 (-1.38)
Formulation-ACT	53 – 46 (-.81)	68 – 59 (-1.04)	47 – 49 (.23)	49 – 54 (0.58)
Baseline-ACT	55 – 46 (-1.04)	70 – 59 (-1.27)	49 – 49 (0)	61 – 54 (-0.81)
Baseline-Follow-up	55 – 43 (-1.38)	70 – 54 (-1.85)	49 – 48 (-.12)	61 – 44 (-1.96)*
EPS				
Baseline-Formulation	5.04 – 4.2 (-1.04)	8.48 – 8.4 (-0.10)	5.2 – 6.24 (1.29)	6.2 – 6.56 (0.45)
Formulation-ACT	4.20 – 3.72 (-.60)	8.4 – 6.12 (-2.83)*	6.24 – 5.6 (-.79)	6.56 – 4.96 (-1.98)*
Baseline-ACT	5.04 – 3.72 (-1.64)	8.48 – 6.12 (-2.93)*	5.2 – 5.6 (.50)	6.2 – 4.96 (-1.54)
Baseline-Follow-up	5.04 – 3.72 (-1.64)	8.48 – 6.8 (-2.08)*	5.2 – 4.9 (-.37)	6.2 – 2.88 (-4.12)*

*Abbreviations: CORE-OM - Clinical Outcomes in Routine Evaluation – Outcome Measure, WSAS – Work and Social Adjustment Scale, AAQ-II – Acceptance and Action Questionnaire, BIPQ -Brief Illness Perception Questionnaire, EPS – Emotional Processing Scale. * Indicates a significant reliable change*

Discussion

The aim of this study was to assess the effectiveness and acceptability of a formulation and brief ACT (F-ACT) intervention for adults with FND. The findings suggest that the F-ACT intervention was well accepted by participants. Participants were experiencing less distress and were able to engage in meaningful activities more despite their FND symptoms. Additionally, the majority of participants experienced improvements in psychological health and emotional processing.

These findings are consistent with previous studies that evaluated the use of ACT in FND populations (24-26) in relation to improved psychological health, reduced symptom interference, as seen in reduced levels of distress and increased engagement in meaningful activities. However, a consistent reliable change was not observed in psychological inflexibility as measured by AAQ-II (40), inconsistent with the previous studies. Reliable changes in lower levels of psychological inflexibility were observed for Participants 2 and 4 following ACT and only maintained at follow-up for Participant 4.

The changes reported above, including the improvements in emotional processing style were observed following the ACT component of F-ACT intervention and maintained at follow-up. This suggests that the ACT element may be the active component of the intervention that facilitated the change. Although this was not reflected in the scores of AAQ-II (40) that has historically been used to measure the effectiveness of ACT. Nonetheless, improvements in emotional processing, distress and ability to engage in meaningful activities, deemed as essential components of psychological flexibility (53), have been observed as a result of the F-ACT intervention.

Participants' understanding of FND did not show a reliable change throughout the intervention as measured by the BIPQ (41), although the reduction in scores was observed. Only Participant 4 perceived FND as less threatening at follow-up. Therefore, F-ACT did not result in improved FND understanding for everyone. It may be that one formulation session is not sufficient for people to develop an in-depth understanding of their condition and a more comprehensive psychoeducational element is needed. Gutkin et al (22) found self-reported improvements in understanding of FND following a 5 session formulation intervention in the majority of FND participants. Similarly, psychoeducational interventions have resulted in improved understanding of FND (20).

Conversely, some participants in this study had recently received a diagnosis of FND and may have required longer time to develop a better understanding and accept the diagnosis. This intervention may have been a starting point at developing an understanding of FND, however this would need to be explored further using a qualitative approach.

In contrast to other therapeutic interventions, such as CBT and psychodynamic therapies (19, 22), QoL remained mainly unchanged throughout the different phases of F-ACT. Only Participant 1 had a reliable change in improved QoL, however that was not maintained at follow-up. This may be reflected by the complexity of patients recruited to this study and the severity of FND symptoms. Three out of 4 participants, as a result of FND and other comorbid neurologic conditions, were no longer able to work, socialise and complete activities of daily living independently. While overall reduction in FND symptom frequency was observed after the ACT intervention, this was not maintained at follow-up, and it may have been related to the lack of changes in QoL.

The results of this study reflect the heterogeneity of FND patients reported in the literature and observed in clinical practice. Each participant presented with differing levels of distress, symptom frequency and FND impact on their lives. Not surprisingly, outcomes differed across participants as well. Those participants (1, 2 and 4) that reported highest levels of symptom interference and psychological distress, appeared to be the ones that benefited the most. While Participant 2 reported to experience severe FND symptom frequency and interference, the intervention resulted in improved psychological health and emotional processing. On the contrary, Participant 3 reported improvements in FND symptom frequency and interference during the intervention only, but no other benefits were observed. Additionally, Participant 3 was not ready to accept the diagnosis. Therefore, psychological treatments in FND should be person-centred.

Applicability and implications

The findings demonstrated that ACT based interventions are acceptable and effective for people with FND, whether offered online or face to face. A one off formulation session on its own may not be enough to facilitate immediate change, however a combination of formulation and ACT, can result in improved outcomes. The results from this study suggest that therapeutic interventions can be brief and effective, and do not have to be delivered by highly skilled clinicians. ACT can help address the transdiagnostic factors (e.g. emotion suppression, avoidance, distress) involved in FND symptom maintenance (8, 10-

12). However, high rescheduling rates due to symptom severity may not be feasible in an outpatient setting. This could be overcome by offering online appointments or home visits to ensure inclusivity and address the care provision gap observed in FND.

Based on the current findings, people with more severe symptoms appear to have benefited the most from this intervention. Whereas one person who received the diagnosis recently and was doubtful of the FND diagnosis, did not sustain the benefits from the intervention at follow-up.

Limitations

While the ACT element of the intervention appears to be the active component, the exact process of change cannot be concluded. This could be addressed by future research evaluating the effects of formulation separately, similar to Gutkin et al's study (22) or including a longer withdrawal period or employing a multiple baseline design. Additionally, it would be important to address the influence of therapeutic relationship as a potential mechanism of change.

To address study limitations further, inclusion of more data points by extending withdrawal period would have allowed a more robust comparison to be made between the two intervention phases. In this study, two participants did not meet the minimum data point (n = 5) requirement (54) in withdrawal and intervention phases. Additionally, while the outcome measures were chosen based on recent recommendations for FND population (31), they need to be validated for this group of people to optimise the validity of future findings. Blinding was not used in this study, the same person delivering the intervention was administering the outcome measures or prompting participants to complete them. While this is common in clinical practice, it may have affected the answers for the study evaluation.

While this study has demonstrated promising effects, this needs to be explored in larger sample sizes. Future research should explore the efficacy of different intervention lengths and introduce longer follow-up period to assess if the observed changes were sustained. Additionally, qualitative designs would allow a further exploration of people's experiences and what changes they may have made as a result of an intervention that may not be captured by outcome measures. In this study it was evident that people's qualitative feedback was not reflected in psychometric outcome measures.

Conclusion

To conclude, an intervention effect was observed for the majority of participants that mostly occurred after the ACT intervention and was maintained at follow-up across levels of distress, impact on engagement in activities and symptom frequency, suggesting that ACT may be the active component facilitating change. The variability in people's improvement may reflect heterogeneity in patients rather than effectiveness of treatment. It may be that using a 'one glove fits all' approach does not work in FND, and patients require a more individualised approach. However, based on our findings we can suggest that ACT in FND, even when used briefly, results in improved outcomes. It is an acceptable and effective therapeutic modality.

References

1. Bennett K, Diamond C, Hoeritzauer I, Gardiner P, McWhirter L, Carson A, et al. A practical review of functional neurological disorder (FND) for the general physician. Clinical Medicine. 2021;21(1):28-36.

2. LaFaver K, LaFrance WC, Price ME, Rosen PB, Rapaport M. Treatment of functional neurological disorder: current state, future directions, and a research agenda. CNS spectrums. 2021;26(6):607-13.

3. Nicholson TR, Carson A, Edwards MJ, Goldstein LH, Hallett M, Mildon B, et al. Outcome measures for functional neurological disorder: a review of the theoretical complexities. The Journal of neuropsychiatry and clinical neurosciences. 2020;32(1):33-42.

4. Rawlings GH, Reuber M. What patients say about living with psychogenic nonepileptic seizures: a systematic synthesis of qualitative studies. Seizure. 2016;41:100-11.

5. Gendre T, Carle G, Mesrati F, Hubsch C, Mauras T, Roze E, et al. Quality of life in functional movement disorders is as altered as in organic movement disorders. Journal of Psychosomatic Research. 2019;116:10-6.

6. Stephen CD, Fung V, Lungu CI, Espay AJ. Assessment of Emergency Department and Inpatient Use and Costs in Adult and Pediatric Functional Neurological Disorders. JAMA Neurology. 2021;78(1):88.

7. Drane DL, Fani N, Hallett M, Khalsa SS, Perez DL, Roberts NA. A framework for understanding the pathophysiology of functional neurological disorder. CNS spectrums. 2021;26(6):555-61.

8. Lidstone SC, Nassif W, Juncos J, Factor SA, Lang AE. Diagnosing functional neurological disorder: seeing the whole picture. CNS spectrums. 2021;26(6):593-600.

9. Raynor G, Baslet G. A historical review of functional neurological disorder and comparison to contemporary models. Epilepsy & Behavior Reports. 2021;16:100489.

10. Pick S, Goldstein LH, Perez DL, Nicholson TR. Emotional processing in functional neurological disorder: a review, biopsychosocial model and research agenda. Journal of Neurology, Neurosurgery & Psychiatry. 2019;90(6):704-11.

11. Ertan D, Aybek S, LaFrance Jr WC, Kanemoto K, Tarrada A, Maillard L, et al. Functional (psychogenic non-epileptic/dissociative) seizures: why and how? Journal of Neurology, Neurosurgery & Psychiatry. 2022;93(2):144-57.

12. MacGillivray L, Lidstone SC. The Biopsychosocial Formulation for Functional Movement Disorder. Functional Movement Disorder: An Interdisciplinary Case-Based Approach: Springer; 2022. p. 27-37.

13. Butler M, Shipston-Sharman O, Seynaeve M, Bao J, Pick S, Bradley-Westguard A, et al. International online survey of 1048 individuals with functional neurological disorder. European Journal of Neurology. 2021;28(11):3591-602.

14. Cullingham T, Kirkby A, Sellwood W, Eccles FJR. Avoidance in nonepileptic attack disorder: A systematic review and meta-analyses. Epilepsy & Behavior. 2019;95:100-11.

15. Barbey A, Pjanic I, Studer H, Bischoff N, Bassetti CL, Aybek S. Management of functional neurological disorders (FND): experience from a Swiss FND clinic. Clinical and Translational Neuroscience. 2022;6(1):2.

16. Patron VG, Rustomji Y, Yip C, Jenkins LM. Psychiatric comorbidities in functional neurologic symptom disorder. Practical neurology (Fort Washington, Pa). 2022;21(3):71.

17. Pun P, Frater J, Broughton M, Dob R, Lehn A. Psychological profiles and clinical clusters of patients diagnosed with functional neurological disorder. Frontiers in Neurology. 2020;11:580267.

18. Beal EM, Coates P, Pelser C. Psychological interventions for treating functional motor symptoms: A systematic scoping review of the literature. Clinical Psychology Review. 2022;94:102146.

19. Gutkin M, McLean L, Brown R, Kanaan RA. Systematic review of psychotherapy for adults with functional neurological disorder. Journal of Neurology, Neurosurgery & Psychiatry. 2021a;92(1):36-44.

20. Lanzillotti AI, Sarudiansky M, Lombardi NR, Korman GP, D´ Alessio L. Updated review on the diagnosis and primary management of psychogenic nonepileptic seizure disorders. Neuropsychiatric Disease and Treatment. 2021:1825-38.

21. Stone J, Carson A, Hallett M. Explanation as treatment for functional neurologic disorders. Handbook of clinical neurology. 2016;139:543-53.

22. Gutkin M, Brown RJ, McLean L, Streimer J, Kanaan RA. Shared Individual Formulation Therapy (SIFT): an open-label trial of a new therapy accommodating patient heterogeneity in functional neurological disorder. Journal of neurology. 2021b;268(12):4882-9.

23. Harris R. ACT made simple: An easy-to-read primer on acceptance and commitment therapy: New Harbinger Publications; 2019.

24. Barrett-Naylor R, Gresswell DM, Dawson DL. The effectiveness and acceptability of a guided self-help Acceptance and Commitment Therapy (ACT) intervention for psychogenic nonepileptic seizures. Epilepsy & Behavior. 2018;88:332-40.

25. Graham CD, O'Hara DJ, Kemp S. A case series of Acceptance and Commitment Therapy (ACT) for reducing symptom interference in functional neurological disorders. Clinical psychology & psychotherapy. 2018;25(3):489-96.

26. Graham CD, Stuart SR, O'Hara DJ, Kemp S. Using acceptance and commitment therapy to improve outcomes in functional movement disorders: a case study. Clinical Case Studies. 2017;16(5):401-16.

27. Du S, Dong J, Jin S, Zhang H, Zhang Y. Acceptance and Commitment Therapy for chronic pain on functioning: A systematic review of randomized controlled trials. Neuroscience & Biobehavioral Reviews. 2021;131:59-76.

28. Lai L, Liu Y, McCracken LM, Li Y, Ren Z. The efficacy of acceptance and commitment therapy for chronic pain: A three-level meta-analysis and a trial sequential analysis of randomized controlled trials. Behav Res Ther. 2023;165:104308.

29. Russell L, Butler L, Lovegrove C, Owens C, Roberts L, Yates P, et al. Developing a multidisciplinary pathway for functional neurological disorders in a UK National Health Service: The Exeter model. ACNR, Advances in Clinical Neuroscience and Rehabilitation. 2022.

30. Krasny-Pacini A, Evans J. Single-case experimental designs to assess intervention effectiveness in rehabilitation: A practical guide. Annals of physical and rehabilitation medicine. 2018;61(3):164-79.

31. Pick S, Anderson DG, Asadi-Pooya AA, Aybek S, Baslet G, Bloem BR, et al. Outcome measurement in functional neurological disorder: a systematic review and recommendations. Journal of Neurology, Neurosurgery & Psychiatry. 2020;91(6):638-49.

32. Dodd S, Clarke M, Becker L, Mavergames C, Fish R, Williamson PR. A taxonomy has been developed for outcomes in medical research to help improve knowledge discovery. Journal of clinical epidemiology. 2018;96:84-92.

33. Mundt JC, Marks IM, Shear MK, Greist JM. The Work and Social Adjustment Scale: a simple measure of impairment in functioning. The British Journal of Psychiatry. 2002;180(5):461-4.

34. Pedersen G, Kvarstein E, Wilberg T. The Work and Social Adjustment Scale: Psychometric properties and validity among males and females, and outpatients with and without personality disorders. Personality and mental health. 2017;11(4):215-28.

35. Baker R, Thomas P, Thomas S, Santonastaso M, Corrigan E. Emotional processing scale. Manual Hogrefe Oxford. 2015.

36. Baker R, Thomas S, Thomas PW, Gower P, Santonastaso M, Whittlesea A. The Emotional Processing Scale: scale refinement and abridgement (EPS-25). Journal of psychosomatic research. 2010;68(1):83-8.

37. Novakova B, Howlett S, Baker R, Reuber M. Emotion processing and psychogenic non-epileptic seizures: A cross-sectional comparison of patients and healthy controls. Seizure. 2015;29:4-10.

38. Evans JM-CFMMBKAJCGMC. CORE: Clinical Outcomes in Routine Evaluation. Journal of Mental Health. 2000;9(3):247-55.

39. Evans C, Connell J, Barkham M, Margison F, McGRATH G, Mellor-Clark J, et al. Towards a standardised brief outcome measure: Psychometric properties and utility of the CORE–OM. The British Journal of Psychiatry. 2002;180(1):51-60.

40. Bond FW, Hayes SC, Baer RA, Carpenter KM, Guenole N, Orcutt HK, et al. Preliminary psychometric properties of the Acceptance and Action Questionnaire–II: A revised measure of psychological inflexibility and experiential avoidance. Behavior therapy. 2011;42(4):676-88.

41. Broadbent E, Petrie KJ, Main J, Weinman J. The brief illness perception questionnaire. Journal of psychosomatic research. 2006;60(6):631-7.

42. Broadbent E, Wilkes C, Koschwanez H, Weinman J, Norton S, Petrie KJ. A systematic review and meta-analysis of the Brief Illness Perception Questionnaire. Psychology & health. 2015;30(11):1361-85.

43. BerrickPsychology. ACT Companion: The Happiness Trap App. In: Harris R, Berrick A, editors. 2021.

44. Russell L, Carrick R. Psychology Assessment of Functional Neurological Disorders 2017.

45. Engel GL. From Biomedical to Biopsychosocial1. Being Scientific in the Human Domain. Psychotherapy and psychosomatics. 1997;66(2):57-62.

46. O'Neill L, Latchford G, McCracken LM, Graham CD. The development of the Acceptance and Commitment Therapy Fidelity Measure (ACT-FM): A delphi study and field test. J Context Behav Sci. 2019;14:111-8.

47. Kazdin AE. Single-case research designs: Methods for clinical and applied settings, 2nd ed. New York, NY, US: Oxford University Press; 2011. xi, 452-xi, p.

48. Parker RI, Vannest KJ, Davis JL, Sauber SB. Combining Nonoverlap and Trend for Single-Case Research: Tau-U. Behavior Therapy. 2011;42(2):284-99.

49. Vannest K, Parker R, Gonen O, Adiguzel T. Single case research: Web based calculators for SCR analysis (Version 2.0)[Web-based application]. College Station: Texas A&M University. 2016.

50. Jacobson NS, Truax P. Clinical significance: a statistical approach to defining meaningful change in psychotherapy research. J Consult Clin Psychol. 1991;59(1):12-9.

51. Baronian R, Leggett SJ. Brief cognitive analytic therapy for adults with chronic pain: a preliminary evaluation of treatment outcome. Br J Pain. 2020;14(1):57-67.

52. Yu L, Norton S, McCracken LM. Change in "Self-as-Context" ("Perspective-Taking") Occurs in Acceptance and Commitment Therapy for People With Chronic Pain and Is Associated With Improved Functioning. J Pain. 2017;18(6):664-72.

53. Cherry KM, Hoeven EV, Patterson TS, Lumley MN. Defining and measuring "psychological flexibility": A narrative scoping review of diverse flexibility and rigidity constructs and perspectives. Clin Psychol Rev. 2021;84:101973.

54. Kratochwill TR, Hitchcock J, Horner RH, Levin JR, Odom S, Rindskopf D, et al. Single-case designs technical documentation. What works clearinghouse. 2010.

Appendix A [Author guidelines for submission to the Journal of Neuropsychological Rehabilitation]

Instructions for authors

Thank you for choosing to submit your paper to us. These instructions will ensure we have everything required so your paper can move through peer review, production and publication smoothly. Please take the time to read and follow them as closely as possible, as doing so will ensure your paper matches the journal's requirements.

For general guidance on every stage of the publication process, please visit our Author Services website.

For editing support, including translation and language polishing, explore our Editing Services website

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Preparing Your Paper

All authors submitting to medicine, biomedicine, health sciences, allied and public health journals should conform to the Uniform Requirements for Manuscripts Submitted to Biomedical Journals, prepared by the International Committee of Medical Journal Editors (ICMJE).

Single-case studies: submitted papers should follow SCRIBE guidelines (http://psycnet.apa.org/fulltext/2016-17384-001.html) and include a completed SCRIBE checklist together with the corresponding page number of the manuscript where the information is located.

Structure

Your paper should be compiled in the following order: title page; abstract; keywords; main text introduction, materials and methods, results, discussion; acknowledgments; declaration of interest statement; references; appendices (as appropriate); table(s) with caption(s) (on individual pages); figures; figure captions (as a list).

Word Limits

Please include a word count for your paper. There are no word limits for papers in this journal.

Style Guidelines

Please refer to these quick style guidelines when preparing your paper, rather than any published articles or a sample copy.

Please use American spelling style consistently throughout your manuscript. Please use single quotation marks, except where 'a quotation is "within" a quotation'. Please note that long quotations should be indented without quotation marks.

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This journal is now including Alt Text (alternative text), a short piece of text that can be attached to your figure to convey to readers the nature or contents of the image. It is typically used by systems such as pronouncing screen readers to make the object accessible to people that cannot read or see the object, due to a visual impairment or print disability. Alt text will also be displayed in place of an image, if said image file cannot be loaded. Alt Text can also provide better image context/descriptions to search engine crawlers, helping them to index an image properly. To include Alt Text in your article, please follow our Guidelines.

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Authors may submit their paper in any scholarly format or layout. Manuscripts may be supplied as single or multiple files. These can be Word, rich text format (rtf), open document format (odt), or PDF files. Figures and tables can be placed within the text or submitted as separate documents. Figures should be of sufficient resolution to enable refereeing.

Appendix B [NHS Ethics Approval Letter]

Ymchwil Iechyd a Gofal Cymru
Health and Care Research Wales

NHS
Health Research Authority

[redacted]
Dr Warren Dunger
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04 November 2022

[redacted]
Dear Dr Dunger

HRA and Health and Care Research Wales (HCRW) Approval Letter

Study title:	**Effectiveness and Acceptability of Formulation and Brief-ACT intervention for Functional Neurological Disorders**
IRAS project ID:	**311583**
Protocol number:	**70341**
REC reference:	**22/NW/0320**
Sponsor	**University of Southampton**

I am pleased to confirm that **HRA and Health and Care Research Wales (HCRW) Approval** has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

Please now work with participating NHS organisations to confirm capacity and capability, in line with the instructions provided in the "Information to support study set up" section towards the end of this letter.

Appendix C [Informed Consent Sheet]

University of Southampton

CONSENT FORM

Study title: Effectiveness and Acceptability of Formulation and Brief-ACT intervention for Functional Neurological Disorders

Researcher name: Irma Konovalova, Trainee Clinical Psychologist
ERGO number: 70341

Please initial the box(es) if you agree with the statement(s):

I have read and understood the information sheet (17.10.2022 /version 3 of participant information sheet) and have had the opportunity to ask questions about the study.	
I understand my participation is voluntary and that I may withdraw at any time for any reason without my medical care or participation rights being affected.	
I understand that relevant sections of my medical notes and data collected during the study may be looked at by individuals from University of Southampton, from regulatory authorities, from the research sponsor or from the NHS Trust, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records.	
I agree to my General Practitioner being informed of my participation in the study.	
I understand that I will not be directly identified in any reports of the research.	
I understand that my personal information collected about me such as my name will not be shared beyond the study team.	
I understand that taking part in the study may involve an audio recording of a session for monitoring purposes, which will be destroyed immediately after it has been listened to by the supervisor.	
I agree to take part in this research project and agree for my data to be used for the purpose of this study.	

Name of participant (print name).....

Signature of participant.....

Date.....

Name of researcher (print name).....

Signature of researcher .....

Date.....

One copy of this document is for you to keep, one copy will be kept by the investigator and one copy will be uploaded on medical records.

Appendix D [The Single-Case Reporting guideline in Behavioural Interventions SCRIBE Checklist]

The Single-Case Reporting guideline In BEhavioural interventions (SCRIBE) 2016 Checklist

Item number	Topic	Item description	Notes
TITLE and ABSTRACT			
1	Title	Identify the research as a single-case experimental design in the title	Pg 70
2	Abstract	Summarise the research question, population, design, methods including intervention/s (independent variable/s) and target behaviour/s and any other outcome/s (dependent variable/s), results, and conclusions	Pg 71
INTRODUCTION			
3	Scientific background	Describe the scientific background to identify issue/s under analysis, current scientific knowledge, and gaps in that knowledge base	Pg 72-74
4	Aims	State the purpose/aims of the study, research question/s, and, if applicable, hypotheses	Pg 74
METHODS			
	DESIGN		
5	Design	Identify the design (e.g., withdrawal/reversal, multiple-baseline, alternating-treatments, changing-criterion, some combination thereof, or adaptive design) and describe the phases and phase sequence (whether determined *a priori* or data-driven) and, if applicable, criteria for phase change	Pg 75
6	Procedural changes	Describe any procedural changes that occurred during the course of the investigation after the start of the study	Pg 79
7	Replication	Describe any planned replication	N/A
8	Randomisation	State whether randomisation was used, and if so, describe the randomisation method and the elements of the study that were randomized	Pg 75
9	Blinding	State whether blinding/masking was used, and if so, describe who was blinded/masked	Pg 75
	PARTICIPANT/S or UNIT/S		
10	Selection criteria	State the inclusion and exclusion criteria, if applicable, and the method of recruitment	Pg 75
11	Participant characteristics	For each participant, describe the demographic characteristics and clinical (or other) features relevant to the research question, such that anonymity is ensured	Pg 76
	CONTEXT		
12	Setting	Describe characteristics of the setting and location where the study was conducted	Pg 77 - 78
	APPROVALS		
13	Ethics	State whether ethics approval was obtained and indicate if and how informed consent and/or assent were obtained	Pg 77-79
	MEASURES and MATERIALS		
14	Measures	Operationally define all target behaviours and outcome measures, describe reliability and validity, state how they were selected, and how and when they were measured	Pg 76-77
15	Equipment	Clearly describe any equipment and/or materials (e.g., technological aids, biofeedback, computer programs, intervention manuals or other material resources) used to measure target behaviour/s and other outcome/s or deliver the interventions	Pg 77
	INTERVENTIONS		
16	Intervention	Describe intervention and control condition in each phase, including how and when they were administered, with as much detail as possible to facilitate attempts at replication	Pg 78 - 79
17	Procedural fidelity	Describe how procedural fidelity was evaluated in each phase	
	ANALYSIS		
18	Analyses	Describe and justify all methods used to analyse data	Pg 81
RESULTS			
19	Sequence completed	For each participant, report the sequence actually completed, including the number of trials for each session for each case. For participant/s who did not complete, state when they stopped and the reasons	Pg 84, Results section
20	Outcomes and estimation	For each participant, report results, including raw data, for each target behaviour and other outcome/s	Pg 83-98
21	Adverse events	State whether or not any adverse events occurred for any participant and the phase in which they occurred	Pg 82
DISCUSSION			
22	Interpretation	Summarise findings and interpret the results in the context of current evidence	Pg 100 - 101
23	Limitations	Discuss limitations, addressing sources of potential bias and imprecision	Pg 102
24	Applicability	Discuss applicability and implications of the study findings	Pg 101 - 102
DOCUMENTATION			
25	Protocol	If available, state where a study protocol can be accessed	
26	Funding	Identify source/s of funding and other support; describe the role of funders	N/A