An evaluation of the impact of occupational therapy sensory modulation group intervention on mental health outcomes for British military veterans accessing treatment for service-related mental health problems.

Christie Alkin

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The candidate confirms that the work submitted is their own and that appropriate credit has been given where reference has been made to the work of others.

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Abstract

Background: Military veterans are likely to experience mental health challenges (Hendrikx *et al.*, 2021). The study was undertaken within a UK charity that provides treatment for veterans' mental health. This provision includes occupational therapy, a profession committed to improving the quality of life, well-being, and occupational functioning of those who they treat. Sensory modulation, an occupational therapy intervention, focuses on changing how a person feels using their senses. Grounding, coping and emotional regulation strategies are an important component of mental health treatment to enable people to feel calmer and participate in their meaningful daily routines.

Aim: The aim of this study was to evaluate the impact of an online group sensory modulation intervention as a part of stabilisation treatment for British military veterans who have experienced mental health challenges as a result of their service.

Methodology: A mixed methods approach sought quantitative data through online outcome measures evaluating anxiety, trauma symptoms, emotional regulation and dissociation which were provided to participants before, after and at a 4 week follow up phase of the groups.

Qualitative data was captured through an online survey asking participants about their understanding and application of any sensory knowledge and strategies they had been taught as a part of the groups.

Results: Data were analysed, with statistical significance set at $p = < 0.05$ There was statistically significant change in the anxiety, anger, trauma and emotional regulation measures following completion of the intervention and at the 4-week follow up phase. The qualitative data showed participants felt sensory modulation was a useful to them, they reported feeling calmer, more self-aware and could implement strategies in varying environments.

Conclusion: This study shows promising insights into the impact of sensory modulation for British military veterans, and useful knowledge for occupational therapists both in terms of the intervention and online service delivery.

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Abbreviations and Acronyms

AASP:	Adult and Adolescent Sensory Profile
APA:	American Psychiatric Association
BJOT:	British Journal of Occupational Therapy
C-PTSD:	Complex post-traumatic stress disorder
CQC:	Care Quality Commission
DSM:	Diagnostic and statistical manual of mental disorders
HCPC:	Health and Care Professions Council
ICD:	International statistical classification of diseases and related health problems
MOD:	Ministry of Defence
NICE:	National Institute of Clinical Excellence
OT:	Occupational Therapy
PTSD:	Post traumatic stress disorder
RCOT:	Royal College of Occupational Therapists
SMD:	Sensory Modulation Disorder
SP:	Sensory Processing
WFOT:	World Federation of Occupational Therapy

Chapter 1: Introduction

The United Kingdom (UK) armed forces comprises of the British Army, Royal Navy, and the Royal Air Force, governed by the Ministry of Defence. The role of the armed forces is for protection and security, which does include going to war (Ministry of Defence (MOD; 2020). There is a culture within the British military, and this can be attributed to the distinctive tasks often required by such an organisation. The expectation of delivering on these activities can enhance a sense belief in the bond between soldiers (Long, 2016) and through clinical experience is often heard to be referred to as a 'brotherhood.' Whilst most transition without difficulty, some veterans face challenges moving culture to that of civilian nature. For those who have served and experience mental health challenges as a result, they can access mental health treatment from various healthcare services.

The service in which this research was undertaken consisted of occupational therapists, psychiatrists, nurses, psychologists, substance misuse nurses, therapists and peer support coordinators. It is regulated by the Care Quality Commission (CQC) and the teams deliver treatment to all British military veterans, from every service and conflict, who may be experiencing complex mental health problems such as post-traumatic stress disorder (PTSD), anxiety, depression, anger and alcohol and substance misuse.

1.1 Accessing treatment

Currently, it is estimated there are 2 million veterans of the armed forces in the UK (House of Commons, 2022) and within this population many veterans experience depression and anxiety (21.9%), post-traumatic stress disorder (6.2%), and substance misuse (10.0%) (Hendrikx *et al*., 2021;Stevelink *et al*., 2018). Furthermore, the social, occupational, and health-related problems following transition are at increased risk of developing for veterans who have experienced mental health difficulties during their service (Hendrikx *et al*., 2021;Stevelink *et al*., 2018).

PTSD is a diagnosis according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), (American Psychiatric Association (APA; 2013) and the criteria for the diagnosis as listed on the National Institute for Clinical Excellence (NICE) website includes:

The person must have “been exposed to actual or threatened death, serious injury, or sexual violence” (NICE; 2022) through direct experience, witnessing, learning of an event to a close family member or friend or experiencing repeated or extreme exposure to aversive details of the traumatic event. There are also symptom clusters of intrusions, avoidance, negative alterations in mood or thoughts as well as alterations in arousal or reactivity. A person must experience symptoms across the clusters to meet the diagnosis of PTSD (NICE; 2022). Being in the military can increase the likelihood of exposure to events that are traumatic, but also reduces the likelihood of veterans talking about these events or the emotional impact it may have had due to the military culture (Combat Stress, 2022).

An overreactive sympathetic nervous state because of a chronic ‘adrenalised state’ is an effect of trauma, making the access of the parasympathetic nervous state hard without conscious focus and often guided support (Walker, 2018). Anxiety is classified by chronic, excessive worry as well as symptoms of physiological arousal also associated with the overactive sympathetic nervous state. Depression symptoms consist of low mood, hopelessness, fatigue, poor concentration, and appetite as well as suicidal ideation in some cases (NICE, 2022). The impact of these symptoms on occupational performance and satisfaction are often recorded; people lose jobs; stop doing things they enjoy; and can even stop looking after

themselves or for those whom they are responsible (Hitch, Taylor and Pepin, 2015). Therefore, there is a clear need for the holistic care and treatment by occupational therapists for those who are experiencing mental health challenges.

1.2 The role of occupational therapy

Quiroga (1995) stipulated there is a rich history of alignment between occupational therapy and the military, where 'reconstruction for wounded soldiers' was embedded into hospitals for servicemen returning from World War 1. (Quiroga, 1995 cited in Christiansen and Haertl, 2014 p. 20) Laws (2011) noted the naming of the profession, occupational therapy, followed this rise in recruitment to deliver craft-based activities for those who experienced 'shell shock' as a result of the warfare they faced, which included trench warfare, toxic gas and repeated exposure to artillery explosions. (Laws, 2011).

Vessby and Kjelberg (2010) conducted a critical review highlighting that occupational participation is connected to meaningfulness, with one paper documenting the positive impact on physical and mental health when the occupations people engage with are valued and meaningful (Horowitz and Chang, 2004 cited in Vessby and Kjelberk, 2010 p 322). Those experiencing mental health difficulties may benefit from the unique treatment of sensory modulation offered by occupational therapists as it can assist a person in processing information from their environment, which can increase a sense of calmness and feeling more grounded (Sutton *et al.,* 2013). These reports support that occupational therapists can assess disruption to participation in meaningful occupation, and, combined with the useful knowledge of sensory interventions, can improve health. Occupational therapists, therefore, are especially useful for those who have experienced trauma, and are experiencing the previously mentioned 'adrenalised state.' This state may lead them to be stuck in the sympathetic nervous system of high arousal and 'fight/flight/freeze' response, which is the name given by Cannon (1927) to label behaviours that occur under perceived threat (Cannon, 1927).

1.3 Summary

Occupational therapists are employed within trauma services and mental health services, including the specialist healthcare delivery for military veterans in the UK. A standard of the profession is continuing professional development and contributing to the knowledge and evidence-base of skills and interventions they use (Health and Care Professions Council (HCPC; 2022). Thus far, there is paucity of research that is particular to occupational therapy delivering sensory strategies for British military veterans. Therefore, this study aimed to explore this sensory based intervention on mental health outcomes for UK ex-forces personnel.

Chapter 2: Literature Review

2.1 Introduction

The aim of this literature review was to locate, refine, and discuss published research to:

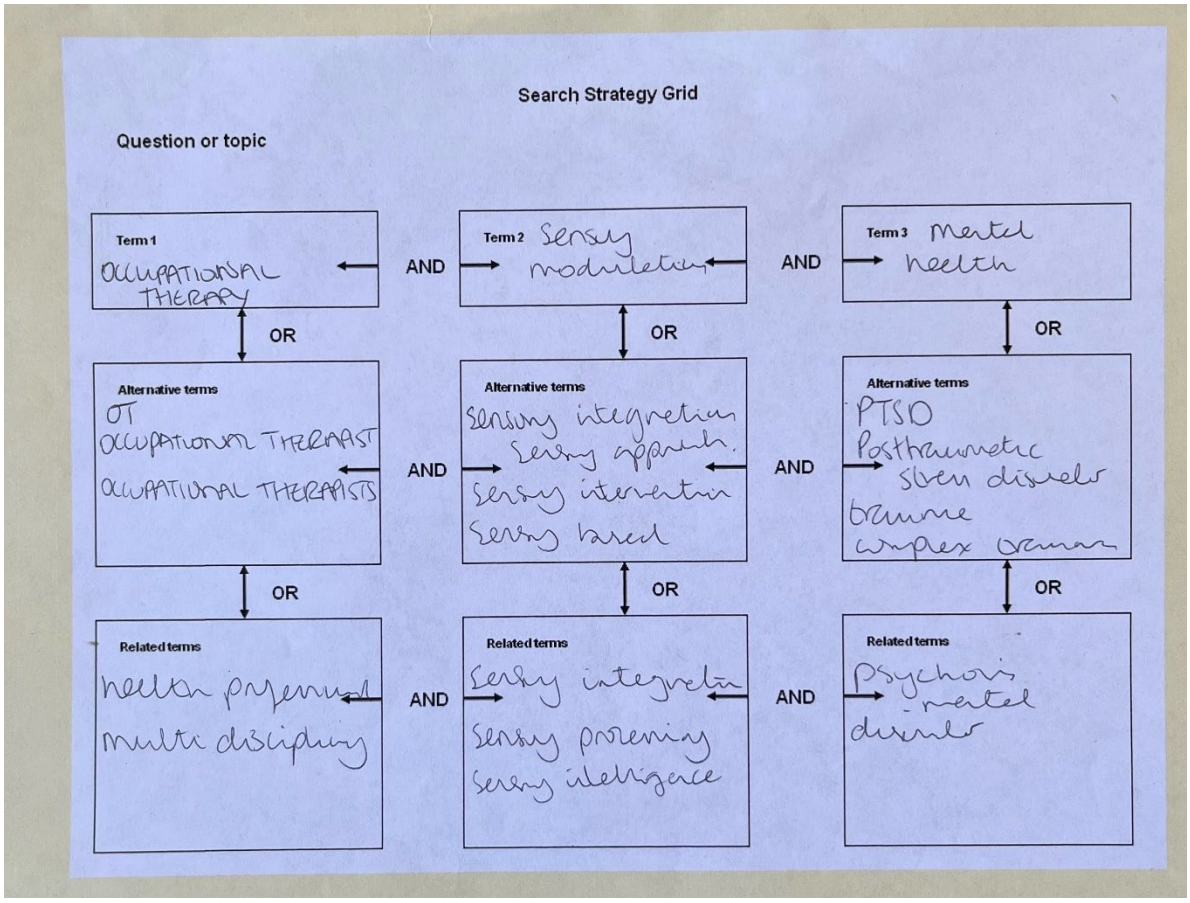
- Investigate the current knowledge of sensory based interventions being used by occupational therapists within the mental health field of practice
- Identify the commonly used sensory based interventions for those who have experienced trauma based mental health problems, particularly for military personnel and veterans
- Summarise the sensory based interventions known to be effectively used to improve mental health

Once an understanding of the available and current evidence was established, there was then the scope to identify gaps for future research to be conducted and further contribute to the occupational therapy evidence base.

2.2 Methods

For this review, search terms were established through a search strategy grid (Figure 1 p14) in discussion with the Head Occupational Therapist of the service and by reflecting on learning points from Sensory Intelligence © training, which all occupational therapists received, about the evolving practice of sensory based interventions (Lombard, 2022). A search, using these established terms (see search terms in Figure 1 below), was conducted in October 2020 through the York St John library and the databases that were accessed included CINAHL, MEDLINE, PsychInfo, AMED through EBSCOhost following advice from specialist subject librarian with recognition that databases should be used in combination to provide access to the widest range of evidence (Taylor, 2007). The key areas that were the foundation for searches were: Sensory based interventions, mental health and occupational therapy and MeSH terms and suggested subheadings were used. Boolean terms “AND” and “OR” as well as truncation were used to broaden search results.

Figure 1 – Search strategy grid used for refining search terms



2.3 Search strategy

When conducting the search, it became evident that using military terms was a limiting factor, therefore these were removed to widen the search and enable literature focused on sensory based interventions and mental health to be identified. An inclusion and exclusion criteria were established to guide the selection of papers for the search (Table 2.1 p15), the researcher then evaluated the titles of the full text papers alongside the inclusion and exclusion criteria to establish the relevant literature to select. Where there was any ambiguity, text abstracts were then reviewed for more detail before concluding whether they were selected. Articles were reviewed and saved as a library of texts to RefWorks, a reference management program, which was then used cite authors and create the reference list for this thesis.

Table 2.1: Inclusion and exclusion criteria for literature review

Inclusion Criteria	Exclusion Criteria
Occupational therapy interventions	Children / paediatric demographic
Adolescent and adult demographic	Non-English language
Mixed methods, quantitative and qualitative studies	Neurodevelopmental disorders i.e ADHD, Autism
Systematic and Integrative reviews	
No date restrictions	
Worldwide	

Table 2.2: Summary of studies critically reviewed and characteristics

Article Details (Author/Country)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Adams-Leask *et al.* (2018)	To conduct a pilot evaluation of the use of sensory modulation in a mental health emergency setting	Pilot mixed methods study	N = 74	Sensory modulation contributed to reducing distress in patients in a mental health emergency setting	Reduction in distress for participants using sensory modulation. More research perhaps with a control to address cointervention implications	Intervention delivered by OT No standardised measures used and no control group	Occupational therapy sensory modulation intervention in mental health
Bailliard (2015)	Habits of the sensory system and mental health: Understanding Sensory Dissonance	Semi-structured interviews and video observations	10 participants	Experiences of sensory dissonance Aesthetics of sensory anchors Harnessing sensory anchors to induce positive mental states	Sensory experiences can induce positive and negative mental states in adults Habits of sensing vary among individuals The sensory environments of clinics and laboratories matter Sensory scaffolding can	Combined method of interviews and observations Thematic analysis used Multiple researchers Sample is not relatable to current study sample Purposive sampling	Discusses the impact of the sensory system on mental health Occupation focus

					be used to minimise sensory dissonance, support positive sensory experiences and sustain habitual occupational processes during interventions	Translation used	

Article Details (Author/Country)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Bailliard and Wingham (2017)	A scoping review of the research on the relationship between sensory processing and mental illness.	Scoping review	149 papers	There were few OT studies that explored the impact of sensory processing deficits on occupational performance Support for remedial interventions that adopt a bottom-up approach to target sensory processing has increased, which could contribute to cognitive gains and occupational performance. There are inconclusive results as to whether the sensory deficits are trait markers of mental illness.	A clear conclusion that more research needs to be conducted in psychiatric settings with more OT focus.	Despite being a scoping review, only peer reviewed papers were included. However, this also contributes to a lack of inclusion of wider papers on this unique subject matter. There is a lack of comparison with healthy populations.	This study identifies a gap in the literature evaluating the efficacy of sensory approaches used by occupational therapy in psychiatry.

Article Details (Author/Country)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Bar-Shalita and Cermak (2016)	Atypical sensory modulation and psychological distress in the general population	Exploratory study	204 48.5% university students	26 of 204 sample met criteria for Sensory modulation disorder (SMD) Brief symptom inventory scores were higher for SMD group but with significance only on GSI (Global severity index) and PST Positive symptom total) as well as for the BSI subscales Interpersonal sensitivity, paranoid ideation and psychoticism.	People in the general population who scored in the highest 2% on a measure of sensory modulation disorder demonstrated more psychological distress symptoms and reduced quality of life. Sensory modulation disorder and quality of life were found to predict psychological distress.	Valid measures used Translation to Hebrew for BSI, The Short Form-36 Small SMD sample in comparison to whole sample Convenience sample; 48.5% being university students	Indicators of (SMD) increasing emotional responses and negative affect Quality of life and SMD together can predict psychological distress Whilst the current study is not focused on SMD, the hypersensitivity to environment as a result of trauma is worth noting as similar to SMD over responsiveness

Article Details (Author/Country)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Barbic *et al.* (2019)	To understand health provider and inpatient service user perceptions on the use of sensory modulation rooms on acute psychiatric units	Qualitative descriptive study using semi-structured interview	10 service users 9 health providers	Themes: Service use empowerment through self management, emotional regulation, an alternative to current practices and health provider and service user education	Supports the use of sensory modulation rooms in an inpatient psychiatric setting	Detailed qualitative approach using thematic analysis to explore respondent experiences Not a random sample and potential sampling bias Limit to generalisability due to lack of population diversity	Themes of emotional regulation and further education for participants is an indicator for the intervention being used in this study Qualitative data and use of thematic analysis mirrors that of this study

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Brown, Tse,and Fortune (2019)	Defining sensory modulation	Concept analysis	21 definitions explored	6 conceptual themes	A definition of sensory modulation is offered	A methodical concept analysis was used Only adult psychiatric population considered Only published work considered	This study explores the impact of sensory modulation A definition which is widely acknowledged and understood helps with clarity for those reading the paper A definition provides boundary for the intervention scope and implementation

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Brown Karim, and Steuter (2020)	To determine the sensory processing preferences of people with a psychiatric condition as measured by the Adolescent/ Adult Sensory Profile (A/ASP)	Retrospective analysis	7 papers	General results showed psychiatric study participants had higher scores in sensory sensitivity, low registration and sensation avoiding and lower scores for sensation seeking There was a discrepancy in Bipolar studies	The sensory processing preferences of people with a psychiatric condition differ from those of the normative sample, however, further research must be don't to target condition specific sensory-based interventions to further Occupational therapy evidence base.	Structured search method and appropriate databases used Varying diagnoses meant a systematic review could not be conducted Small samples and only one study per psychiatric condition and no inclusion of unpublished data.	A study focusing on Post traumatic stress was included and these participants had higher scores for sensory sensitivity, low registration and sensation avoiding and lower scores for sensation seeking. However, these participants did not meet the criteria for Post traumatic stress disorder.

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Champagne (2011)	To overview how PTSD, depression, SPPs influence occupational engagement and work performance	Descriptive case study	N = 1	Occupational performance improved.	More research required with an Occupation focus	Improvement in occupational performance Non-standardised outcome measure used. Single case study therefore cannot be generalised	Occupational therapy intervention for post-traumatic stress disorder, with focus given to sensory processing patterns
Edgelow *et al.* (2019)	Identify and describe the ways occupational therapy addresses PTSD in practice	Scoping review	50 texts	Three themes: (1) Recognising trauma within specific populations (2) PTSD's impact on a range of occupations (3) occupational therapy's response to PTSD	A trauma informed approach is important when considering OT interventions with those who have experienced trauma	Search details were reported A scoping review is not a critical review of the literature	Corroborates with other evidence of the use of OT within the MDT for treating trauma Acknowledges military as specific population who experience PTSD with specific needs

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Holland *et al*. (2018)	A descriptive analysis of the theory and processes of an innovative day program for young women with trauma-related symptoms	Descriptive case study	Day treatment program Female sample	Observed reduction in trauma-related mental health symptoms Reduction in self-injury, improved self-regulation, improved participation in daily activities, improved social connections. Environment is targeted specifically for 18-25 year old women who have experienced trauma Psychology, medication and OT treatment provided	Describes a patient who was successfully discharged from the program Hypothesises: Application of interventions that address each area of the ARC model contribute to reduction in trauma related mental health problems Further study required to quantify findings	Evidence based models applied to program development Single female case study Descriptive No generalisable results Occupational therapy was not the singular treatment method Sensory strategies cannot be singled out as a single treatment method	Details the sensory components linked to those who have experienced trauma including veterans Recognition for personalised sensory kits Links to Scanlan and Novak's (2015) literature review of sensory-based interventions in mental health Proposes the need for quantifiable data in this area

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Kinnealey, Koenig and Smith (2011)	To explore the relationships between sensory modulation and health related quality of life outcomes, social supports and mental health symptoms of anxiety and depression	Exploratory study	N = 28	There were significant relationships between those measured as Sensory over responsive and anxiety. An inverse relationship was found between scores of perceived social support and increased anxiety.	This study indicated a significant difference between adults with sensory over responsiveness (SOR) and those without SOR in sensory scores as well as anxiety and depression scores. The results suggest that as a SOR increases, mental health and social functioning decrease.	The sensory outcome measure is a valid measure This study used a volunteer sample and was a small sample with potential seasonal bias	This study indicates self-regulation and occupational participation to improve quality of life; which are the aims for the groups being evaluated in the researcher's study. This study has an OT setting, uses an adult population relating to mental health outcomes.

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Marchingura and Lloyd (2017)	To reflect on the impact of sensory modulation and staff training implementation	Critical reflection	Staff from two acute mental health wards No sample size given 70% of staff completed the sensory modulation training	Indications of sensory modulation practices being beneficial on the two mental health wards staff were trained on	Some insight into how sensory modulation can be used to reduce distress in acute mental health wards Not all staff committed to the training Clients utilised the intervention when they had more knowledge on what it was	The reflection was conducted by experienced OTs Evidence base on sensory modulation utilised for developing interventions No valid or reliable measure used for capturing data Limited insight into sample	The use of sensory modulation in mental health showing some benefit More reliable data required

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Marchingura and Lloyd (2017)	No clear aim documented A reflection of practice and literature in the area of sensory modulation use by OTs	Review	No detail of number of studies read or how they were reviewed	Suggests best practice principles for OTs following reflection of their own practice and review of some literature	Acknowledges sensory modulation as a growing intervention being used by OTs More evidence is required on its utility and effectiveness	Links to occupational therapy core practice and occupational science No details on review methodology or sample size or appraisal method	Promotes occupational focus on the use of sensory modulation interventions

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
McGreevy and Boland (2020)	To identify, analyse and summarise the empirical evidence for and the sensory based interventions, which occupational therapists are using in the treatment of adult and adolescent trauma survivors.	Integrative review	18 papers	Three themes identified: (1) Atypical sensory processing patterns (2) Type of sensory based intervention with trauma survivors (3) Trans disciplinary treatment programs can reduce symptoms of trauma	There was a focus on symptom management as an outcome, with little use of standardised occupational measures across the papers. There is limited empirical research available regarding complex post traumatic stress disorder and the use of sensory based interventions.	Clear search terms and strategy identifying paucity and leading to integrative over systematic meta-analysis Limited number of published empirical studies and heterogeneity of studies presents a drawback to this review.	There is a need for follow up data to be collected and evaluated. There needs to be consideration given to the participants' perspective and experience.

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Scanlan and Novak (2015)	What is known from the published, peer-reviewed literature about the effectiveness of sensory approaches designed specifically for use with individuals experiencing a mental illness or mental health problem?	Scoping review	17 papers	Three themes identified: (1) Types of sensory approaches evaluated (2) Types of outcomes measured (3) The comparison of sensory approaches to other approaches	Tentative conclusion that sensory interventions are likely to support reductions in distress and behaviour disturbances.	Almost all studies in this review had raters that were not blind – which may impact on potential bias. There are limitations due to small sample sizes, lack of rigour and no longitudinal studies.	There were some qualitative elements, but only in two studies, this can be utilised more in research for a client-centred focus. There has been a shift in addressing sensory processing in individuals through sensory integration to using sensory approaches as an intervention to support self-management and distress and other strong emotions.

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Sokmen and Watters (2016)	Emotional regulation with mindful arts activities using a personalised self-soothing kit	Multiple case study with qualitative and quantitative methods	6 participants	Multisensory activities can impact on mood regulation Personalised kits modulated arousal levels through self-soothing Engaging in activity can distract from negative cognitions Increased self-awareness and mindfulness through use of a rating scale and activity	Self-designed multimodal and multi-sensory creative activity sessions help mental health service users Personalised sensory kits can impact arousal levels	Use of semi structured interviews, self-reporting questionnaires and scales as well as Adult Adolescent Sensory Profile completed Sample cannot be generalised Case study bias	Discusses impact on emotional regulation Personalised sensory kit

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Sutton et al. (2013)	To examine the potential of using sensory-based approaches to develop the theory and practice of preventing, minimising, and managing aggression in mental health settings	Qual Narrative analysis of interview and focus group data	Adults Staff n=40 Clients n=20	Three key themes: 1) Facilitating a calm state 2) Enhancing interpersonal engagement Supporting self management	Three key themes Polyvagal theory continues to be a useful framework to integrate SM Sensory tools within occupational therapy can be part of a range of effective interventions to manage aggression	Consistency across reports in relation to SM being 'soothing' No valid tool used for data Conducted with clients who had been discharged Conducted over three years – 2009 – 2011 Research conducted by staff employed in the service More staff interviewed than clients	Aggression is a common experience for military veterans Sensory modulation specific intervention Mental health setting Thematic analysis

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Wallis, Sutton and Bassett (2018)	To measure occupational performance and participation as well as anxiety levels within a community based setting	Mixed methods study	N = 4	Occupational performance and satisfaction improved with sensory modulation intervention	Study into a UK population Explore impact on other mental health symptoms as well as anxiety	Quantitative and qualitative data to meet client centred practice Small sample with short follow up time No details of OT education of sensory modulation and the intervention was not delivered by the same OT	Similar field of community mental health and mixed methods study Use of sensory modulation as an intervention

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Warner *et al.* (2013)	Can the Body Change the Score? Application of Sensory Modulation Principles in the Treatment of Traumatized Adolescents in Residential Settings	Conceptual paper		Improved regulation reported in samples Improved effectiveness of trauma processing through use of sensory modulation Reduced restraint occurrences Sensory rooms and kits have benefit Occupational therapists are skilled in sensory knowledge and strategies	Provisional theories about sensory interventions need further evaluating Specific to children and adolescent samples	Improved regulation reported in samples Improved effectiveness of trauma processing through use of sensory modulation Reduced restraint occurrences	Identifies areas of trauma treatment to further evaluate empirically Hypo/hyperarousal states reflect in wider trauma samples Occupational therapy intervention

Article Details (Author/ Title)	Aims	Research Design	Sample Size / Text	Findings / Results	Conclusion	Strengths and Limitations	How it relates to the study
Wiglesworth and Farnworth (2016)	An exploration of the use of a sensory room in a forensic mental health setting: Staff and patient perspectives	Mixed methods	4 staff for focus group Female forensic patients aged between 18 and 60 years – 8 participants	AASP, sensory room evaluation form were quantitative data method of collection Focus group for qualitative data collection Mean time of 35.36 minutes of the sensory room being accessed Stress reduction was recorded on an evaluation from, with the most common being -2 points (n-14) out of the 50 recorded sessions	Weighted items in the sensory rooms were effective when used – staff report Sensory room can be accessed as an 'escape' – staff report Staff supervision impedes on independent use of the room – staff report Sensory profile informed sensory strategies on the safety plan – but the plan element was missing so not effective – staff report	Standardised sensory profile used for patient participants (however only 5/8 completed) Qualitative data from staff to support / interpret experience of sensory room use. Small sample of one gender of a specific unit Cannot account for presence of staff Small levels of stress reduction shown – but on a self rating scale tool which is not standardised	Sensory interventions and mental health Mixed methods study More data relating to sensory interventions impact on mental health required Recognises the value of OTs delivering this unique intervention

2.4 Selection of studies

The papers selected included an integrative review, systematic and scoping reviews, quantitative, qualitative as well as mixed methods studies. The broad spectrum of resulting research methods in this search reflects the diversity of approaches to analysing this field of work. There were, however, numerous articles replicated across the databases searched. By developing a hierarchy of potential evidence, this helped refine research that addressed the research question for this study (Taylor, 2007) and there were no restrictions put in place to limit a particular piece of literature being evaluated, so all study methods were included in this review.

As the researcher progressed through the process, it became clear that there has been an abundance of literature evaluating the use of sensory based interventions with children and adolescent populations, particularly in relation to neurodevelopmental disorders such as Attention deficit hyperactivity disorder and Autism (Schoen *et al.,* 2019) (Bulkeley *et al.*, 2016) (Bobier *et al.*, 2015). Studies of this type were then excluded according to the criteria relevant to this project. Further to this, having removed the search term relating to the military population, the spotlight focus was on mental health populations and sensory based interventions. Once the relevant studies were established, a methodological approach was taken to critically evaluate their findings. It was recognised by the researcher that with such a variety of approaches and methods there is a risk that this review could lack rigour, therefore recognised appraisal tools were sought to support critical analysis. The Critical Appraisal Skills Programme offer tools (Appendix 1) to support optimal checking of research for trustworthiness, results, and relevance (Critical Appraisal Skills Programme (CASP; 2022) which were implemented to support the critical analysis in this review.

From the database searches, a total of 80 relevant papers were found, then duplicates were removed. Following titles and abstracts being screened, the resulting studies were critically reviewed by the researcher and are presented in Table 2.2 (p16).

It is important to understand how bias impacts on research, as bias can occur at any stage and impact on all phases of research (Pannucci and Wilkins, 2010). With the variety of cultural backgrounds to the included papers, it is to be expected that there could be varying factors impacting on their findings. These biases could include beliefs, practices, and religions of different cultures that service users, practitioners and governing bodies may adhere to. Political views, healthcare funding, access to education, technology and equipment are also factors to consider that could influence study outcomes. Despite the varied populations studied in this literature sample, there were commonalities across the resulting papers in language, approaches and outcome measures used. However, there were no studies relating to the intervention with populations reflecting that of the present study, military veterans, highlighting a clear gap in the knowledge base and indicating the need for contribution to the evidence based in this field. To contribute to knowledge relating to this study, the researcher accessed available literature that was deemed relevant to the military demographic and reference lists of the selected literature were scanned for any further relevant sources which provided supplementary texts to the formal database search.

2.5 Language and definition

The language used to introduce sensory based interventions across the resulting papers was shared, exemplified by Brown, Tse,and Fortune (2019) who state that:

“Sensory Integration is considered a frame of reference and the umbrella term encompassing sensory processing and the associated disorders, including modulation, receiving, registering, perception, organisation and interpretation” (Brown, Tse,and Fortune, 2019 p517).

Although, as established by Brown, Tse,and Fortune (2019) there is a lack of clarity surrounding the key attributes that define sensory modulation, which suggests to the researcher that this area of knowledge needs to be further investigated by the profession to unify in its application as an intervention. This is supported by Brown, Tse,and Fortune as it was this uncertainty of the intervention’s key attributes which led to their questioning if this “disempowers clinicians and could limit the therapeutic benefit of sensory-based interventions” (Brown, Tse,and Fortune 2019 p515). Following their concept analysis, Brown Tse,and Fortune offered a definition:

“Sensory modulation is considered a twofold process. It originates in the central nervous system as the neurological ability to regulate and process sensory stimuli; this subsequently offers the individual an opportunity to respond behaviourally to the stimulus.” (Brown, Tse,and Fortune, 2019 p521).

When evaluating Brown, Tse,and Fortune’s (2019) study, it is of note that it was conducted by Australian occupational therapists. Australian governance for occupational therapy, Occupational Therapy Australia, (Occupational Therapy Australia, 2022) is different to British governance; British Association of Occupational Therapists (BAOT) and the Healthcare Professions Council (HCPC) (Royal College of Occupational Therapists (RCOT; 2022) (Healthcare and professions council (HCPC; 2022). This difference could impact on the professional education of these practitioners, which could then influence the definition they concluded. Therefore, when evaluating further texts, the researcher looked to consider if wider authors corroborated with Brown, Tse,and Fortune’s definition. This is because ongoing discrepancies in sensory terms and definitions provides further reasoning that contributing to knowledge, understanding and evidence around this intervention is required in the Occupational Therapy field. This is to solidify the intervention’s meaning for it to be effectively utilised and recognised across the globe.

Acknowledging the importance of universal language, in relation to the present study, sensory modulation is a suite of tools used to assist mental health service users, in this case ex-forces personnel specifically, to moderate their responses when distressed (Brown, Karim and Steuter, 2020; Champagne and Stromberg, 2004 cited in Machingura and Lloyd, 2017 p35). It is not referring to the subtype of atypical sensory processing, atypical sensory modulation, which is a generalised disorder that affects the ability to grade response to stimuli across single or multiple sensory systems (Bar-Shalita and Cermak, 2016).

Sutton *et al.* (2013) also introduce the use of sensory modulation to regulate responses, in which their focus was aggression. They note the common use of cognitive ‘top down’ (Sutton *et al.*, 2013 p500) as an intervention strategy to regulate emotional responses and how sensory modulation offers a ‘bottom up’ (Sutton *et al.*, 2013 p501) alternative through increasing self-awareness and promoting strategies for emotional regulation. Anger and aggression are common symptoms witnessed in

military veterans experiencing PTSD (Forbes *et al.,* 2008) (Turgoose and Murphy, 2018). Whilst Sutton *et al.* (2013) study did not solely focus on military personnel, it does introduce the scope for evaluating the potential of emotional regulation from sensory modulation, an intervention that does not require the cognitive approach. The paper concludes that the intervention does have a role in managing arousal and regulating emotion, which therefore with more research, could be of great benefit for the demographic of ex-forces who can present with these difficulties as a result of their traumatic experiences.

Kinnealey, Koenig and Smith (2011) reported that sensory modulation disorder occurs when behavioural responses are not graded in a way that is consistent with the situational demand, and the range of emotional and attention responses cannot be appropriately graded. Whilst the focus of the researcher's study was not sensory modulation disorder, it was contextual to recognise the impact of sensory disorders on function and quality of life. This was because there can be lifelong impact on occupational choice, self-care, and social participation due to sensory issues. (Kinnealey, Koenig and Smith, 2011).

The profession of occupational therapy aims to help people do things that are meaningful to them, so it is essential to have knowledge, skills and professional development dedicated to the areas of sensory approaches to improve people's independence and well-being (RCOT, 2022).

Kinnealey, Koenig and Smith's (2011) research was conducted to evaluate relationships between sensory modulation disorders, mental health outcomes and quality of life. They conclude that introducing a routine of sensory self-regulation can provide a foundation for a better quality of life. Further to this, the study recognises the importance of social support as a contributing factor to mental health outcomes of anxiety and depression, which is widely acknowledged in the field of occupational therapy in mental health. Despite the limited sample, the statistically significant results demonstrate the complex relationship between person, regulation skills and environment impacting on mental health in way of anxiety and depression. (Kinnealey, Koenig and Smith, 2011). The present research project was focused on sensory modulation as an intervention but acknowledged that the innate sensory intricacies and their impact for people, summarised by Kinnealey, Koenig and Smith

(2011), is a core element in all occupational therapy work as a client centred practitioner, and should underpin any intervention within mental health work.

2.6 Development of intervention

Jean Ayres was a pioneer in the occupational therapy field in developing theory and knowledge in sensory integration. Sensory integration is the process by which people register, modulate, and discriminate sensations received through the sensory systems to produce purposeful, adaptive behaviours in response to the environment (Ayres and Robbins, 2005). Ayres' is the original work to which concepts of sensory approaches are being developed and advanced. The discovery that functional and behavioural difficulties in children could be attributed to information from multiple sensory systems being poorly integrated, or not integrated at all (Gorman and Kashani, 2017) set the basis of a new treatment approach in occupational therapy. As with all knowledge development, there will be expansion to Ayres' existing work, but potentially, progress towards varying perspectives and frameworks (Smith Roley *et al*., 2007).

Dunn (2008) established a four-quadrant model of sensory processing and contributed to the development of the Adult Sensory Profile. This work was based on the occupational therapy field being predominantly focused on sensory processing in children, with the majority of tests in use being designed for children, despite there being evidence that adults also experience sensory processing concerns similar to children (Brown *et al., 2001).* Occupational therapists are client-centred practitioners and therefore recognise that each person is unique in their perception, preferences, and engagement in what is meaningful to them. This engagement in meaningful activity will have sensory properties, which can offer regulation, whether this is conscious or not. If someone experiences illness this then can impact on the level of engagement and therefore access to the sensory stimulation those activities provide (O'Sullivan and Fitzgibbon, 2018). Each person experiences life through their senses, and has sensory preferences or dislikes which can lead to peace, pleasure or overwhelm (Dunn, 2008 p17). The reason why sensory modulation has considerable potential as a treatment for occupational therapists, is because humans can adjust how we respond to the sensory information we are receiving and the experience we are having, through improving self-regulation. (Dunn, 2008) (O'Sullivan and Fitzgibbon, 2018).

The UK Psychological Trauma Society developed guidelines for the treatment and planning of services for complex post-traumatic stress disorder in adults. Within this guidance it acknowledges the 'impairments in regulating emotional experience' as part of the diagnosis with a recommended sequential approach, with the first phase improving symptom management, self-soothing and addressing current life stressors to achieve safety and stability in the present (Janet, 1925 cited in McFetridge *et al.*, 2017; Herman 1992 cited in McFetridge *et al.*, 2017 p13). As Holland *et al.* (2018) documented in their vignette, there are changes that occur in the brain as a result from activation of the stress response repeatedly, which conclude in a hyperaroused state and dysregulation. Acknowledging the guidance and recognising the potential of sensory principles, sensory modulation appears to be a potentially appropriate intervention for those experiencing complex trauma symptoms.

2.7 Current knowledge

A recent integrative review conducted by occupational therapists asked, 'What sensory based interventions are occupational therapists utilising in adult and adolescent trauma survivors?' (McGreevy and Boland 2020 p31). Due to the paucity of research in this area the authors adopted an integrative approach over a meta-analysis to establish a more complete insight of the subject. Their informative paper concluded that the introduction of Complex Post Traumatic Stress Disorder, a diagnosis by the International Classification of Diseases (ICD-11) has widened the requirement for evidence base for the already limited empirical research in the occupational therapy field for trauma work. The ICD-11 is a global categorisation for physical and mental illness (World Health Organisation; WHO, 2022). Both the ICD-11 and DSM-5 are used for guiding recognition and diagnosis of mental health conditions, with the DSM-5 being solely focused on mental disorders (American Psychiatric Association, 2013). Whilst sensory based approaches are becoming well utilised and the evidence for this is growing in the adult mental health field, along with children, there are few studies exploring the specificities of sensory practices with trauma survivors (Sutton *et al*., 2013; Machinngura and Lloyd, 2017 cited in McGreevy and Boland, 2020 p32).

There are limitations in the studies evaluated for the McGreevy and Boland's (2020) review; they acknowledge the lack of standardised measures used to evaluate outcomes, as well as no conceptual papers exploring the needs or perspectives of

trauma survivors, despite occupational therapy being a client centred profession. Despite these limitations, the summarising themes from the empirical papers provide useful perspectives, in particular to the researcher; the use of sensory interventions that focus on stabilisation and creating safety for trauma survivors, being "preparatory in nature that create conditions within which to support clients participating in meaningful and purposeful activities" (Champagne, 2011; Parker *et al*., 2007 cited in McGreevy and Boland, 2020 p45). There is a lack of ability to generalise these findings due to the case study design being a single person, but this creates an opportunity to address the knowledge gap of sensory interventions for trauma specific mental health populations.

A second theme from these papers was that transdisciplinary treatment programmes can reduce symptoms of trauma and concludes that a variety of disciplines is vital for trauma informed practice and could be the basis for enhancing intervention efficacy (Martin, 2015 cited in McGreevy and Boland, 2020). The varying specialities required to approach trauma treatment mirror the very nature of trauma complexity itself (Champagne *et al.,* 2010 cited in McGreevy and Boland, 2020 p45). This shows there is scope to evaluate specific sensory based interventions with a targeted population who have experienced trauma, resulting in poor mental health, as part of a transdisciplinary approach.

A scoping review conducted by Bailliard and Whigham (2017) to review the literature on the relationship between sensory processing and mental illness also found that comprehensive reviews in occupational therapy in this area were absent. There were 149 studies included, and the authors acknowledge the limitations of the scoping review method in that it does not critically evaluate the evidence found. To manage this, they made use of a methodological framework and a diverse range of recognised databases to maximise access to relevant articles.

Despite the limited number of studies exploring sensory deficits in mental illness, there is evidence to indicate that there are links between proprioception deficits and disorders of self-awareness. (Arnfred *et al*., 2015 cited in Bailliard and Whigham, 2017 p8) This is important to be aware of when providing psychiatric treatment and care as people experiencing mental illness may miss information and avoid

environments with particular sensory qualities (Brown *et al*., 2016 cited in Bailliard and Whigham, 2017 p8).

These sensory deficits can contribute to cognitive deficits in concentration, self-regulation, or environmental regulation in sensory rich environments (Wexler, Ikezawa and Corbera, 2014 cited in Bailliard and Whigham, 2017 p8). For those experiencing sensory deficits when accessing mental health care this could mean potential limitations in fully utilising talking therapies including trauma focused cognitive behavioural therapy, one of the recommended interventions for those who have experienced trauma (National Institute of Clinical Excellence (NICE; 2021). Without knowledge of sensory interventions, there may also be potential to prescribe psychotropic medication to promote a regulated affect in those experiencing mental illness. Whereas, with more knowledge and evidence, alternative treatments that focus on sensory processing to improve cognition and occupational performance could optimise client-centredness, as well as potentially reduce the financial outlay associated with medication. (Jahshan *et al*., 2013; Moritz *et al*., 2014 cited in Bailliard and Whigham, 2017 p8).

Bailliard and Whigham's (2017) scoping review supports that existing research suggests a bottom-up approach targeting sensory skills may contribute to improved cognitive and occupational performance. One study included, highlighted that sensory processing difficulties may impede adults with PTSD in forming intimate relationships (Stols *et al*., 2013 cited in Bailliard and Whigham, 2017 p9). This further contributed to the formulation of the current research question, to explore of the use of sensory interventions for those experiencing trauma related mental health difficulties. Occupational therapists need to continue to build evidence of sensory approaches in mental health to support the credibility of their contribution in psychiatric care, which was cemented by Bailliard and Whigam's (2017) review.

2.8 Commonly used sensory based interventions

Literature around bottom-up sensory based interventions from the occupational therapy field in complex trauma is scarce, however there is recognition that sensory modulation techniques are important for people with PTSD and trauma backgrounds. This includes breathing and body movement, to support self-awareness and promote self-regulation (Van der Kolk, 2006). An occupational therapist is uniquely skilled in

assessing the dynamic relationship between person and environment and how occupational performance is a result of the interaction between person, environment and the occupation (Law, 2020). People who have experienced trauma can perceive harmless environments and situations as being dangerous. They may have individual triggers and an adjusted relationship with their body that sensory modulation, when individualised, could be of benefit. There is emphasis is on the sensory modulation strategies to be personalised to improve efficacy, in which an occupational therapist is best place to assess and provide, due to the aforementioned skills. (Koomar, Warner & Westcott, 2009 cited in O'Sullivan and Fitzgibbon, 2018 p13). Therefore, contributing knowledge in the occupational therapy field of the use of sensory based interventions with complex trauma patients is necessary.

Ford *et al.* (2005) note that clients can learn that traumatic memories or affects are not necessarily toxic or overwhelming when moderated through self-regulation skills. Their paper corroborates with the UK Trauma Society guidelines around increasing stabilisation in early phases of treatment, and recommends treatment principles:

- Treatment must enhance the client's ability to manage extreme arousal states
- Treatment should enhance the client's sense of personal control and self-efficacy
- Treatment must assist the client in maintaining an adequate level of functioning consistent with her or his past and current lifestyle and circumstances
- Treatment must enhance the client's ability to approach and master rather than avoid experiences that trigger re-experiencing, emotional numbing and hyper and hyperarousal.

The key element to the Ford *et al.* report is that there is a focus on enhancing psychological 'top-down' interventions such as Cognitive Behavioural Therapy, Interpersonal-Affective Regulation and Cognitive Processing Therapy. Drawing on the earlier comments of the importance of trans-disciplinary working in McGreevy and Boland's (2020) review, there is a clear benefit to providing sensory intervention as a way of building skills in self-regulation to then participate in onward psychological trauma therapy treatment. However, there should be a positive benefit

in daily function through treatment. By going beyond psychological treatment of root causes and symptoms, and adopting occupational therapy expertise, there could be improvements in occupational performance and satisfaction. Ford *et al.* allude to this in principle 3, but by utilising occupational therapists, not only could the stabilisation phase of trauma treatment be optimised through sensory approaches, the onward engagement in 'top down' interventions and recovery for clients could be enhanced. This cannot be done without the evidence to demonstrate the effectiveness of sensory interventions for self-regulation and stabilisation in trauma treatment.

2.9 Summary of sensory interventions being used in mental health treatment

Looking deeper into specific sensory interventions, a randomised control trial was completed by Stoller *et al.* (2012) and evaluated sensory enhanced yoga as an intervention with deployed US military personnel who exhibited combat stress symptoms. This randomised control trial recruited 80 participants, with a final sample of 35 treatment and 35 non-treatment completing the trial. The yoga intervention targeted vestibular input combined with deep breathing, and the use of standardised measures concluded that the yoga program helped with anxiety. This is promising research into the targeted demographic of US military personnel that can be followed up with looking at wider military veteran populations. The intrusive symptoms experienced as a result of trauma can impact on confidence in sleep routines. Sleep is defined as an occupation by occupational therapists, and this study has reenforced that sensory based interventions could help those with sleep difficulties, in particular as a symptom of trauma (Stoller *et al*., 2012).

A pilot study conducted by Adams-Leask *et al.* (2018) in an emergency department in Australia evaluated the impact of sensory modulation tools on a sample of 74 people accessing the psychiatric emergency care. In relation to the current researcher's study, the population sample were those accessing mental health emergency care is of interest, as the researcher's study is looking specifically at mental health outcomes. Although, the Adams-Leask *et al.* study context is different in terms of governance and treatment environment. Within the pilot study, the occupational therapist author selected participants based on risk assessment and clinical judgement which could contribute towards bias, as well as a self-developed evaluation form as a single outcome measure impedes on the validity of the results.

Despite this, 73 of the 74 consumers commented that they found the experience as positive, helpful, or good and the intervention was seen as being helpful as it provided a distraction, was calming and promoted strategies for self-management of distress. Participants were offered various sensory equipment, the most common being accessed were lights and hand fidgets, and they could use them for as long as they wished (Adams-Leask *et al*., 2018).

As a pilot study, the limitations are acknowledged by the authors, but the recommendation to further research into the intervention of sensory modulation for those experiencing mental health challenges is meaningful to the researcher.

A community-based study conducted by Wallis, Sutton and Bassett (2018) evaluating sensory modulation intervention impact on anxiety and occupational performance used a UK sample, which is of note for the author's study. It was a mixed methods study, using valid measures to assess both anxiety and occupational performance in three phases, as well as a semi-structured interview at the end of the study. Participants in this study had a more structured access to sensory work in comparison to Adams-Leask *et al's* study (2018). This included an education component during their one-to-one sessions about the nervous system, along with access to tools and support in application of the sensory strategies. The outcome of Wallis, Sutton and Bassett (2018) study was that there was significant change in outcome scores relating to anxiety both immediately and at the follow up stage of the study for all but one participant. The qualitative data showed themes of improved functioning, improved self-management, increased self-awareness and improved environment management and connection. The small sample needs to be acknowledged as a limitation, but the strength of valid measures supports a foundation of evidence that sensory modulation can positively impact mental health outcomes in terms of anxiety (Wallis, Sutton and Bassett, 2018). The use of mixed methods to expand on the empirical data was beneficial as it went beyond outcomes related to anxiety. Incorporating qualitative methods to give voice to participants reflects the client-centred ethos of occupational therapy; finding out what is meaningful to client's and helping them achieve it. This reiterates the researcher's earlier reference to going beyond symptom management and bringing focus to improving daily functioning and quality of life through this unique intervention.

As well as access to sensory tools and guided one-to-one sessions, another common sensory intervention across the literature is that of a sensory room. In the researcher's literature review there were frequent documentation of the use of dedicated environments for sensory work (Wiglesworth and Farnworth, 2016; Holland *et al.*, 2018; Warner *et al*,. 2013), which was acknowledged in both Scanlan and Novak's (2015) and Bailliard and Whigham's (2017) scoping reviews. (Scanlan and Novak, 2015) (Bailliard and Whigham, 2017). The most recent review of McGreevy and Boland (2020) acknowledges the prevalence of sensory rooms across the field of mental health research. (McGreevy and Boland, 2020). Despite this prevalence, there continues to be unique and small samples, along with varying outcome measures across the studies which make it difficult to generalise results. Although, the outcomes documented are in favour of utilising this as a method that supports better regulation, reducing stress, increasing safety for conducting trauma treatment as well as reducing restraint in forensic and residential settings.

Further to sensory rooms, reference to increasing self-awareness, personalised sensory kits, targeted relaxation, and mindfulness strategies were also frequent across this review (Sokmen and Watters, 2016; Wiglesworth and Farnworth, 2016; Holland *et al.*, 2018; Warner *et al.*, 2013). Again, the commonality of these interventions was not reflected in the samples they were researched with and despite promising outcomes, further targeted empirical research has been recommended to build stronger evidence for their use. Other than the sensory based yoga, (Stoller *et al.,* 2012) no interventions have been assessed for use in military, specifically military veteran, mental health.

2.10 Summary

In this chapter the researcher has presented a definition of sensory modulation that will depict the intervention being evaluated in this current study. The originating framework of Sensory Integration (Ayres and Robbins, 2005) and the development of sensory concepts and approaches have been shown to provide context of the treatment itself, along with how it is currently being implemented in the mental health field of practice.

As this literature review indicates, there is emerging evidence demonstrating the effective impact of sensory based interventions for those experiencing mental health

difficulties. These range from impacting seclusion and restraint practices, reported symptom reduction, and improved self-regulation during hospital admission as well as in the community.

Despite this, there was no evidence revealed from the search that investigated sensory based interventions for ex-military personnel experiencing trauma based mental health problems. This indicates there is a gap in the literature to address. The knowledge on the use of sensory approaches within mental health treatment for military veterans needs to be explored, along with the evidence base to investigate occupational therapists' contribution in trans-disciplinary working.

Chapter 3: Methodology

3.1 Introduction

This chapter aims to summarise the philosophical considerations by the researcher that underpin this research project design and highlights the reflections made to arrive at this choice of mixed methods research. There is discussion regarding the research setting to provide context to the project and the researcher's standpoint. The design, methods and ethical considerations for the research are presented at the end of this chapter.

3.1 Philosophical considerations

This mixed-methods study aims to gather empirical and phenomenological data to evaluate the effectiveness of, as well as the experiences of veterans engaging with, sensory modulation interventions.

Theories of the philosophy of science can be analysed under two broad headings or aspects: ontology and epistemology. "Ontology is the study of being, and epistemology is the study of knowledge" (Ladyman, 2002 cited in Allmark and Machaczek, 2018 p1302). Both the epistemological and ontological views of the researcher lay between opposing interpretations of postpositivist and constructivism views. The postpositive lens being that knowledge is based on determinism or cause and affect thinking, and the constructivism lens being that phenomena is a world view made up of participants and their subjective views (Creswell and Plano Clark, 2018).

Denzin (2010) argues that paradigms are human constructions and are more than nested assumptions about ontology, epistemology, methodology and ethics. This is supported by Doyle, Brady and Byrne (2009) who articulate that paradigm differences influence how we know, our interpretation of reality and our values and methodology in research (Doyle, Brady and Byrne, 2009).

The ontological view of pragmatism is that there are singular and multiple realities whilst the epistemology denotes a practicality and focus on 'what works' (Doyle,

Brady, Byrne 2009 p183) to address the research question. Pragmatism is a diverse philosophical tradition (Hall, 2013) with an underpinning that acknowledges and guides a variety of approaches to answer research questions that cannot be addressed using a singular method (Doyle, Brady and Byrne, 2009).

The pragmatic approach to research is informed by the belief that the practicalities of research are such that it cannot be driven by theory or data exclusively and a process of abduction is recommended, which enables one to move back and forth between induction and deduction through process of inquiry (Morgan, 2007 cited in Doyle, Brady and Byrne, 2009 p176). Pragmatism uses diverse approaches, valuing both objective and subjective knowledge (Creswell and Plano Clarke, 2018). The pragmatic argument for this study is that the researcher could achieve a more complete and contextualised understanding of the social processes and causal mechanisms through a mixed methods approach (Maxwell, 2004a, 2012b; Pawson, 2006 cited in Bazeley, 2018 p16).

Mixed methods research is emerging as a dominant paradigm in healthcare research (Doyle, Brady and Byrne, 2009) and it is thought that the combination of quantitative and qualitative methods presents more enhanced insight into the research problems, which reflects the pragmatic view held by the researcher (Creswell, 2012; Frels and Onwuegbuzie, 2013; Hong and Espelage, 2011 cited in Caruth, 2013 p113). Being a client-centred practitioner, the choice of mixed-methods to promote outcome-based research also has its place. This is owing to the view that “measurement of intervention outcomes should include the aspects of measuring outcomes of interest to consumers and practitioners and showing clinically meaningful changes that are easily observable and can be related to daily function” (Sudsawad, 2005 p354). Also, to produce stronger inferences and allow for greater diversity of findings, mixed methods can be advocated for (Creswell and Clark 2009; Teddlie and Tashakkori 2003b, cited in Denzin, 2010, p14-15). This is because this approach is capable of ‘bridging the gap between quantitative and qualitative positions’ (Johnson and Onwuegbuzie, 2004 cited in Doyle, Brady and Byrne, 2009 p177).

It is important to acknowledge the role of the researcher in relation to the study at this stage. The above paradigm arguments contributed to the inclusion of a quantitative approach through gathering empirical data from outcome measures at varying time points, along with the collection of further qualitative data collected to explore participants' experiences, application and learning of the intervention. Consideration was given to the potential impact of the researcher's views and position on the study, as researchers can "shape and are shaped" (Attia and Edge, 2017 p36) during the research process.

A reflexive commitment was adopted by the researcher to acknowledge the potential impact of the social and physical environments, the researcher herself, and the context in which the research was being conducted on the research process. Corlett and Mavin (2018) comment on how reflexivity is more than reflection, and it's process often brings about change through self-monitoring (Corlett and Mavin, 2018 cited in Cassell, Cunliffe and Grandy, 2018). Recognising any influences through self-monitoring (Appendix 2) enabled the researcher to better deliver on the research process through problem solving any opportunities and limitations impacting on the project.

The overall philosophical assumptions in this study design shift from post-positivist to constructivist as researchers can use multiple philosophical positions, (Creswell and Plano Clark, 2018).

3.3 Research design

This design, in line with the philosophical paradigms acknowledged earlier by the researcher, utilises quantitative and qualitative data collection and the analysis methods implemented were predetermined and planned. The research proposal was approved by York St John University ethics committee in February 2021 (Appendix 3). The qualitative data was collected to compare with the collected quantitative data, this approach is associated with a convergent design with the rationale of explaining results with more depth (Creswell and Plano Clarke, 2018).

3.4 Sample

Convenience samples are the norm within developmental science (Jager, Putnick and Bornstein, 2017) and despite the non-probability sampling strategy, the specificity of the sample being that of the relevant veteran population of this project, as well as the accessibility in line with the service delivery, were key factors in this choice of sampling method. Participants were referred for treatment via inter-disciplinary team meetings, with members representing occupational therapy, psychology, nursing, psychiatry, and peer support veteran coordinators. Due to the ethical considerations of the study, participants were recruited as they accessed their mental health stabilisation intervention as usual.

Inclusion criteria stipulated participants were to: have served in the British armed forces; be adults with the minimum age of 18; be experiencing complex mental health problems as a result of military trauma; have mental capacity and provide informed consent under the Mental Health Act 2005 (Gov UK, 2007); be able to engage in group intervention via the online platform Microsoft Teams or at hub locations across the country; and be experiencing struggle to regulate their emotions.

Exclusion criteria stipulated the exclusion of people with neurodevelopmental difficulties that present in a way that means they are likely to interfere with emotional self-control and/or the running of the group, for example people with severe attentional difficulties due to traumatic brain injury, significant autism spectrum disorder and or attention deficit hyperactivity disorder.

3.5 Intervention and treatment fidelity

Initially, the research project intervention was planned for delivery to be face-to-face but due to the evolving nature of restrictions during COVID-19 this was adapted to be conducted via web-based technology in line with the service development within the service.

The evaluated intervention was delivered by a team of occupational therapists employed at the service, and was overseen by the Head of Occupational Therapy,

via Microsoft Teams software, a video hosting platform. A pilot group was conducted by the researcher and Head of Occupational Therapy to evaluate the service delivery and gather feedback ahead of the larger data collection process. The pilot group aims were to test the referral process along with the facilitation of the manualised treatment, including the timings of sessions to evaluate and change anything where necessary following feedback from facilitators and participants. It also offered the opportunity for the researcher to reflect on the research project design and method to ensure the selected approach was effective in answering the research question.

Five participants were referred to the pilot group via the inter-disciplinary meeting and placed on a waiting list that the researcher had sole access to. Once the minimal number of three participants were met, the researcher then set the date and time of the group with the Head of Occupational Therapy. There was a set number of minimum participants to provide group dynamics, with a group being acknowledged to be a minimum of two people who influence one another through interactions (Shaw, 1976 cited in McKenna and Green, 2002 p117).

With the two staff facilitators, it was agreed by the researcher and Head of Occupational Therapy that three veterans would be appropriate to promote veterans sharing experiences through discussion as they would potentially feel more comfortable to do so. The idea that veteran identity being shared by participants could promote participation is supported by Turner (1982) who advised that a “common social identity” is required for groups (Turner, cited in McKenna and Green, 2002 p117). Once concluded, the researcher and Head of Occupational Therapy reviewed the pilot group and reflected in discussion any concerns or adjustments needing to be made, however, only a minor adjustment was made to introduce a timing agenda for facilitators to keep to, which was to enable structure to discussions without overrunning.

Participants were approached via telecoms to inform them of the intervention, the dates, times, and further available communication method of email. Emails containing the intervention aims, instructions for joining and contact details were sent to each individual participant. The groups were conducted on Microsoft teams, with an initial 'pre-group' session to discuss consent to the research project, to provide access to the online subject content which was via a password protected service portal, explanation of the questionnaires, and provision of links to access these and any questions participants had. A 'pre-group' was imbedded into the intervention to provide participants with the opportunity to discuss any limitations with technology throughout their planned engagement, to optimise treatment and to facilitate a peer supportive environment prior to starting the groups focusing on the treatment. This was informed by the recognition of the "healing power of groups" acknowledging the group environment as influential, with inter-personal learning, connectedness and emotional support being valued by veterans engaging in mental health treatment (Yalom and Leszcz, 2005 cited in Vaughan-Horrocks, Reagon and Seymour, 2020, p6).

Following the pre-group, which was the introductory group discussing technology access, ground rules and ice breakers, there were 6 treatment groups following the manual (Appendix 4) with 3 facilitators, including the researcher and Head of Occupational Therapy, each completing a reflection following every group (Appendix 5). Feedback was collected throughout the sessions informally from participants, but also at the end of the group intervention through service feedback forms (Appendix 6). The post-group outcome measure data was collected in the last treatment group, and the 4-week follow up data was prompted for collection at the one-to-one review meeting held by the facilitating occupational therapist for each participant ahead of any further treatment or discharge from the service.

The pilot group feedback was collated and discussed between facilitators and then discussed further with the wider occupational therapy team at the occupational therapy team meeting to inform the next facilitators of the pilot learnings. The fundamental purpose of conducting a pilot study is to examine the feasibility of an approach that is intended to ultimately be used in a larger scale study (Leon, Davis and Kraemer, 2011). It was with these principles in mind that the researcher evaluated the research methods and processes through the pilot group. On

completing the pilot group, the consent process and data collection process was evaluated and kept the same for the onward study. Due to the lack of change to the facilitating process or data collection following the pilot, participant data from the pilot group was utilised within the overall sample and data analysis.

To maximise the standardisation of service delivery, both the researcher and Head of Occupational Therapy developed the treatment manual (Appendix 4), for the occupational therapists to follow to facilitate from the group intervention. Furthermore, each occupational therapist was trained in Sensory Intelligence © (Lombard, 2022) training prior to starting, and remote group supervision was established with the occupational therapists to support any learning needs and ensure confidence with carrying out the intervention. Each clinician shadowed other clinicians facilitating the groups, prior to beginning their own with a co-facilitator to ensure best practice as possible. Adaptations were made to the initial service delivery due to the COVID-19 pandemic, and it was to be held online and, therefore, there were adaptations to the interventions for the occupational therapists facilitating the groups to prepare for. To aid their preparedness and support in delivering the manualised treatment via technology, upskilling their IT knowledge was essential to ensure those participating could be fully supported through technology if necessary whilst engaging in the treatment pathway as part of the research project.

3.6 Data collection methods:

The data collection was conducted nationally through the service, during the COVID-19 pandemic and the gatekeeper for the project was Head of Occupational Therapy (Appendix 7).

3.7 Quantitative data collection methods:

The efficient convergent design allowed the researcher to collect data during one phase, both with importance in answering the research question (Creswell and Plano Clark, 2018) which reflects the nature of the service delivery in which the research was being conducted. To ensure minimal impact on participants, the researcher wanted the data collection to be in line with what would be expected as part of receiving treatment as usual. The methods chosen for the quantitative research element were outcome measure questionnaires (Appendix 8), made up of multiple outcome measures, which were collected: at the beginning of each group phase; then again at the end after the 6 treatment sessions; and finally at 4 weeks follow up from the end of the group intervention. To reduce bias, and to optimise collecting rigorous data to strengthen the study, the researcher appraised standardised measures to implement, meaning the validity and reliability of the measures used were paramount.

3.8 Measures

The quantitative element of this study was undertaken using the measures noted below:

The General Anxiety Disorder Assessment (GAD-7) for measuring generalised anxiety disorder (Spitzer *et al.*, 2006). The GAD-7 is a useful tool with good reliability, as well as criterion, construct, factorial, and procedural validity. It is a valid tool for screening for anxiety and assessing severity in clinical practice and research (Spitzer *et al.*, 2006).

The Dimensions of anger reactions questionnaire (DAR-5) for measuring dimensions of anger reactions (Novaco, 1975). The DAR-5 demonstrated internal reliability, along with convergent, concurrent and discriminant validity against a variety of established measures (Forbes *et al.*, 2004) (Forbes *et al.*, 2014). Turgoose and Murphy (2018) document the commonality of military personnel experiencing anger and the clear links between anger and other variables including mental health issues and PTSD (Turgoose and Murphy, 2018). A reduction in anger can lead to improvements in other areas (Turgoose and Murphy, 2019), therefore, the DAR-5 was selected to assess the impact of the intervention on the presence of anger in participants.

The Post-traumatic stress disorder (PTSD) Checklist (PCL-5) for measuring Post-traumatic stress disorder. The PCL-5 is a psychometrically sound measure of PTSD symptoms (Blevins *et al.*, 2015) which according to the classification manual of mental disorders; DSM-5 (American Psychiatric Association, 2013) include re-experiencing, avoidance and hyperarousal. PTSD is an anxiety disorder caused by stressful events (NHS, 2022). Therefore, the PCL-5 was selected to assess the impact of the intervention on PTSD symptomology for participants.

The International trauma questionnaire (ITQ) (Cloitre *et al.*, 2018). The ITQ is the only validated measure for the assessment of the new Complex Post-traumatic stress disorder symptoms (CPTSD) from the International Classification of Diseases (ICD-11) (WHO, 2022). Both the ICD-11 and DSM-5 are used for guiding recognition

and diagnosis of mental health conditions, with the DSM-5 being solely focused on mental disorders (American Psychiatric Association, 2013).
The ICD-11 outline for CPTSD involves three of the symptom clusters for PTSD; re-experiencing, avoiding reminders, and a heightened sense of threat and arousal which are listed in the DSM-5. However, there are further problems of emotional regulation, guilt, shame, and interpersonal difficulties which contribute to the classification of CPTSD (Trauma 2022). The ITQ has been evidenced to be useful in the assessment of both PTSD and CPTSD in treatment-seeking veterans (Murphy *et al.*, 2020). It has been selected considering the participant population of military veterans and to strengthen quantitative measurement of the impact of sensory modulation on PTSD symptomology.

Dissociative symptom scale (DSSB) (Carlson and Putnam, 1993). This scale was developed to assess moderately severe levels of depersonalistion, derealistion, gaps in awareness or memory, and dissociative reexperiencing. It has been concluded to be useful to identify those with elevated levels of dissociation and to monitor treatment progress (Carlson *et al.*, 2018). A common symptom displayed by veterans experiencing trauma is dissociation, and sensory modulation has the potential to address this symptom, therefore, this measure was selected to evaluate the treatment potential.

The Difficulty in Emotional Regulation Scale (DERS-18) is the short measure version of the DERS-36 (Gratz and Roemer, 2004) which is designed to assess emotional dysregulation, and the DERS-18 demonstrates excellent reliability and validity, performs similarly to the original DERS whilst placing less demand on research participants (Victor and Klonsky, 2016). Sensory modulation promotes self-regulation through increasing self-awareness and soothing interventions (O'Sullivan and Fitzgibbon, 2018), therefore, accurately assessing the impact in this area could be informative for future treatment.

3.9 Qualitative data collection methods:

Demographic and qualitative data were collected using an online survey (Appendix 9), which, as a method, gives information about attitudes and beliefs relating to interventions or health behaviours (Taylor, 2007). One might argue that quantitative research is weak in understanding context or settings in which people live. Also, the voices of participants are not directly heard in quantitative research. Qualitative research helps to mitigate against these weaknesses (Creswell and Plano Clark, 2018).

The demographic data collected included: gender; date of birth; age at referral; referral source; education level; home status; employment status; relationship status; number of dependents; enlistment status; Military service; rank on discharge; role during service; year leaving service; length of service; reason for leaving the services; and any conflicts. Following the convergent design, the researcher reviewed the qualitative research questions (Creswell and Plano Clark, 2018) which were further reviewed through reflections from the pilot group and conversations with the Head Occupational Therapist and researcher. With the quantitative data measuring the impact of the intervention on specific mental health outcomes, the aim of the qualitative questions was to gather participants' responses on their comprehension of sensory modulation, the impact, if any, of what they may have learned, and whether and how they may be using sensory modulation in their daily life.

The questions asked were:

Q1: What is your understanding of sensory modulation and how to use it?
Q2: What have been the changes you've experienced since using sensory modulation?
Q3: How have you used sensory modulation in your daily life?

Occupational therapists are client centred in their relationships with all their clients (World Federation of Occupational Therapists, 2010), therefore, it is important to hear about the client's experience. The survey was disseminated individually through email to consenting participants and was created through SurveyMonkey, an online survey software, with a licence devoted to the researcher so they had sole access to the returning data.

3.10 Data analysis

The research design informs the combining of data sets to increase the validity, as is the essence for of mixed methods research (Creswell, 2014; Bazely 2018; Creswell and Plano Clarke, 2018). The quantitative data was analysed using descriptive statistics and statistical testing. 'Statistics have been located within a paradigm of post-positivist empiricism as a means of discovering information about our world as it really is' (Bazely, 2018 p57). Following data being collected over the period allotted, it was pseudonymised and data analysis was conducted. This involved extracting complete data sets, that is, the total number of full outcome measures completed across the pre, post and follow up from treatment stages. Then calculating the necessary means, standard deviation and completing normality testing per each outcome measure data set. Data was tested for normality using the Shapiro-wilk test (Shapiro and Wilk, 1965) to assess for which statistical test to utilise for analysing statistical significance.

The statistical test chosen was the related samples *t*-test, which is a robust test that is suitable for dependent samples (Lipttakova, 2021) such as this study, and when the data which met the underlying assumptions for parametric testing. The Wilcoxon Signed-rank test is the non-parametric equivalent to the related-sample *t*-test was

used as the alternative for data which did not meet those assumptions (Wilcoxon 1945) (Siegal,1956). The Wilcoxon Signed-rank test was used when data from participants is collected more than once, however, there are violations to the assumptions of the data which inhibits the use of parametric tests (Roni and Djajadikerta, 2021). Lund Research © (Lund Research, 2018) list the assumptions for using the *t*-test as:

- The independent variable needs to be consistent of two categorical “matched pairs” or “related groups”
- The dependent variable should be measured on a continuous scale
- There should be no significant outliers in the differences between the related groups
- The distribution of the differences in the dependent variable between the two related groups should be approximately normally distributed

The listed assumptions for the Wilcoxon Signed-rank test from Lund Research © (Lund Research, 2018) are:

- The independent variable should consistent of two categorical, “matched pairs” or “related groups”
- The dependent variable should be measured on an ordinal or continuous level
- The distribution of the differences between the two related groups needs to be symmetrical in shape

As the data was collected using outcome measures that were formed of Likert scale responses, the data was treated as interval (Wu and Leung, 2017) and taken at repeated time points to meet the necessary requirements for both the statistical tests used. However, when the data was tested and did not meet normality as per the assumption for the *t*-test the researcher utilised the Wilcoxon Signed-rank test. The analysis was performed utilising the IBM SPSS Statistics, the statistical software package. (IBM Corp. Released 2021)

.

Quantitative and qualitative data sets were used to validate each other, and the qualitative data was analysed using thematic analysis that provides a systematic procedure for generating codes and themes from qualitative data (Terry *et al.,* 2017). There are numerous ways of collecting and analysing qualitative data, but the researcher was interested in using surveys followed by thematic analysis due to its pragmatic focus (Guest, MacQueen, and Namey, 2012, p.17). The survey questionnaires were collected at the 4-week follow up period alongside the quantitative questionnaires. The researcher utilised Braun and Clarke's (2022) framework to ensure a guided approach to analysis. There is a continuum of methods to qualitative analysis offered by Sandelowski and Barroso (2003) who stated thematic analysis sits in the middle of grounded descriptive analysis and highly interpretive analysis. The aim of the project was to gather data to explore the impact of the group intervention, and using thematic analysis meant that common and shared meanings could be discovered to expand on the quantitative data (Sandelowski and Barroso, 2003 cited in Kiger and Vaprio, 2020, p3 ;Kiger and Varpio, 2020).

The use of reflexive practice through a reflective journal (Appendix 10) allowed the researcher to examine assumptions, decisions, interactions, and actions throughout the study, and was to try and account for potential bias due to the situation of the researcher (Cunliffe, 2016).

Braun and Clarke's (2022) Thematic Process framework for the qualitative analysis follows:

1. Familiarising yourself with the data
2. Generating initial codes
3. Searching for themes
4. Reviewing themes
5. Defining and naming themes
6. Producing the report

The researcher used this framework to familiarise, label and code data with any themes identified as being recurring ideas relevant to the research question (Braun and Clarke 2006; Robson and McCartan, 2011).

3.11 Ethical considerations

The researcher is a registered Occupational Therapist with the British Association of Occupational Therapists and Health and Care Professions Council and, therefore, committed to following the ethical standards set out by these governing bodies (Royal College of Occupational Therapists (RCOT; 2021) (Health and care professions council (HCPC; 2022).

The research proposal outlined key ethical considerations including data protection, confidentiality, anonymity, risk of harm to participants and risk of bias. This research project collected data from consenting participants experiencing mental health difficulties throughout their treatment and at 4 weeks follow up. Careful consideration was given to the sensitive nature of the data being collected and the risks associated to participants whilst engaging in the intervention. Data was collected and anonymised by the researcher and saved on the service drive, secured by username and password. Participants were provided with an information sheet detailing how to access support during and after the project to minimise any risk of mental health deterioration. (Appendix 11).

3.12 Informed consent

During the pre-group session, held a week before beginning the intervention specific sessions, each participant was provided with a participant information sheet via email including details about their right to withdraw via email (Appendix 11), prior to a consent form (Appendix 12). The consent was digitately signed and returned to the researcher via email by participants, with the option of hand signed and returned where appropriate. The intention of the pre-group was to set aside time to fully inform participants of the research project, problem solve any technical barriers and introduce the subject matter ahead of beginning the treatment. Participants were routinely informed of their right to withdraw from the research study without impact on their treatment.

3.13 Data protection, confidentiality, and anonymity.

As the researcher was employed at the service, access to participant data was part of the delivery of the treatment in which the research project was embedded. Thought had been given as to how to extract the relevant and necessary data from the conventional data gathered by the service. General data protection regulation principles (GDPR) dictate that there are purpose and data minimisation (Information Commissioner's Office (ICO; 2018), therefore, creating independent demographic and outcome measure questionnaires from the standard service questionnaires was required. Data was collected through a SurveyMonkey © (Momentive, 2022) licensed software program, with a service purchased licence, coded and exported to a Microsoft excel document then stored utilising service provision laptops, as well as signed consent forms, on an encrypted and password protected device securing it from unauthorised access. Identifiable information relating to participants is treated as confidential as expected ethically as a health care professional (HCPC, 2022).

3.14 Risk of harm

The psychological wellbeing of participants throughout the project was paramount, in alignment with The Code of Ethics and Professional Conduct for Occupational Therapists, which states "Your duty of care is your responsibility to act in a way that ensures that injury, loss or damage will not be carelessly or intentionally inflicted on the individual or group to whom/which the duty is owed as a result of your actions" (Royal College of Occupational Therapists; RCOT, 2021, p.11).

To meet this responsibility, participants are provided with signposting information as part of the participant information sheet, advising how they can access support following completion of the online survey (Appendix 11).

3.15 Rigour

3.16 Risk of bias

Acknowledging that every study has its confounding variables and limitations therefore potential sources of bias need to be highlighted and all possible actions undertaken to reduce and minimise the deviation from the truth (Simundic, 2013). An evident risk of bias needs to be commented on due to the employment of the researcher by the setting in which the research is being conducted and participants recruited. The researcher's role was externally funded by Lloyd's Patriotic Fund who were involved in raising awareness and promoting the unique research being undertaken. The researcher actively took precaution to be conscious of the potential impact this could have in unintentionally wanting to produce results to validate the researcher's role. Measures were taken to minimise the impact of this through reflexive reflections, independent research supervision provided by an external supervisor as well as removing the researcher from facilitating any treatment intervention following the pilot group.

As discussed earlier in the chapter, the researcher was actively reflective throughout the research process to increase awareness of impacting beliefs, biases and conflicting interests that could impact on the project. (Appendices 3 and 10).

3.17 Method limitations

The convergent design is a popular mixed methods design with equal emphasis on quantitative and qualitative orientation (Creswell and Plano Clark, 2018). The already embedded outcome measure data collection within the service felt appealing to the researcher to utilise as the quantitative aspect of data collection, with the aim to minimise the impact on participants accessing treatment. It has been acknowledged that community engagement for veterans is pivotal, with withdrawal a real risk due to struggles trusting the civilian community (Brewer and Herron, 2018 cited in Vaughan-Harrocks et al 2020) therefore the researcher was mindful not to add to participant concern, stress or worry of accessing services through additional measures outside of what is already established. As an employee and clinician, a person-centred service is an ethical standard expected of the researcher (RCOT, 2021).

The qualitative element to this mixed methods approach aims to provide a voice for participants and illustrate quantitative findings can help paint a better picture of the phenomenon under investigation (Bryman, 2006 cited in Doyle, Brady and Byrne 2009). Whilst semi-structured interviews and focus groups were considered to enlist richer phenomenological data, the researcher acknowledged being the sole researcher conducting this project in line with commitments with service delivery. The pragmatic approach of managing resources effectively was important. The study sought to answer the research question whilst gathering necessary data, with minimal impact on participants, but recognising the constructivist paradigm that multiple realities and different interpretations may result from any research endeavour, and therefore thematic analysis was introduced to find common meanings from participants (Appleton and King, 2002 cited in Doyle, Brady and Byrne, 2009 p117).

3.18 Summary

This chapter has discussed epistemological and ontological underpinnings to this research project with the researcher having beliefs that lay between the opposing interpretations of postpositivist and constructivism views. This led to pragmatism being the overarching paradigm adopted for this study as it values both objective and subjective knowledge (Creswell and Plano Clarke, 2018). There has been introduction to this mixed methods study, utilising outcome measures and open-ended survey questions to collect data via a secure online process which has been ethically approved by York St John University. The intervention, too, was introduced as a manualised online group being facilitated weekly for 7 sessions by occupational therapists, and referrals for these groups being assessed by the multi-disciplinary team and accepted if deemed appropriate for the treatment as a part of stabilisation treatment. The process of gathering and documenting informed consent as well as reducing the risk of harm and bias through providing direction for participant support and reflexive practice have been detailed, and the chapter finishes with consideration of the limitations to the methodology.

The researcher aimed to minimise impact on participants during their access to treatment, which meant choosing surveys over interviews or focus groups, and whilst

this may be considered a limitation in rigorous research the reduction of risks of stress, fear and harm are paramount.

Chapter 4: Results

4.1 Introduction

The aim of this research was to evaluate the impact of the sensory modulation group intervention on mental health outcomes for British military veterans accessing mental health treatment for military related mental health problems. This chapter presents the data collected through the outcome measures and survey questions, which provided both quantitative and qualitative results. These results are presented and considered separately and then combined, reflecting the convergent mixed methods design (Creswell and Plano Clarke, 2018). This chapter begins with the sample's demographic information, moving on to the discussion relating to the chosen statistical analysis conducted and then presenting the outcomes from each sample. The chapter then moves on to the qualitative findings, and presents the themes identified from that data, then finishes with the combined results.

Table 4.1: Details of the sample numbers

Sample	Number
Accessed treatment	41
Consented to participate in the study	22

Approximately half the veterans (n = 22) who undertook the intervention provided consent to participate in the study (see table 4.1 above). Within the consenting sample, there were varying completion rates of the outcome measures at the different time points. Therefore, the researcher created sub-samples of participants who had completed measures at the different data collection time points (see table 4.2 below). This optimised the use of completed data by not discounting completed measures and offered more opportunity to observe patterns and analyse data for the hypotheses being tested.

Table 4.2: Sample breakdown per measure

Outcome measure	Sample A (pre, post and 4-week follow up)	Sub-sample B (pre and post)	Sub-sample C (pre and 4-week follow up)	Sub-sample D (post and 4-week follow up)
GAD-7	n=10	n=15	n=12	n=10
PCL-5	n=10	n=15	n=12	n=11
DAR-5	n=10	n=15	n=12	n=12
ITQ	n=10	n=14	n=12	n=11
DSSB	n=8	n=13	n=10	n=10
DERS-18	n=9	n=12	n=11	n=11

Table 4.3: Participants' demographic details

Sample n=22	
Male	100%
Female	0%
British Army	86%
Royal Navy	9%
Royal Air Force	5%

All participants were male British military veterans (see table 4.3 above) who accessed mental health treatment relating to their military service and were referred to the group intervention as a part of the stabilisation phase of their treatment.

The researcher set the following hypotheses to guide testing:

Hypotheses

1. From the beginning to the end of treatment there will be a statistically significant change in scores in the GAD-7 (Spitzer *et al*., 2006) indicating an improvement in symptoms of anxiety.
2. From the beginning to the end of treatment there will be a statistically significant change in scores in the DAR-5 (Novaco, 1975) indicating an improvement in anger.
3. From the beginning to the end of treatment there will be a statistically significant change in scores in the PCL-5 (Blevins *et al.*, 2015) indicating an improvement in trauma symptoms.
4. From the beginning to the end of treatment there will be a statistically significant change in scores in the ITQ (Cloitre *et al.*, 2018) indicating an improvement in trauma symptoms.

5. From the beginning to the end of treatment there will be a statistically significant change in scores in the DSSB (Carlson and Putnam, 1993) indicating an improvement in dissociation symptoms.
6. From the beginning to the end of treatment there will be a statistically significant change in scores in the DERS-18 (Gratz and Roemer, 2004) indicating an improvement in emotional regulation.
7. From the end of treatment to the 4-week follow up treatment all the scores will have been maintained indicating no deterioration in symptoms

4.2 Quantitative results

The outcome measures chosen to gather data for this evaluation were given careful consideration as discussed in the previous chapter (see chapter 3 section 3.8). The measures utilised in this project use varying Likert scales, and the lower the total score indicated lower experience of symptomologies for all measures. There are long standing opposing views regarding whether a Likert scale can be treated as interval scale, rather than an ordinal scale, during data analysis (Wu and Leung, 2017). However, as previously discussed the data was treated as continuous and tested for normality using the Shapiro-Wilk test (Shapiro and Wilk, 1965). Where the data met assumptions for parametric tests, the *t*-test for paired data was selected for testing significance. Where necessary, non-parametric testing in the form of Wilcoxon signed-rank test (Wilcoxon, 1945) was utilised. The efficiency of the Wilcoxon signed-rank test to the *t*-test is near 95% for small sample sizes (Siegal, 1956 cited in Meek, Ozgur and Dunning, 2007 p92). When assumptions for parametric methods are not valid, the limited assumptions required about the format of the data for non-parametric methods can be an advantage (Whitley and Ball, 2002). The level for significance was set to p= or <0.05 for both parametric and non-parametric testing.

4.3 Pre-treatment, post-treatment and 4-week follow-up measure results

As this data was collected at three time points, pre-treatment, post-treatment and 4-week follow-up after treatment, a descriptive comparison of the means was undertaken on data from participants who provided responses covering all these time points for each measure (sub-sample ‘A’). This is because the *t*-test and

Wilcoxon signed-rank test compares two related samples and, therefore, cannot be used for comparing repeating samples due to the increasing risk of a rise in unacceptable errors (Lund Research, 2018). The data for the sub-sample 'A' who completed all 3 measures met the assumptions of parametric testing methods when comparing pre and post, pre and 4-week follow up and finally post and 4-week follow up related samples. The assumptions for the parametric *t*-test:

- The independent variable needs to be consistent of two categorical "matched pairs" or "related groups"
- The dependent variable should be measured on a continuous scale
- There should be no significant outliers in the differences between the related groups
- The distribution of the differences in the dependent variable between the two related groups should be approximately normally distributed

(Lund Research, 2020).

Table 4.4: The total means and standard deviation for sub-sample 'A' for each measure used across the time points they were implemented, along with the mean difference and P value across the time points.

Outcome measures (Number of participants who completed measures)	Pre-treatment (baseline) total mean score and standard deviation	Post-treatment (2nd test) total mean score standard deviation	Difference in mean score from pre-treatment to post-treatment	4-week follow up (3rd test) total mean score standard deviation	Difference in mean score from post-treatment to 4-week follow up treatment	Difference in mean score from pre-treatment to 4-week follow up treatment	P Value Pre to post	P value Pre to 4-week follow up	P value Post to 4-week follow up
GAD-7 (n=10)	14.1 3.54	9.5 4.03	4.6	10.5 5.50	-1	3.6	P=0.018	P=0.058	P=0.223
PCL-5 (N=10)	48.8 11.6	37.2 20.20	11.6	37.1 18.25	0.1	11.7	P=0.040	P=0.021	P=0.486
DAR-5 (N=10)	15.9 6.17	12.5 5.08	3.4	12 4.90	0.5	3.9	P=0.043	P=0.015	P=0.172
ITQ (n=10)	48.6 9.66	37.8 19.33	10.08	34.7 18.77	3.1	13.9	P=0.026	P=0.005	P=0.018
DSSB (N=8)	8.22 6.08	6.11 4.70	2.11	5.56 3.75	0.55	2.66	P=0.077	P=0.073	P=0.234
DERS-18 (N=9)	60.67 12.26	47.22 13.86	12.78	42.44 14.28	4.78	18.23	P=0.016	P=0.005	P=0.049

Key for table:

Downward change in mean		Increased change in mean	
No change in mean		P= or <0.05	
P= or >0.05			

Table 4.4 shows the downward trend from the pre-treatment (baseline test) to the post-treatment (second test) and a further downward trend from baseline to the 4-week follow up (third test) for all measures, apart from the GAD-7 (Spitzer *et al.*, 2006) measure. Statistical significance was met with p=0.018 for the change from pre to post tests for the GAD-7 for sub-sample 'A.' This measure indicates that the symptoms of anxiety being reported by participants reduced over the period of treatment, however, increased by 4 weeks after the treatment was finished. The PTSD measure, PCL-5 (Blevins *et al.*, 2015), shows the change in scores statistically meeting significance with p=0.040 over the period of treatment, and remaining reduced from pre-treatment to 4-week follow up with p=0.021 for sub-sample 'A'. The ITQ (Cloitre *et al.*, 2018), which also measures PTSD and C-PTSD symptoms, also shows statistically significant reductions in scores across the treatment period with p=0.026, and at the 4-week follow up with p=0.005, as well as further significant change from the end of treatment to the 4-week follow up with p=0.018 for sub-sample 'A'. The mean averages for feelings of anger, as measured on the DAR-5 (Novaco, 1975) scores by participants reduced over the period of treatment and remained reduced 4 weeks following treatment, with statistical significance reached for the changes from pre to post treatment (p=0.043), and pre to 4-week follow up (p=0.015). The decrease in observed dissociation symptoms on the DSSB measure (Carlson and Putnam, 1993) by participants reduced over the period of treatment and remained reduced following treatment, however this change did not meet statistical significance. The DERS-18 (Gratz and Roemer, 2004) results for sub-sample 'A' indicated that the emotional regulation abilities being reported by participants improved over the period of treatment and this remained 4 weeks after treatment. Statistical significance was reached for all changes measured across the collection points, with p=0.016 for pre to post treatment, p=0.005 for pre to 4-week follow up from treatment, and p=0.049 for post treatment to 4-week follow up from treatment on the DERS-18

.

Using the mean scores to assess trends in the data provided useful insights into patterns which may otherwise have not been noticed if the researcher had chosen to focus solely on statistical testing. It is necessary to use both descriptive and inferential statistics when analysing data (Whitley and Ball, 2002) and, therefore, the mean and standard deviation were selected to describe the data prior to completing the *t*-test.

Table 4.4 shows that for sub-sample ‘A’ statistical significance was reached for the GAD-7, PCL-5, DAR-5, ITQ and DERS-18 results for the pre and post treatment measures. It was also reached for the PCL-5, DAR-5, ITQ and DERS-18 for the pre and 4-week follow up measures. For the post and 4-week follow up measures for the ITQ and DERS-18 change was found to be significant.

This means that both hypotheses 1 to 4 are supported for sub-sample ‘A’, with only the DSSB scores not meeting significant change and therefore hypothesis 5 is not supported. Hypothesis 6 was supported with significant change met on the DERS-18 for this sample and hypothesis 7 was mostly supported, with the scores across the measures being maintained, except for the GAD-7 which increased. However, statistical significance was reached within the post treatment to 4-week follow up treatment scores for the ITQ and DERS-18 from the post-treatment to 4-week follow up measures.

4.4 Pre-treatment and post-treatment measure results

To explore results in more detail, all measures that were completed at pre-treatment and post-treatment stages (sub-sample ‘B’) had their data statistically analysed using the paired sample *t*-test. Using pre and post-treatment measures created groups which could be compared (Lund Research, 2020). The significance level was set to .050 ($p = \text{or} < 0.05$) when analysing this data using the *t*-test or the Wilcoxon signed-rank test. This tested hypotheses 1-6: From the beginning to the end of treatment there will be a statistically significant change in scores on all measures indicating an improvement in symptoms and emotional regulation.

Table 4.5: The total means, standard deviation, and p value for each measure along with the mean difference across the time points sub-sample 'B'

Outcome measures (Number of participants who completed both measures)	Pre-treatment (baseline) total mean score and standard deviation	Post-treatment (2nd test) total mean score standard deviation	Difference in mean score from pre-treatment to post-treatment	P Value (one side *t*-test or Wilcoxon signed-rank test))
GAD-7 (n=15)	13.60 4.37	9.73 5.43	3.87	P = 0.021
PCL-5 (n=15)	46.87 12.26	37.60 21.11	9.27	P= 0.023
DAR-5 (n=15)	15.07 5.64	12.73 5.32	2.34	P = 0.067
ITQ (n=14)	47.07 9.85	34.21 19.29	12.86	P = 0.003
DSSB (n=13)	8.15 5.90	6.62 5.49	1.53	P = 0.191(Wilcoxon signed-rank)
DERS (n=12)	59.08 12.18	46.08 13.13	13	P = 0.005

Key for table:

Significant P Value (p= or <0.05)	

As shown in table 4.5 above, the mean scores for reported anxiety on the GAD-7 decreased from the first to the second time of collection and was concluded to be statistically significant with p=0.021 for sub-sample 'B'. A change can be seen in the means for PTSD symptoms on the PCL-5 trauma measure, decreasing from the pre to the post-treatment data collection. The change measured in the PCL-5 data was concluded to be statistically significant with p=0.023. This is then supported with the strength of the ITQ trauma measure, with a significance of p=0.03. The downward trend in emotional regulation scores on the DERS-18 was statistically confirmed with p=0.005, however, the downward trends on the anger measure, the DAR-5, did not meet significance with p=0.067.

Table 4.6: GAD-7 t-*test* result for pre and post measures showing significant change

Paired Samples Test

		Paired Differences							Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Pair 1	GADpre - GADpost	3.86667	6.67476	1.72341	.17031	7.56302	2.244	14	.021	.042

Table 4.7: PCL-5 t-*test* result for pre and post measures showing significant change

Paired Samples Test

		Paired Differences							Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Pair 1	PCLPre - PCLpost	9.26667	16.45542	4.24877	.15396	18.37938	2.181	14	.023	.047

Table 4.8: ITQ t-*test* result for pre and post measures showing significant change

Paired Samples Test

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			One-Sided p	Two-Sided p
Pair 1	ITQpre - ITQpost	12.85714	14.27670	3.81561	4.61402	21.10026	3.370	13	.003	.005

Table 4.9: DERS-18 t-*test* result for pre and post measures showing significant change

Paired Samples Test

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			One-Sided p	Two-Sided p
Pair 1	DERSPre - DERSpost	13.00000	14.56646	4.20498	3.74491	22.25509	3.092	11	.005	.010

The DSSB data was tested for significance using the Wilcoxon signed-rank test, due to the data not being normally distributed, and it did not meet significance with a result of p=0.191.

All measures in sub-sample ‘B’ showed downward trends to their changes in mean scores from the first to the second test point, before and after the group treatment. Statically significant change was demonstrated in the GAD-7, PCL-5, ITQ and the DERS-18. This means that hypotheses 1,3,4 and 6 were supported for this sample with the statistically significant changes. Hypothesis 7 could not be tested with the

outcome measures only being taken pre and post-treatment. Hypotheses 2 and 5 were not supported, in that there was no significant change to the DAR-5 and DSSB scores for sub-sample 'B.'

4.5 Pre-treatment and 4-week follow up measure results

The outcome measures were collected at the 4-week follow up time point from the end of the group treatment (sub-sample 'C') in line with the clinical operating procedure for following up veterans before identifying onward treatment pathways by clinicians. This gave the researcher an opportunity to collect data from participants knowing they had not received further treatment within the 4-week period and test hypotheses 2 and 3 by assessing the lasting impact of the group intervention on mental health outcomes.

Table 4.10: The total means, standard deviation, and p value for each measure along with the mean difference across the time points for the sub-sample 'C'

Outcome measures	Pre-treatment (baseline) total mean score and standard deviation	4-week Follow up treatment (3rd test) total mean score standard deviation	Difference in mean score from pre-treatment to 4 week follow up from treatment	P Value (one side *t*-test or Wilcoxon signed-rank test)
GAD-7 (n=12)	14.83 3.69	11.42 5.57	3.41	P=0.37
PCL-5 (N=12)	50.25 11.55	40.08 19.16	10.17	P=0.018
DAR-5 (N=12)	16.58 6.05	13.08 5.32	3.5	P=0.010
ITQ (n=12)	50.50 10.03	37.58 19.09	12.92	P=0.002
DSSB (N=10)	10.50 9.20	8.00 8.50	2.5	P=0.152 (Wilcoxon signed rank test)
DERS-18 (N=11)	61.91 13.75	44.00 16.49	17.91	P=0.001

Key for table:

Significant P Value (p= or <0.05)	

In comparison to sub-sample ‘C’, the sub-sample ‘B’ results also showed statistically significant changes in the PTSD measures, with the PCL-5 having significance of p=0.018 and the ITQ having significance of p=0.002. Furthermore, analysing the change in DERS-18 scores for this sample meant a significance of p=0.001 was reached. The DAR-5 downward trend in scores resulted in a statistical significance of p=0.010 however despite the same trend, the GAD-7 approached, but did not meet, significance with p=0.37. Significance was not reached on the DSSB measure scores, for which the Wilcoxon signed-rank test was utilised, with p=0.152.

Table 4.11: PCL-5 t-*test* result for pre and 4-week follow up measures showing significant change

Paired Samples Test

		Paired Differences							Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Pair 1	PCLPre - PCLfu	10.16667	14.68353	4.23877	.83720	19.49614	2.398	11	.018	.035

Table 4.12: ITQ t-*test* result for pre and 4-week follow up measures showing significant change

Paired Samples Test

		Paired Differences							Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Pair 1	ITQpre - ITQfu	12.91667	12.76685	3.68547	4.80500	21.02834	3.505	11	.002	.005

Table 4.13: DERS t-*test* result for pre and 4-week follow up measures showing significant change

Paired Samples Test

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			One-Sided p	Two-Sided p
Pair 1	DERSPre - DERSfu	17.90909	14.55647	4.38894	8.12992	27.68826	4.081	10	.001	.002

Table 4.14: DAR-5 t-*test* result for pre and 4-week follow up measures showing significant change

Paired Samples Test

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			One-Sided p	Two-Sided p
Pair 1	Darpre - Darfu	3.50000	4.42102	1.27624	.69102	6.30898	2.742	11	.010	.019

All measures continued to show downward trends in change from the pre-treatment to the 4-week follow up from treatment testing points. Comparing sub-sample 'C' and sub-sample 'B' data, there was consistency in the total mean scores declining over time for each measure. Hypotheses 3,4 and 6 were supported with statistical significance (p=0.005) being reached on the PCL-5, ITQ and DERS-18 measures across the period pre-treatment to 4-week follow up from treatment. Hypotheses 1,2

and 5 were not supported as the GAD-7, DAR-5 and DSSB outcomes did not meet significance when evaluating the change in means for these tests in scores.

4.6 Post and 4-week follow up results

The rationale for analysing data from the end of group treatment time point to the follow up time point (sub-sample 'D') was to investigate if there were sustained or significant changes for participants without ongoing treatment during this 4-week period.

This was testing hypothesis 7; From the end of treatment to the 4-week follow up treatment all the scores will have been maintained indicating no deterioration in symptoms

Table 4.15: The total means, standard deviation, and p values for each measure along with the mean difference across the time points for the sub-sample 'D'

Outcome measures	Post-treatment (2nd test) total mean score and standard deviation	4-week Follow up treatment (3rd test) total mean score standard deviation	Difference in mean score from post-treatment to 4 week follow up from treatment	P Value (one side *t*-test or Wilcoxon signed-rank test)
GAD-7 (n=10)	9.73 3.90	10.36 5.24	-0.63	0.303
PCL-5 (n=11)	35.73 19.78	37.36 17.32	-1.63	0.429
DAR-5 (n=12)	12.18 4.94	11.91 4.66	0.27	0.307
ITQ (n=11)	36.91 18.58	34.55 17.82	2.36	0.148
DSSB (n=10)	6.50 4.60	5.70 3.56	0.8	0.280 (Wilcoxon signed-rank test)
DERS-18 (n=11)	49.36 15.09	45.09 15.40	4.27	0.035

Key for table:

Significant P Value (p= or <0.05)	

There were varying data trends for these measures from the end of treatment to the final time of collection. When performing analysis on the results for the measures for sub-sample 'D', significance was only reached on the DERS-18 at p=0.035 and not reached for any measure. The GAD-7 and PCL mean scores increased during this time and therefore hypothesis 7 was not supported.

4.7 Quantitative results summary

The data collected from sub-sample ‘A’ pre, post and 4-week follow up, was compared using the mean measure of central tendency. Descriptive statistics have been utilised to provide an oversight, and the use of central tendency allows for a representation of all the values, with the mean being the most common and this provides a summary of the data (Whitley and Ball, 2022). When describing the data, the mean averages show a downward trend across all measures. There was a slight increase from post treatment to the 4-week follow up for the GAD-7 anxiety measure.

The parametric *t*-test was used for samples when the data was found to be normally distributed due to its reliability to accurately compare means across matched data, and the Wilcoxon signed rank test for the related samples when data did not meet normality because of its ability to take account not only of the signs of the difference but also their magnitude (Whitley and Ball, 2002).

Hypotheses were used to guide the data testing, and revisited to conclude the outcome from the testing:

Hypotheses

1. From the beginning to the end of treatment there will be a statistically significant change in scores in the GAD-7 indicating an improvement in symptoms of anxiety.

Hypothesis 1 was supported, with statistical significance met when analysing sub-sample ‘A’ and ‘B’ data, indicating that symptoms of anxiety improved following treatment.

2. From the beginning to the end of treatment there will be a statistically significant change in scores in the DAR-5 indicating an improvement in anger.

Hypothesis 2 was supported, with statistical significance met when analysing sub-sample ‘A’ and ‘C’ data, indicating that symptoms of anger improved following treatment.

3. From the beginning to the end of treatment there will be a statistically significant change in scores in the PCL-5 indicating an improvement in trauma symptoms.

Hypothesis 3 was supported, with statistical significance met when analysing sub-sample ‘A’ ‘B’ and ‘C’ data, indicating that symptoms of PTSD improved following treatment.

4. From the beginning to the end of treatment there will be a statistically significant change in scores in the ITQ indicating an improvement in trauma symptoms.

Hypothesis 4 was supported, with statistical significance met when analysing sub-sample ‘A’ ‘B’ and ‘C’ data, indicating that symptoms of C-PTSD improved following treatment.

5. From the beginning to the end of treatment there will be a statistically significant change in scores in the DSSB indicating an improvement in dissociation symptoms.

Hypothesis 5 was not supported, with statistical significance not met when analysing sub-sample ‘A’ ‘B’ and ‘C’ data, indicating that symptoms of dissociation did not improve following treatment.

6. From the beginning to the end of treatment there will be a statistically significant change in scores in the DERS-18 indicating an improvement in emotional regulation.

Hypothesis 6 was supported, with statistical significance met when analysing sub-sample ‘A’ ‘B’ and ‘C’ data, indicating that emotional regulation improved following treatment.

7. From the end of treatment to the 4-week follow up treatment all the scores will have been maintained indicating no deterioration in symptoms

Hypothesis 7 was not supported, with statistical significance only met on the DERS-18 from sub-sample ‘D’ and varying changes in mean scores when evaluating sub-sample ‘A’ ‘B’ and ‘C’ data, indicating that some symptoms may have deteriorated whilst others were maintained, and emotional regulation continued to improve.

The convergent design of this research involved analysing quantitative data initially, then combining the qualitative data through the establish themes (Creswell and Plano Clark, 2018). Therefore, the next part of this chapter will evaluate the qualitative results ahead of the final discussion.

4.8 Qualitative results

4.9 Thematic Analysis

Thematic analysis offers a method for developing, analysing and interpreting patterns across a qualitative data set. Combined with reflexivity, it enables the researcher to critically evaluate their position and therefore is more than just a tool to present key themes (Braun and Clarke, 2022). There are clear limitations to using thematic analysis in that there are few well developed tools to conduct a rigorous and pertinent analysis, as well as sparse literature in comparison to that of other qualitative methods. (Nowell, Norris and Moules, 2017). The flexibility that the researcher aligned with when choosing thematic analysis could be interpreted as a further downfall for utilising this method due to the inconsistency it can bring when developing themes. (Holloway ad Todres, 2003 cited in Nowell, Norris and Moules, 2017 p2).To minimise these limitations and promote trustworthiness, critical reflection supports the thematic analysis process, as themes evolve through linking thoughts on the data in combination with the realities of the participants. Themes are developed under the influence of a researcher's presuppositions which is why rigorous reflection and acknowledgement of the researcher's position in relation to the data was implemented (Ho, Chiang and Leung, 2017). The researcher followed the six-phase guide for completing thematic analysis to improve consistency when interpreting the participant survey responses (Braun and Clarke, 2022), keeping reflective notes throughout the process, and sharing ideas with supervisors to prompt further thoughts and assessment of the data.

The six phases include:

- Familiarisation
- Coding
- Generating initial themes
- Developing and reviewing themes
- Naming themes

- Presenting through writing

The data analysed was in relation to the specific research question of this study, meaning that the process was an inductive thematic analysis in which open coding was utilised, leading on to establishing semantic and latent themes (Braun and Clarke, 2006). The researcher spent time going through the survey responses with no intention other than to read them and observe any emotional and cognitive responses as a form of familiarisation with the data. Codes were developed through a more meticulous reading and re-reading of data which allowed the researcher to recognise clear phenomenological moments from the responses that participants gave to each of the survey questions (Fereday and Muir-Cochrane, 2006). Colour codes were given to specific excerpts of data which were collected to form visual representation for the researcher, and word clouds were also used for a further visual depiction. Once developed, codes were then evaluated by the researcher into preliminary themes through recognising the patterns arising in the data. Finally, semantic themes, which are a result of surface, explicit or manifest levels of meaning were identified based on the coding of what participants had reported, and then developed into latent themes, which are a result of exploring underlying or more implicit meaning (Braun and Clarke, 2006). This development required interpretation of the data from the researcher which was explored through reflections of the researcher's clinical experience, being mindful of any emotional projection, as well as knowledge of documented literature on the subject. The process was undertaken in a quiet environment using both digital and written notes at differing times to promote more creative and critical thinking. If there were codes which related to known evidence base, the researcher looked to utilise the evidence to explore the potential meaning of the semantic themes and classify into latent themes. Visiting and revisiting the survey response data frequently allowed fresh perspective from the researcher as well as confirming when to release attachment that may have formed to some concepts, data or emotional responses of the researcher.

The survey questions, participant responses and finalised themes are presented below to illustrate the codes assigned to the excerpts of data which had meaning in relation to the research question. Word clouds were also used by the researcher to offer a visual representation of common words that participants responded with, the

larger the word the more prevalent it appeared during the survey responses. The colours of the words have no relevance in relation to frequency of the words.

Table 4.16 Number of participants who completed survey responses n=12 and example of label of participant number in text

Qualitative sample no = 13	P1 – Participant 1

4.10 Themes

Following the recommended six-phase guide developed by Braun and Clarke (2022) combined with reflective and iterative processes, these key themes were produced from the analyses of each survey question:

- Sensory modulation is a useful intervention for mental health problems
- Self-awareness is key to knowing what to implement
- Veterans experiencing mental health problems often feel hyperarousal
- Sensory modulation is more than symptom management for stabilisation in treatment
- Sensory modulation is one of many methods that can contribute to better mental health
- Feeling calm is a sign of good mental health
- Sensory modulation is a personalised intervention that can be used anywhere

Collectively, there was a clear overlap of themes across the question responses, and so were then further refined by the researcher to these concluding themes:

1. Sensory modulation is a useful intervention for mental health problems
2. Self-awareness is key to knowing what to implement
3. Veterans experiencing mental health problems often feel hyperaroused
4. Sensory modulation is a personalised intervention that can be used anywhere

How the researcher analysed, coded, and formed the concluding themes is now presented by each question. Three survey questions were asked, the first was:

Q1 – What is your understanding of sensory modulation and how to use it?

The researcher used thematic analysis on the responses from this question and there were patterns across the data relating to using sensory modulation to impact their mental health symptoms and particular references to mental health diagnoses:

“it is the use of sensory objects to ease up stress, anxiety and depression” (P1)

“Using the senses to affect how you feel and combat symptoms of PTSD” (P10)

“Understanding which ones to use for different times for stress or something like that” (P3)

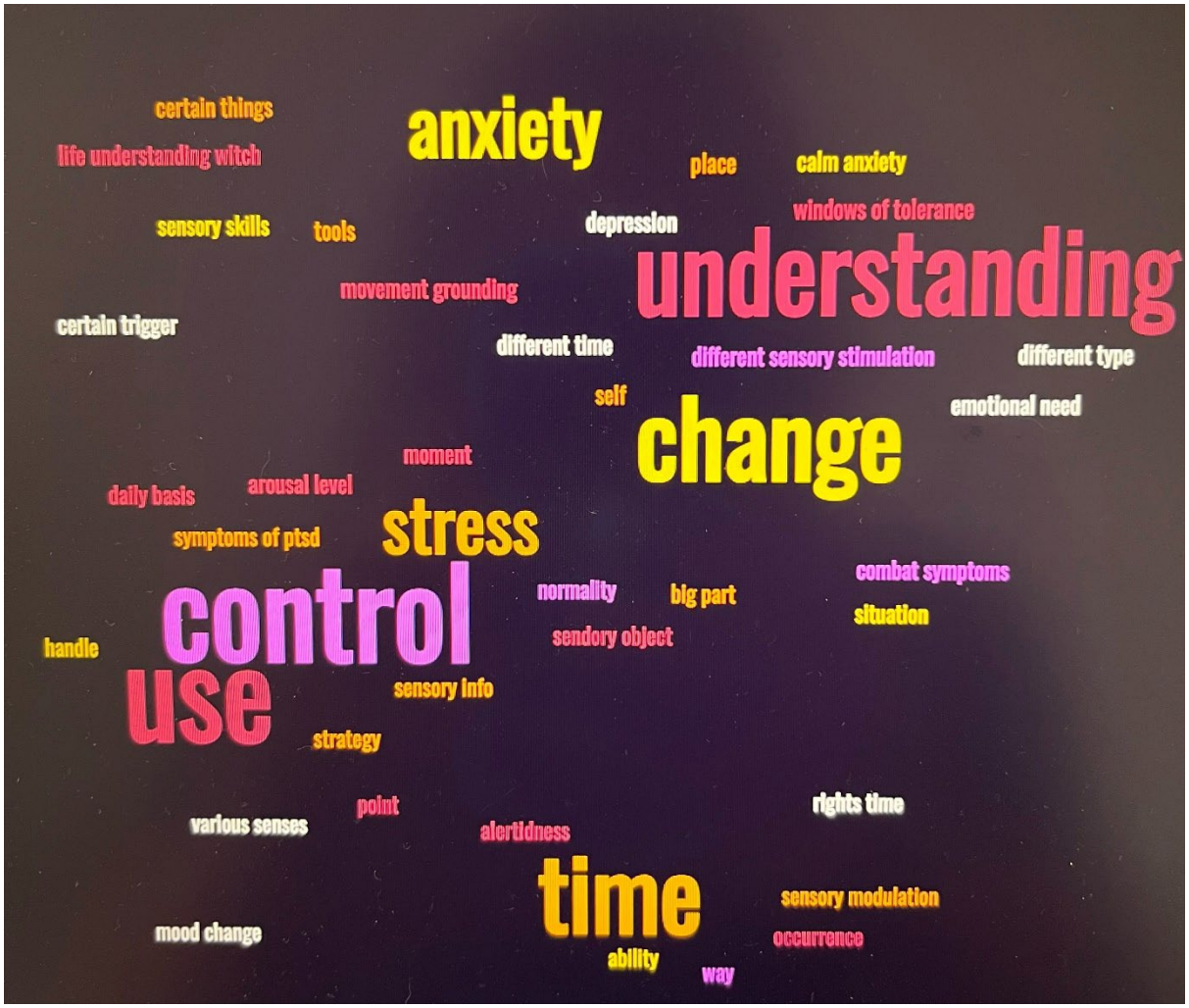
The recurring reports of mental health symptoms and diagnoses from participants were indicative that the intervention and observations in their mental health were coinciding. These responses were coded by the researcher and developed into the semantic theme of 'sensory modulation impacts on mental state.' Further analysis and interpretation facilitated the acknowledgement of the positive impact of the intervention with the use of language "*ease up*" (P1), "*combat symptoms*" (P10) and "*how to balance my moods*" (P5) concluded in the latent theme:

'Sensory modulation is a useful intervention for mental health problems.'

A further identified recurrence was the mention of the Window of Tolerance; "*To recognise where I am on the Window of Tolerance*" (P5) and "*Understand where I am on the window of tolerance*" (P11) which was then coded as 'self-awareness'. The word cloud (Figure 2) provided the visual representation of the word "understanding" which, when viewed independently, the researcher initially had different conclusions from what participants perhaps meant, however, when revisiting data and contextualising with what participants were "understanding" it became clear this was linked to recognition and awareness. With more observation, this code the basis for developing initial semantic theme of 'sensory modulation improves self-awareness.' The researcher reflected on this theme, revisiting responses in relation to the design of the survey question and concluded the latent theme of:

'Self-awareness is key to sensory modulation intervention'

Figure 2: Word cloud representation for Q1 responses



Q2 – What have been the changes you've experienced since using sensory modulation?

The thematic analysis used for this question produced three latent themes following the coding process. Initially, the codes of 'feeling calm due to sensory modulation' and 'specific sensory modulation techniques' were generated from participant responses such as:

"I am now able to calm and ground myself better using the techniques that I used" (P2) and *"I've been able to use my calming strategies*" (P1) and "*been calmer not triggered at slightest thing n [and] if I do I go n [and] ground*" (P8).

It was evident to the researcher that there was a semantic theme of 'sensory modulation can promote a sense of calm.' The researcher evaluated why the commonality of 'calm' was showing and the word cloud (Figure 2) helped with

recognising that the participants were feeling anxious and were utilising the sensory strategies to calm themselves, as opposed to using them for alerting or 'waking up' purposes. Combined with the clinical experience of the researcher, this then provided the basis for the latent theme:

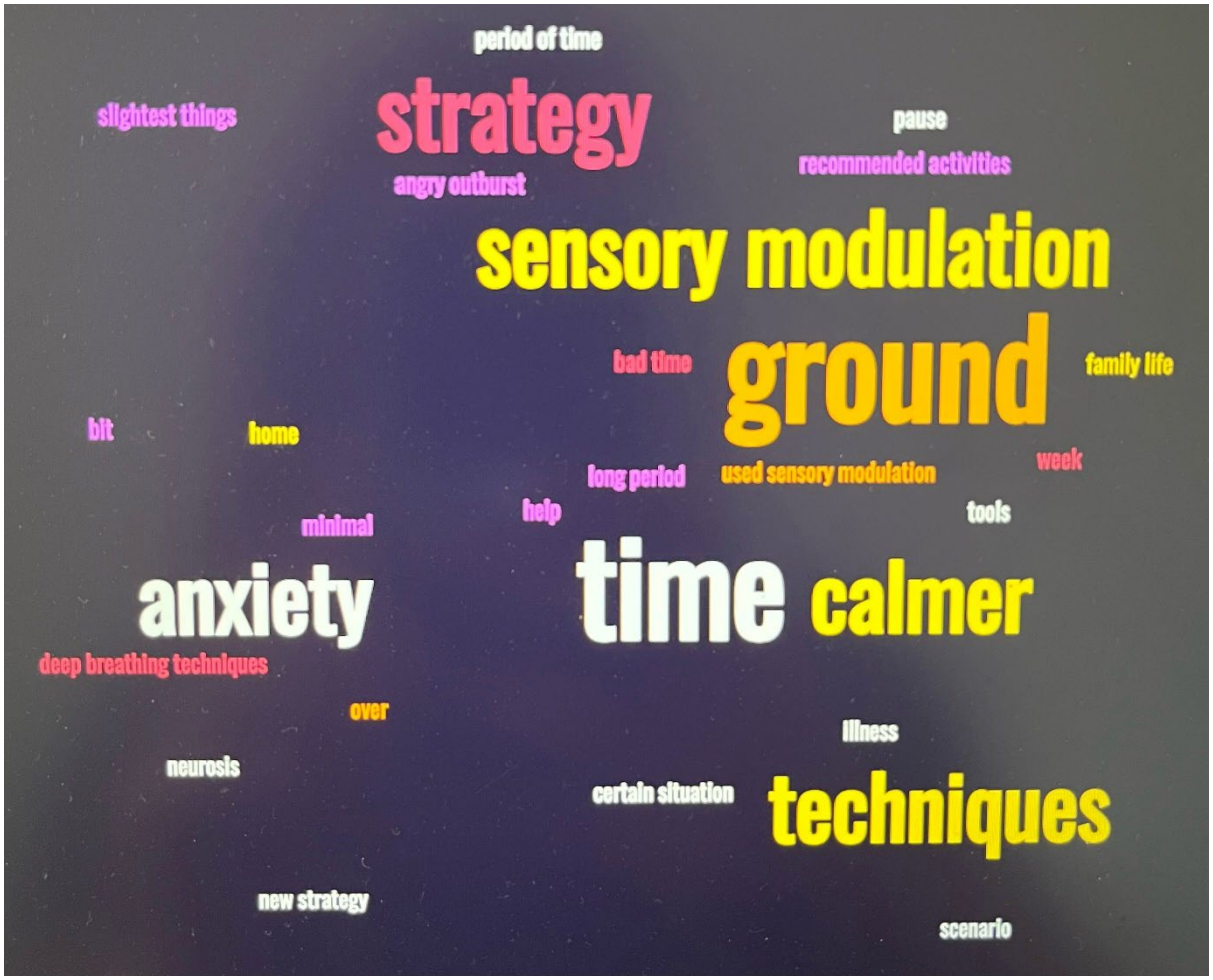
'Veterans experiencing mental health problems often feel hyperaroused.'

The researcher revisited coding to explore more feelings that were being reported, and coded 'feeling confident' which was established from the participant answers of *"more confident and happier"* (P4) and *"I recognise when I am struggling and feel confident that I have the tools to deal with it*" (P10). The semantic theme derived from this coding was 'improved confidence and happiness' but on more interpretation the use of "confidence" was analysed in terms of sense of feeling, and sense of influence of outcome from actions. The researcher evaluated whether participants were feeling more confident in themselves, or more confident in their use of sensory modulation. It was connected by the researcher that participants were mastering, but going beyond symptom management, and experiencing more confidence as a result. Following this evaluation, the latent theme was concluded:

'Sensory modulation is more than symptom management for stabilisation in treatment.'

Whilst coding, there were some responses that denoted that the changes sensory modulation implemented were not impactful with one participant saying the changes were *"minimal – some help but limited although still continuing with recommended activities"* (P7) and another responding with *"due to illness over the past 4 weeks I've not used sensory modulation" (P6).* The semantic theme of 'sensory modulation is helpful initially' developed into a latent theme of 'Sensory modulation is one of various methods that can contribute to better mental health.' This came from reflecting that the participant continued to use the techniques with some "*limited*" (P7) help and, therefore, other interventions may be better suited, or combined with sensory modulation, to improve their mental health. This was compared and there was clear overlap with theme arising from Q1 responses, and with reflection, the reader concluded on the latent theme 'Sensory modulation is a useful intervention for mental health problems.'

Figure 3: Word cloud representation for Q2 responses



Q3 – How have you used sensory modulation in your daily life?

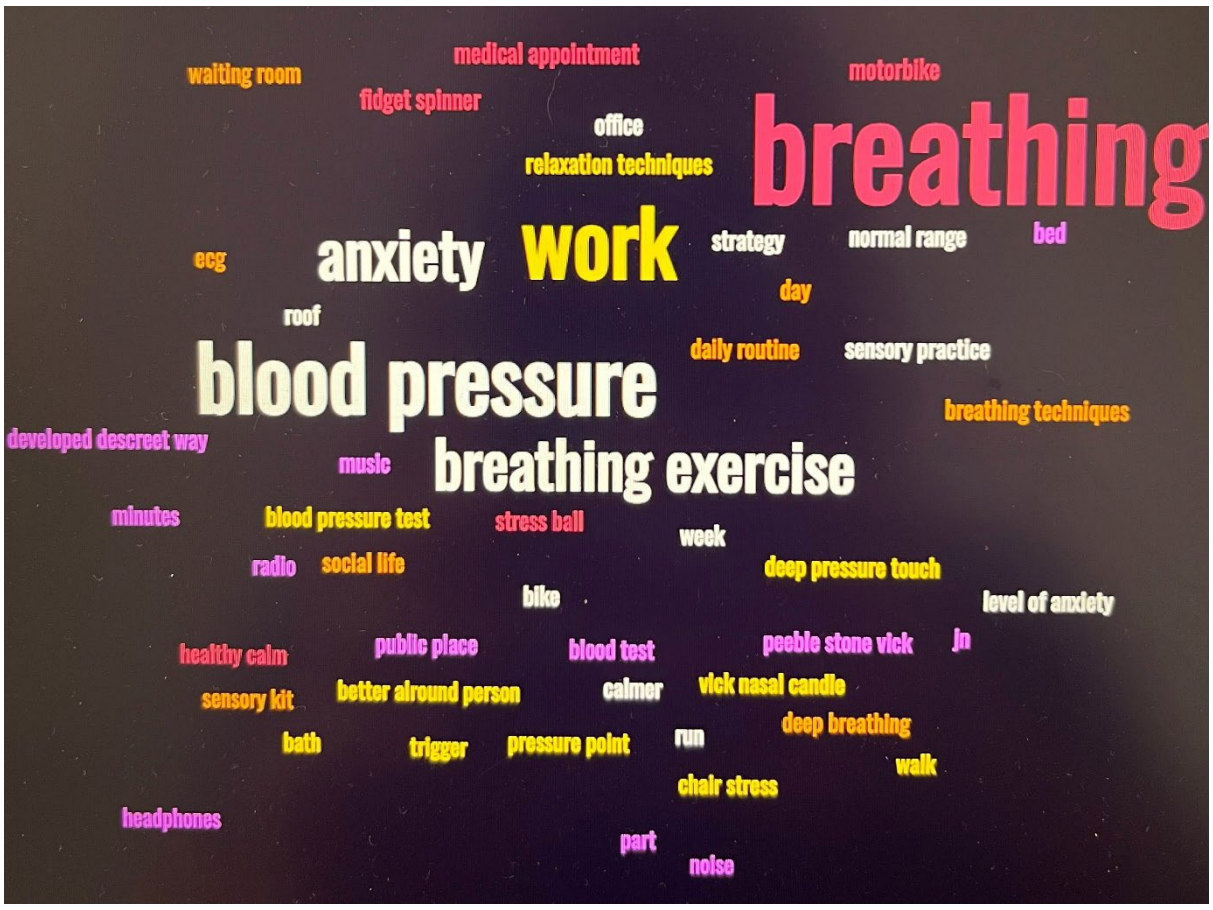
The coding process for this question revealed the expectations of the researcher, and reflections on how participants were identifying practical tools such as *"pebbles, stone, vic nasal, candles, rocking chair, stress balls, breathing" (P8)* and *"keeping busy. Radio, baths, deep breathing" (P3)* more commonly than the occupations or life roles they perhaps could be participating in again because of the intervention. Further codes relating to calm, similarly to Q2 responses, from *"breathing to calm down" (P9) "dial down my levels of anxiety"* (P2) and "*I regularly use my noise cancelling headphones, music, and breathing techniques to remain calm as well as my stressball*" (P13) were also observed. The semantic theme related to the codes was 'sensory modulation uses practical skills to help with feeling calm' which the researcher analysed further. On revisiting the data and questioning what the "calm" response was representing, the latent theme was derived:

‘Feeling calm is a sign of good mental health.’

The word cloud (Figure 4) clearly showed the specific strategies participants were recurrently reporting in their answers. Coding revealed where participants were using these strategies, as well as how they were using them. Reports of *“when going for a medical appointment … showed that the calming strategies had worked” (P12)* and *“using sensory kit whilst at work and relaxation techniques before bed” (P11).* The semantic theme arrived at following coding was ‘I have tools to take away’ which developed into the latent theme of:

‘Sensory modulation is a personalised intervention that can be used anywhere.’

Figure 4: Word cloud representation for question 3 answers



The concluding latent themes from the thematic analysis process of each survey question were then revisited by the researcher, and it was clear there was overlap of themes from the collective analysis. Therefore, more refinement was conducted to establish the final four themes.

4.11 Themes in detail

As presented at the beginning of this chapter, the concluding themes from the overall analysis from the survey questions are repeated here for clarity:

Sensory modulation is a useful intervention for mental health problems

Self-awareness is key to knowing what to implement

Veterans experiencing mental health problems often feel hyperaroused

Sensory modulation is a personalised intervention that can be used anywhere

Theme 1: Sensory modulation is a useful intervention for mental health problems

Multiple participants described that sensory modulation is a way of having control over mental health symptoms, with this participant referencing PTSD in particular:

"Using the senses to affect how you feel to combat symptoms of PTSD" (P10)

A further participant reported on the understanding of sensory modulation and the desired impact on commonly known mental health diagnoses:

"*the use of sensory objects to ease up stress, anxiety and depression"* (P1)

As stated in chapter 2, symptoms of poor mental health often impact on daily functioning and an absence of mental health symptoms does not always equal mental well-being. Occupational therapists' value that a quality of life comprises of meaningful occupations which play a vital role in mental wellness. These participants reflected this:

"It allows me to respond to sensory info and still function on a daily basis/normality." (P6).

"*Sensory is a big part of everyday life; understanding which one to use for different times for stress or something like that*." (P3)

The intervention being evaluated was being conducted as a form of stabilisation treatment for those with mental health problems as a result of trauma, and overall, the responses mostly denote improvement in mental health symptoms following the sensory group program. There was one response that saw the impact as "*Minimal – some help but limited although continuing with recommended activities*." (P7).

However, the comment that this participant continues to use the activities still implied to the researcher that the intervention was somewhat useful to this participant.

Theme 2: Self-awareness is key to knowing what to implement

A key element to the manualised group intervention being evaluated was the 'Window of Tolerance' model (Siegal, 1999). It is perhaps this model being utilised that contributed to the increased reports around improved self-awareness in the survey question responses from participants, one of which was:

"To recognise where I am on the Window of Tolerance and how to balance my moods" (P5)

Avoidance is a symptom cluster of PTSD, therefore the recognition and tuning into the self can be challenging for those who have experience trauma. This is because it can bring awareness to painful, unpleasant and triggering memories which may have been long avoided as a way of coping. The effectiveness of sensory modulation relies on knowing which strategies to implement depending on the level of arousal state. Further participants commented on the relevance of self-awareness:

"I recognise when I am struggling and feel confident that I have the tools to deal with it." (P10)

"*Less mood swings as I'm able to recognise when things are bad"* (P5)

Despite the common use of avoidance as a coping strategy for trauma, no participants reported that they had no alternative or that the intervention brought self-awareness which increased harmful or stressful experiences. This could suggest that the strategies implemented following increased self-awareness were useful in reducing negative symptoms associated with trauma, which is supported by the direct participant comment of "*using the senses to affect how you feel and combat the symptoms of PTSD"* (P10).

Theme 3: Veterans experiencing mental health problems often feel hyperaroused

From the survey responses, a sense of calm was often reported and this provided the foundation that it can be an indicator of a settled mental state. The impact of trauma can contribute to PTSD symptoms, as documented by the DSM-V (American Psychiatric Association, 2013) one of which is an increase of a sense of threat known as hypervigilance. Being in this constant state of perception, combined with military training, can lead to the hyperaroused state which reflects feelings of

irritability, anxiety and/or being ‘on-guard’ to respond. It is common in practice to refer to being ‘grounded’ when not hyperaroused, or to ‘ground yourself’ as a way to reduce this state. Across the three survey questions asked, a common response of ‘feeling calm’ arose:

“*I am now able to calm and ground myself better using the techniques I learnt.”* (P1)

“*I am able to ground myself. Then calm my anxiety or neurosis. I find this easier now that I use sensory modulation*.” (P2)

“The calming strategies had worked” (P12)

This autonomic hyperarousal is recognised as a mental health symptom of PTSD (American Psychiatric Association, 2000 cited in Stoller *et al.*, 2012) and is often observed in military veterans who have experienced trauma. Whilst sensory modulation can be used to regulate both hyperaroused and hypoaroused states, it can be deduced from the participant responses that they are often utilising this intervention for the hyperaroused state:

“*Less stressful, not angry all the time, mind not going to bad times for long periods of time and more laid back*” (P3)

“*Breathing to calm down. Pressure points to ground me*.” (P9)

“I have been calmer more confident and happier” (P10)

Theme 4: Sensory modulation is a personalised intervention that can be used anywhere

Across the answers were details of specific techniques or equipment that participants were utilising for their own sensory modulation, and these varied across participants with some using candles, another using deep breathing and another using movement.

“It’s become part of my daily routine from starting the day with a walk or run, using a sensory kit whilst at work and relaxation techniques before bed.” (P11)

“I regularly use my noise cancelling headphones, music and breathing techniques to remain calm as well as my stressball.” (P13)

The responses highlighted that the techniques were being used across different environments, including home and at work. This participant noted that the strategies can be subtle:

"At work, I have developed discreet ways to help keep myself calm and dial down my levels of anxiety." (P2)

4.12 Combining results

Thus far, this chapter has reported on findings from outcome measures evaluating various mental health outcomes and three survey questions asking about sensory modulation. Participants were British military veterans accessing stabilisation treatment for service-related mental health problems. As per the convergent design, following individual evaluation the researcher then combined the results to obtain more insight into the findings in relation to the research question.

The quantitative data arising from the PCL-5 (Blevins *et al.*, 2015) pre and post testing, as well as pre and 4-week follow up testing corroborate with the first qualitative theme; 'Sensory modulation is a useful intervention for mental health problems.' There was a direct comment from one participant that the intervention can be used to "*combat the symptoms of PTSD*" (P2) and further reports included: "*I am now able to ground myself. I find this easier now that I use sensory modulation" (P2) and "I have been able to use my calming strategies along with alerting to balance our some of my anxieties and angry outbursts*" (P11). For the trauma measures, PCL-5 and ITQ (Cloitre *et al.*, 2018) which assess PTSD and C-PTSD symptomology there was statistically significant change (PCL-5 p= 0.023 and ITQ p=0.003) for the pre and post measures, and again for the pre and 4-week follow up measures (PCL-5 p=0.018 and ITQ p=0.002). The findings support one another and indicate that participating in the sensory modulation intervention has had an impact on mental health, with participants feeling able to use the strategies to ground and calm themselves, with direct reference to impact on PTSD symptoms from one participant.

Whilst those responses indicate the influence on mental health, they also reference to emotional states such as "*angry outbursts*" (P11) and "*I am now able to ground myself*" (P2) demonstrate the influence on emotional states that sensory modulation can have. The DERS (Gratz and Roemer, 2004) emotional regulation scale also provided statistically significant change in the pre and post testing, pre and 4-week

follow up testing as well as post and 4-week follow up measures (p=0. 005; p=0. 001; p=0. 035). Emotional regulation requires recognising emotions, which the qualitative theme 'Self-awareness is key to knowing what to implement' encompasses. The qualitative reports of "*understanding where I am*" (P11) and "*to recognise where I am on the Window of Tolerance*" (P5) support the changes in the quantitative data for the DERS-18 measure. Observing the DAR-5 (Novaco, 1975) results, which assesses the specific emotion of anger, significance was reached on the pre and 4-week follow up testing sample (p=0. 010). The coding process during thematic analysis produced common references of "*I have been calmer*" (P10) "*realising when feeling my mood change"* (P4) and "*to effect change in emotion*" (P7) along with the prior reported "*to balance our some of my anxieties and angry outbursts*" (P11). Analysing these quantitative and qualitative results can suggest that using sensory modulation can positively impact on emotional states and self-regulation abilities.

The third theme 'Veterans experiencing mental health problems often feel hyperaroused' arose through the frequent reference to anxiety in the survey responses such as "*my anxiety was through the roof, I used calming sensory practices*" (P12) and using strategies such as "*breathing to calm*" (P9). The changes in GAD-7 (Spitzer *et al.*, 2006) data, which is a measure of anxiety, met statistical significance on the change from pre and post measures (p=0.021). The mean changes across the pre and post, pre and 4-week follow up tests did show a downward trend which could be considered indicative of the intervention impacting on anxiety levels, which are associated with hyperarousal. All of the significant change in DERS-18 scores (p=0. 005; p=0. 001; p=0. 035) and the findings from the DAR-5 for the post and 4-week follow up measures (p=0.010) are stronger quantitative evidence to support the third theme. One participant's response of "*smells, movement, grounding are points I revert to before flying off the handle"* (P8) indicates a personal experience of hyperarousal, and how this is now better managed with the sensory modulation. This reflects in the quantitative scores across the measures relating to emotional states, with improved emotional regulation and feelings of anger demonstrating improvement in managing hyperarousal.

Evaluating the relationship of the final theme 'Sensory modulation is a personalised intervention that can be used anywhere' with quantitative findings required looking at

the relationship between the described use of the strategies and the recorded outcomes on the measures. Participants detailed which strategies they implement, including "*I regularly use my noise cancelling headphones, music and breathing techniques to remain calm*" (P13) and another said, "*I used calming sensory practices such as deep pressure touch and breathing exercises*." (P12). Further to the individualised selection of strategies, where participants implemented them varied. "*The diffuser is always in my office*" (P7), "*using sensory kit at work and relaxation techniques before bed*" (P11) and *"when going for a medical appointment … showed that the calming strategies had worked*" (P12). Participants having learned or recognised these sensory strategies can be utilised anywhere, and so implementing them, mostly confirm that the results are feeling calmer or more in control, which reflect the DER-18 outcome of statistically significant change in the pre and post testing, pre and 4-week follow up testing as well as post and 4-week follow up measures (p=0. 005; p=0. 001; p=0. 035). The survey answers relating to use of the intervention corresponded with the quantitative outcomes that show significant and meaningful change following treatment on the PCL-5 p= 0.023 and ITQ p=0.003, and again for the pre and 4-week follow up measures PCL-5 p=0.018 and ITQ p=0.002.

There were minimal opposing responses from participants on the survey questions, however these formed further inquiry of the researcher in the thematic analysis process to ensure trustworthiness and true representation of data (Braun and Clark, 2006). One participant said, "*due to illness over the past 4 weeks I have not used sensory modulation*" (P6) and another stating that the changes since using sensory modulation are "*minimal – some help but limited although still continuing with recommended activities*." (P7). These were the only participant responses that were indictive of the intervention not being utilised or overly impactful. Due to the anonymity of participants when completing questionnaires, the quantitative data cannot be evaluated in relation to these specific comments. However, the overall downward trend across samples demonstrate that the intervention has impacted beneficially on mental health outcomes for the participating samples.

4.13 Summary

To conclude this chapter, the results from the quantitative outcome measures and the qualitative survey questions have been presented separately and then combined, reflecting convergent mixed methods design (Creswell and Plano Clarke, 2018).

The quantitative results demonstrated statistically significant changes from the PCL-5, ITQ and DERS-18 across all testing time points, with the GAD-7 showing statistically significant changes from the beginning to the end of treatment, and DAR-5 also at the 4-week follow up from treatment. This meant that all 1-6 hypotheses were supported, with hypothesis 7 not supported due to the increase in the scores from post to 4-week follow up on the GAD-7.

The qualitative results following thematic analysis (Braun and Clark, 2006) produced 4 themes:

1. Sensory modulation is a useful intervention for mental health problems
2. Self-awareness is key to knowing what to implement
3. Veterans experiencing mental health problems often feel hyperaroused
4. Sensory modulation is a personalised intervention that can be used anywhere

Combining these results, the trauma measures which showed statistical change in the symptomology recorded by participants had echoed results from the theme 1; ‘Sensory modulation is a useful intervention for mental health problems’ of the qualitative data, and where one participant felt the intervention impacted on “*symptoms of PTSD*” (P2). Theme 2; ‘Self-awareness is key to knowing what to implement’ is reflected in the DERS-18 emotional regulation measure results, where an increase in emotional regulation is seen across the testing points. Increasing self-awareness aids emotional regulation which is commented on with reference to the “*Window of Tolerance*” (P5) (P6). The DERS-18 scores, along with the sub-sample ‘B’ GAD-7 scores align with theme 3; ‘Veterans experiencing mental health problems often feel hyperaroused’ in that increasing emotional regulation and reporting less anxiety following the sensory modulation groups reflects how participants are using new knowledge to help “*to remain calm*” (P13). Whilst there was an increase in the average mean scores in the GAD-7 in sub-sample ‘A’ from the end of treatment to the 4-week follow up test, the majority of scores remained maintained and could support that participants were implementing their skills learned without the group

support, as described in theme 4; ‘Sensory modulation is a personalised intervention that can be used anywhere’. Discussion for causation and relationships to current literature will take place in the following chapter.

Chapter 5: Discussion and implications of findings

This research aimed to evaluate sensory modulation as an intervention for military veterans who have experienced trauma, as the existing literature exploring this treatment had been mostly focused on other populations or areas of mental health. The impact of poor mental health can be multifaceted and felt internally through cognitive, emotional, and physiological states but also externally through relationships, roles, productivity, leisure and self-care (Mental Health Foundation, 2022). Treating mental health effectively is paramount to enabling individuals to lead meaningful and pleasurable lives. Veterans can experience a culture shift when transitioning from the military and this adjustment can contribute to feelings of vulnerability, isolation and change that can be associated with mental health risk factors (Grenawalt *et al*., 2021). Sensory modulation has scope as an effective treatment intervention according to current literature, (McGreevy and Boland, 2020) (Scanlan and Novak, 2015) however, there is minimal evidence for its use with military veterans.

This chapter compares the results from each phase of data collection with the previously reviewed literature. The researcher presents interpretations of the findings, implications for clinical practice and the limitations of this study before providing recommendations for future research.

5.1 Sensory modulation and PTSD

As the literature review in chapter 2 indicated, there is encouraging evidence (Champagne, 2011) (McGreevy and Boland, 2020) (Scanlan and Novak, 2015) (Bailliard and Wingham, 2017) that demonstrates sensory modulation as a useful treatment for those experiencing mental health problems, and the findings from this study also indicate this. The published integrative review by McGreevy and Boland (2020) summarised that sensory modulation is a promising area of practice in occupational therapy when treating those who have experienced trauma. Specifically, as trauma elicits physiological ‘fight/flight/freeze’ (Cannon, 1927) survival responses which can impact extensively on the individual where repeating triggering events can result in overwhelming physiological and emotional responses that impact on the person’s occupational participation, performance and potential

(Champagne, 2011; Koomar, 2009 cited in McGreevy and Boland, 2020 p47). Sensory modulation intervention utilises the body through the sensory system which is argued as a pivotal element to treating symptoms of trauma (Champagne and Stromberg, 2004; Koomar, 2009; Ogden *et al.,* 2006; *L*eBel *et al.,* 2010*;* Van der Kolk*,* 2014; Warner *et al.,* 2013 cited in McGreevy and Boland, 2020 p47). The findings from the researcher's study further contribute to this, with both quantitative data showing statistically significant change on the trauma measures that evaluate symptoms of PTSD (p=0.021 sub-sample 'A' pre to 4week follow up) and C-PTSD (p=0.005 sub-sample 'A' pre to 4week follow up). Combining these outcomes with the qualitative result of theme one: 'sensory modulation is a useful intervention for mental health problems' provides supportive evidence for the use of sensory modulation as a mental health intervention for occupational therapists. The direct reference of mental health conditions in participant feedback to the survey questions, reporting that sensory modulation can be used to "*combat symptoms of PTSD*" (P10) and "*the use of sensory objects to ease up stress, anxiety and depression*" (P1) contributed to the development of theme one. McGreevy and Boland's (2020) review highlighted the sparse empirical data from sensory intervention evaluations, which the researcher has begun to address, but also, their theme of 'type of sensory-based intervention used with trauma survivors' is also applicable to reflect on in relation to the researcher's new findings from this study.

The case study carried out by Champagne (2011) described sensory modulation as a form of stabilisation practices for those who have survived traumatic experiences to support engagement in purposeful activities and improve daily functioning. Similarly, this research study evaluated the same sensory modulation intervention, including related grounding techniques and sensory diets identified in Champagne's report, as a part of a stabilisation phase of treatment for military veterans. Critically, the case study report was limited as findings cannot be generalised owing to the blended therapeutic use of sensory modulation and talking therapy, as well as it being a single case study. However, the promising findings provided the impetus for further empirical study, undertaken in this study. The differences being this was delivered as a group intervention and was delivered online. The researcher's results showed statistically significant changes in the PCL-5 and ITQ quantitative outcome measures indicating that symptoms of trauma decreased, and emotional regulation

improved (DERS-18 p=0.005 sub-sample 'A' pre to 4 week follow up) following treatment. The qualitative theme 3 'Veterans experiencing mental health problems often feel hyperaroused' further demonstrates the recognition of dysregulation as a trauma symptom by veterans. Survey answers of "*I am now able to calm and ground myself better using the techniques I learnt*" (P1) and "*Been calmer, not triggered at slightest thing and if I do I go and ground*" (P8) were analysed as a part of theme 3 development, and clearly build on Champagne's (2011) initial findings by showing the use of grounding sensory strategies used similarly to Champagne's (2011) case study.

Considering the delivery and environment this research study was conducted in is key. Scanlan and Novak's (2015) scoping review had a theme of the 'type of sensory approaches investigated' (p.279), they found the common approach being sensory rooms, equipment, or groups. However, these studies had been conducted in acute inpatient units and a forensic hospital. In comparison, the researcher has now extended the field of study to evaluate sensory modulation as an intervention that can be delivered via teletherapy to those in their local communities. Scanlan and Novak (2015) commented that it is likely that occupational therapists will be leading in using these approaches, but require more evidence and an understanding of the research to be able to advocate soundly for this treatment.

To expand on this, in relation to the sample for this research study, it is acknowledged there is stigma for accessing mental health treatment. Ashwick, Turgoose and Murphy (2019) described the barriers of accessing specialised PTSD treatment for military veterans being stigma, getting time off work, costs and long waiting lists to residential programs, which often are considerable in length (Ashwick, Turgoose and Murphy, 2019). The COVID-19 pandemic lasted the duration of this project and was a clear barrier to engagement in treatment for those experiencing mental health problems. These problems are also likely to have been exacerbated due to the pandemic itself (Hendrikx *et al.*, 2021). The new occupational therapy service delivery, which was the basis of this research study, offers an alternative approach which can facilitate access to treatment for those in need. The stabilisation phase being relevant also, as the skills being learned in this stage may facilitate engagement in onward treatment or recovery options such as talking therapy (Ford et al, 2005), which is a common therapeutic modality for trauma treatment (Hetrick *et*

al., 2010, van der Kolk, 2018 cited in McGreevy and Boland, 2020 p32). The researcher's qualitative theme 4 'Sensory modulation is a personalised intervention that can be used anywhere' shows how instrumental the sensory strategies could be in clinical environments, as well as personal, to enable participation in meaningful occupations. "*I use it whenever I'm stressed and depressed particularly when I am in public place and after a trigger*" (P1) and *"when going for a medical appointment … I used calming sensory practices such as deep pressure touch and breathing exercises*" (P12) are survey response that demonstrates the multifaceted implementation of the intervention by participants.

When dysregulated or unwell, veterans may not consider talking therapy and this could be a contributing factor to the increased drop-out rates seen in this population in comparison to civilians (Creamer and Forbes, 2004; Garcia *et al.*, 2011 cited in Ashwick, Turgoose and Murphy, 2019 p2). It could be now, with sensory modulation intervention that these drop-out rates reduce owing to the improved self-regulation strategies, and is an area of future research to consider by the researcher. This inference is supported when combining the qualitative analysis with the DERS-18 (Gratz and Roemer, 2004) emotional regulation scale which demonstrated statistically significant change in the pre and post testing, pre and 4-week follow up testing as well as post and 4-week follow up measures (p=0. 005; p=0. 001; p=0. 035). The rationale behind this research was to gather more insight, evidence and understanding of the impact of sensory modulation, as per Scanlan and Novak's (2015) recommendation, however, contextualising that these are preliminary findings owing to the online delivery, with no control group, as well as the specific military veteran demographic which, until now, had not been evaluated.

PTSD is a recognised mental health condition with symptoms of intrusions, avoidance, negative alterations, and hyperarousal which have a significant impact on a person's day to day life (NHS, 2022). When working with those who have experienced trauma, paying attention to the sensory nervous system can promote feelings of safety, security and improve a sense of control over symptoms (Rothschild, 2011). Overall, the qualitative data from this project mostly indicated improvements in mental health symptoms following the sensory group program for these military veterans. The qualitative theme 2, 'Self-awareness is key to knowing what to implement', encompasses the feedback participants gave on awareness to

their state of regulation, indicating overcoming of avoidance and purposeful implementation of strategies to manage symptoms. "*Less mood swings as I'm able to recognise when things are bad*" (P5), "*I recognise when I am struggling and feel confident that I have the tools to deal with it*" (P10) and "*learning to use my senses instead of my reaction*" (P9) were qualitative answers to the survey questions. There was a response that saw the impact as "*Minimal – some help but limited although continuing with recommended activities*" (P7). However, the comment that this participant made that they continue to use the activities, still implies that the intervention was useful.

When qualitative theme 2 was combined with the quantitative trauma scales, PCL-5 (Blevins *et al.*, 2015) and ITQ (Cloitre *et al.*, 2018),which show statistically significant change following treatment (p= 0.023 and p=0.003), and again for the pre and 4-week follow up measures (p=0.018 and p=0.002) indicate that participants were utilising the intervention appropriately to manage their trauma symptoms effectively.

5.2 'Bottom up' and 'top down'

Occupational therapists are experts in occupation and when circumstances impact the ability to perform meaningful activity, occupational therapists find different ways to address this (RCOT, 2021). For those who have experienced trauma, symptoms can include hyper or hypo-arousal impacting on mood and anxiety levels, hypervigilance which can lead to avoidance of people, places and tasks, and intrusive symptoms which can impact on sleep (NHS, 2022). These symptoms can influence a person's daily routine and functioning, therefore, occupational therapists play a vital role in trauma care. McGreevy and Boland's (2020) review summarised that there was a reduction in traumatic stress symptoms of those studied as a result of a transdisciplinary approach, which included occupational therapists. This has been echoed in the chapter 4 of this study's results. The evaluated occupational therapy intervention also demonstrated a reduction in trauma symptoms as reported on the PCL-5 (p=0.21) and ITQ (p=0.005) outcome measures at the 4-week follow up from treatment. Supporting this is the qualitative theme 1, with example participant feedback of "*it allows me to respond to sensory info and to still function on a daily basis/normality*" (P6) indicative that participants are better able to participate in their "*normality*" (P6) as a result of this intervention.

Wallis, Sutton and Bassett (2018) describe how occupational therapists' knowledge of sensory processing and modulation can offer a 'bottom-up' (Sutton *et al.,* 2013 p501) approach to treatment intervention, which is different to the traditional 'top down' (Sutton *et al.,* 2013 p500) cognitive approaches to treatment. Sutton *et al*. (2013) looked at the use of sensory strategies to target managing aggression in mental health populations. The quantitative results from the researcher's study on the DAR-5 anger measure showed statistically significant change in sub-sample 'A' scores (p=0.043 pre to post and p=0.0015 pre to 4-week follow up) indicating the effective use of sensory intervention on managing anger. Sensory approaches target physiological symptoms through the conscious management of physiological arousal input from various objects, activities, and environments (Wallis, Sutton and Bassett, 2018). Registering the physical sensations and then acting on them is a key element to maintaining equilibrium and safety of the body, which requires a conscious focus. (Van der Kolk, 2014). As previously described, the impact of trauma can alter the threat response system which impacts on the brain's ability to accurately depict what is happening in people's internal and external worlds (Van der Kolk, 2014). The qualitative theme of 'self-awareness is key to knowing what to implement' from the current research was produced, which mirrors the previously documented conscious element to managing arousal levels because if a person does not know where they sit or how they feel, they cannot know what to implement to influence it. The "Window of Tolerance" (Siegal, 1999) is a description of the optimum arousal state that supports functioning, moving outside of these states into hyper or hypo-arousal requires intervention to return within the window. Participants frequently referenced this as a useful self-awareness tool in their survey responses; "*to recognise where I am on the window of tolerance and how to balance my moods*" (P5) and "*understanding where I am on the window of tolerance*" (P11) which then prompted the action to use the sensory modulation skills. These reports support the statistically significant changes observed on the emotional regulation measure, the DERS-18 (Gratz and Roemer, 2004), showing that there was improved emotional regulation following the group treatment. These findings indicate that the alternative 'bottom up' (Sutton *et al., 2013 p501)* treatment approach for those who have experienced trauma are helpful, due to the recruitment of self-regulation which is not a cognitive process, but may complement and enhance the impact of the 'top down' approach (Sutton *et al., 2013 p500).* As previously mentioned, the impact on 'top down' (Sutton

et al., 2013 p500) is certainly a specific research area which could be further explored. By being more regulated, engaging in more cognitively demanding treatment may be easier when remaining in the “Window of Tolerance” (Siegal, 1999) where concentration, focus and alertness is optimised. This was observed by the psychotherapist in Champagne’s (2011) case study, reporting that she had not seen the participant ‘as organised and socially engaging in all of the two years they had been working together’ (Champagne, 2011 p72). The occupational therapy profession has a crucial role in delivering this ‘bottom up’ approach for both veterans and staff working with veterans. The increased self-awareness and emotional regulation improvements reported in the results align with the Scanlan and Novak (2015) conclusions that simple and effective strategies can improve staff and consumer relationships and self-management for those in distress.

5.3 More than symptom reduction

As stated earlier, occupational therapists are interested in meaningful occupation, and participation in occupations can directly impact on health, well-being, and quality of life positively (Champagne, 2011). Mental health symptoms can affect occupational engagement, performance and satisfaction as well as being able to exhibit effective interpersonal skills, which are an important component of work and social roles (Strauser, 2008 cited in Champagne, 2011 p68).

Brown, Karim and Steuter (2020) explored sensory processing preferences in those with psychiatric conditions using a valid and reliable measure, the Adolescent/Adult sensory profile (Brown Karim and Steuter, 2020). Whilst one of the studies within their retrospective analysis had participants with symptoms of Post-traumatic stress (PTS) which differs from PTSD but shares commonalities in symptoms, the criteria for Post-traumatic stress disorder was not met. Despite this, a PTS sample is still of interest to the researcher as the participating sample have trauma related mental health problems, and there is an increasing diagnosis of PTSD amongst military service leavers (Murphy *et al*., 2015 cited in Ashwick, Turgoose and Murphy, 2019 p1). However, the findings amongst their PTS sample were that they had higher scores for sensory sensitivity, low registration and sensation avoiding. Meaning, they are more susceptible to sensory input and tend to avoid sensory input, they also had lower scores for sensation seeking suggesting that they do not seek sensory input. Evaluating Brown, Karim and Steuter (2020) findings alongside Kinnealey, Koenig

and Smith (2011), who investigated sensory modulation and health related quality of life, social supports and mental health symptoms, it was concluded that there was high risk of health-related quality of life issues for people who are sensory over responsive, especially sensory avoiding. Meaning that those with PTS and PTS symptoms could be at more risk of health-related quality of life issues, combined with the reports on barriers to engagement in treatment experienced by veterans which the researcher noted earlier, could mean that this demographic are at higher risk of mental health problems. Whilst Kinnealey, Koenig and Smith (2011) study was small, it demonstrates the parallels that are reported by those during the current research study, which is key to occupational therapy due to the absence of rigorous research in this area. As veterans progressed through the treatment, they reported improvement in relationships, daily routine and accessing the community. "*More confident and happier and easier to understand myself and others*" (P4), "*My home and family life has improved significantly*" (P10), "*it's become a part of my daily routine from starting the day with a walk or run*" (P11) are all qualitative examples in the analysis which show the improvements made by participants as a result of the intervention. Not only do these current reports contribute to evidence for using sensory approaches in mental health, especially when combined with the quantitative outcomes where statistical significance was shown following treatment across the numerous mental health outcome measures. These results are informative for a veteran demographic who potentially are at more risk of mental health problems, but they also begin to highlight the association among mental illness, sensory processing and occupational engagement, which Bailliard and Wingham (2017) strongly suggested was necessary in their review. To further these results for occupational therapists, an occupation focus would be beneficial to evaluate the enhancement of engagement and participation in occupations as a result of sensory modulation interventions.

The scoping review completed by occupational therapists, Scanlan and Novak (2015), revealed that varying outcome measures were utilised when assessing the usefulness of sensory approaches. These included self-related distress and seclusion rates being the most common, with one other study looking at psychiatric symptoms and one looking at physiological arousal levels. The variety and strength of the outcome measure tests were considered by the researcher for this study to

capture a broader picture of the potential impact sensory modulation can have on symptoms of mental health, in particular PTSD. As stated by the World Health Organisation; 'Health is a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity' (WHO, 2022). The researcher utilised mixed methods to go beyond symptom data, and the qualitative method was used to explore the impact of the intervention on daily functioning. PTSD is an anxiety disorder (NHS, 2022) and participation in everyday activities is often reduced because of anxiety (Wallis, Sutton and Bassett, 2018). It is therefore of interest to the field of occupational therapists working in mental health to understand more fully how this intervention can be used to increase occupational participation. Participant responses that contributed to this knowledge were: "*my home and family life have improved significantly*" (P10); "*when I am in a public place and after a trigger" (P1); "at work, I have developed discreet ways to keep myself clam and dial down my levels of anxiety*" (P2); and "*when going for a medical appointment for ECG, Blood pressure and blood tests, which whilst in the waiting room my anxiety was through the roof, I used calming sensory practices such as deep pressure touch and breathing exercises, when it came to my blood pressure test 5 to 10 minutes later my blood pressure was in the normal range, which showed that the calming strategies had worked*" (P12). These findings demonstrate initial insights into how sensory modulation has been used to increase occupational participation for those who have service-related mental health problems.

5.4 Accessible, personal, and cost effective

The mind-body interactions are essential in emotion regulation, and multi-sensory experiences of activity and mindfulness practices can contribute to enhanced regulation outcomes (Koole and Rothermund, 2011 cited in Sokmen and Watters, 2016 p347). Occupational therapists' therapeutic use of activity is unique, and on this sensory level offers even further potential therapeutic impact. The challenge of adapting to delivering occupational therapy via teletherapy was widely felt, but it was also acknowledged that it may improve access to services (World Federation of Occupational Therapists, 2014). As stated earlier, there are barriers of finances, travel, time off work, or even the symptoms themselves of those seeking treatment are experiencing that impact on accessing services. Veterans experience these and further barriers to care including being unaware of where to seek treatment, stigma

from employers and not having transport (Iversen *et al.*, 2011). Offering teletherapy as an alternative helps address some of these existing limitations (Turgoose, Murphy and Ashwick, 2018) whilst acknowledging the clear need for the technology which may also lead to treatment barriers. Despite this, offering an occupational therapy intervention which utilises practical elements via technology provided some opportunity for creative problem solving.

Sensory modulation programs often utilise self-soothing kits in clinical practice when working in mental health services (Sutton and Nicholson, 2011; Te Pou, 2013 cited in Sokmen and Watters, 2016 p349). Developing personalised sensory kits was a part of the clinical intervention received by participants completing this current study, offering the opportunity to identify current or potential items in their immediate environment which could be recruited. This is an alternative strategy to the common practice of having access to items offered by clinicians, such as during Adams-Leask *et al.* (2018) pilot evaluation where a mobile trolly and sensory box was used to offer items to participants experiencing mental health challenges in an emergency setting. Sokmen and Watters (2016) documented at the time of their study that no investigation had been done on the effects of personalised self-soothing kits for mental health clients. Whilst researcher's study did not target the impact of sensory kits alone, the intervention encompassed the use of them as a tool. The results from the quantitative data indicate statistically significant improvement in emotional regulation through the DERS-18 which suggest that the skills and strategies being taught in the intervention impacted on emotional regulation abilities. Also, acknowledging the results on the anger scale from pre-treatment to the 4-week follow up phase also supports that the sensory modulation intervention, adapted to teletherapy and still comprising of key clinically indicated tools had an impact on emotional regulation. The fourth qualitative theme from that data was: Sensory modulation is a personalised intervention that can be used anywhere. This developed from the varying response from participants in the strategies they were using. From "*pebbles, stones, vix nasal, candles, rocking chair, stress balls, breathing*" (P8), "*radio, baths, deep breathing*" (P3), "*noise cancelling headphones, music and breathing techniques*" (P13) and "*breathing and pressure points to ground me*" (P9). Further contribution was from specifically referenced work environments where participants were using the intervention: "*using sensory kit whilst at work*"

(P11); "*at work, I have developed discreet ways to keep myself calm*" (P2); and "*the diffuser is always in my office*" (P7). With these findings, there is evidence that occupational therapists can continue to deliver clinically effective interventions without providing the physical access to these, and possibly promote engagement through encouraging service users to identify and build their own sensory kit, from their own environment.

The very nature of the occupational therapy profession is client-centred care and approaches to treatment. A large part of mental health recovery is engaging in meaningful occupation, and this can include employment and there is a need for support in returning to work for those who have experienced absence as a result of mental health issues (Jarman *et al.*, 2016; Cameron *et al*., 2016 cited in RCOT, 2017). Not only does the researcher's evaluated intervention continue to meet this professional conduct and ethical standard of client-centredness (RCOT, 2021) but it can be done at a low cost and potentially reduce cost in other areas of health provision, such as inpatient admission, medication and talking therapy provision. Furthermore, the intervention being used in varying environments could potentially reduce absence from work through ill health and enhance productivity performance and outcomes, resulting in boosting gross domestic product. This is based on reports that UK GDP I 2015 could have been over £25 billion higher if it weren't for the impact of mental ill health on individuals and businesses (Oxford Economics, 2016 cited on Mentalhealth Org, 2022). The qualitative results previously commented on detail how participants have implemented changes to their work environment using sensory tools, which suggest that the benefits can be felt in their productive roles and environments. The quantitative data that highlights reduction in anxiety, trauma symptoms, anger and improvements in emotional regulation could also imply that this intervention could be influential in improving productivity through better reduced symptomology along with improved cohesion, communication, concentration, and problem solving by remaining more regulated. More research would be welcomed to explore if those with mental health problems could experience a quicker, more informed, and individualised return to their work as a key element to recovery, and if employers recognise potential enhanced productivity as a result of the sensory modulation interventions.

5.5 Limitations

The limitations to this study are evident, being the first of its kind. There are small, varying samples contributing to the quantitative data and a small sample of completed qualitative data, although the intention of enriching the quantitative data through the qualitative proved valuable. The participant reports verified the significant changes observed in the outcome measures. The strength of the manualised intervention that was developed using relevant evidence base was impacted by the lack of randomisation, sampling or comparison group. Despite the intervention being placed at the stablisation phase of treatment, and although unlikely, it could not be accounted for that participants did not receive prior or concurrent intervention.

The researcher was employed at the service prior and throughout conducting the project, which was externally funded, and therefore invites researcher bias as a limitation. Efforts were made to reduce this, for example, the researcher did not actively recruit or refer to the study, nor facilitate cohorts of participants.

Chapter 6 : Conclusion

6.1 Novel contribution

This was the first study of its kind. The literature was sparse when investigating sensory interventions for military veterans experiencing mental health problems, and non-existent for British ex-forces personnel. The results presented in this study denote a significant change this intervention had on mental health outcomes; symptoms of PTSD reducing and emotional regulation improving.

The occupational perspective of these outcomes is how the reduction of symptoms then influences satisfaction and performance in these veterans' daily lives. This was explored in the qualitative findings which produced meaningful responses that relationships improved, being able to do essential tasks such as going to the GP was easier to cope with and general feelings of being happier and more confident.

Sensory approaches are being introduced across veteran mental health service delivery in the UK due to the emerging knowledge of these interventions being used for those who have experienced trauma. The military culture and experiences are unique, which is why specialist services exist for the assistance in transition for personnel into civilian life. Occupational therapists working with military veterans experiencing mental health problems now have a basis of sensory intervention knowledge to utilise, and further contribute to. On average, it can take thirteen years for a veteran to seek mental health support, often once crisis has occurred in the form of losing a job, relationship or facing homelessness or the justice system. Now that evidence is being developed, sensory approaches could be implemented early in the transition for veterans, upskilling them with coping skills to help manage the challenges they will no doubt face.

6.2 Further research

Evidently, this study has illuminated further areas of research to be conducted. The UK government have reported that by 2028 the Ministry of Defence is predicting there will be approximately 1.6 million military veterans residing in Britain. Further to this, there will be a rise in working age veterans from 38% to 44%. Key support areas that are being addressed for veterans include health, community, relationships, and employment. (GOVUK, 2022). Knowing this there are clear areas

where sensory modulation's effectiveness could be further evaluated including supporting veterans into further mental health treatment, maintaining productive and family roles as a result of enhanced regulation, support with transition into civilian life and any improvements in occupational functioning. This study has given preliminary data that British military veterans experienced a reduction in PTSD symptoms, there were improvements in emotional regulation as well as reports of feeling more self-aware, calmer and using the skills in varied environments. There has been insight that the intervention helps interpersonal functioning in relationships, allowing veterans to engage more fully in their communities, manage working environments as well as reducing symptoms of their mental health, increasing participation in meaningful routines. More research, with control groups to increase validity, will further contribute to these findings in relation to the identified specific domains.

This research has made an original contribution to the literature. The intervention was delivered online to British military veterans, and the effectiveness has been evaluated. Sensory interventions are available to all but require occupational therapy knowledge and guidance to be adequately applied. However, the adaptability and availability of these interventions give them the potential of being more personalised, cost effective and better utilised in various settings. This invites the varying delivery strategies to be explored, this could include one-to-one treatment, whether in-person or online, or further group treatment, but again, in-person or online. Where possible, a comparison of the intervention across all delivery styles could be conducted to establish what the common barriers to engagement are, the preferences of veterans, and the effectiveness of the varying service provisions.

Overall, sensory interventions continue to show promise to be effective within the mental health field of treatment, and certainly an area of research to maintain focus on for occupational therapy.

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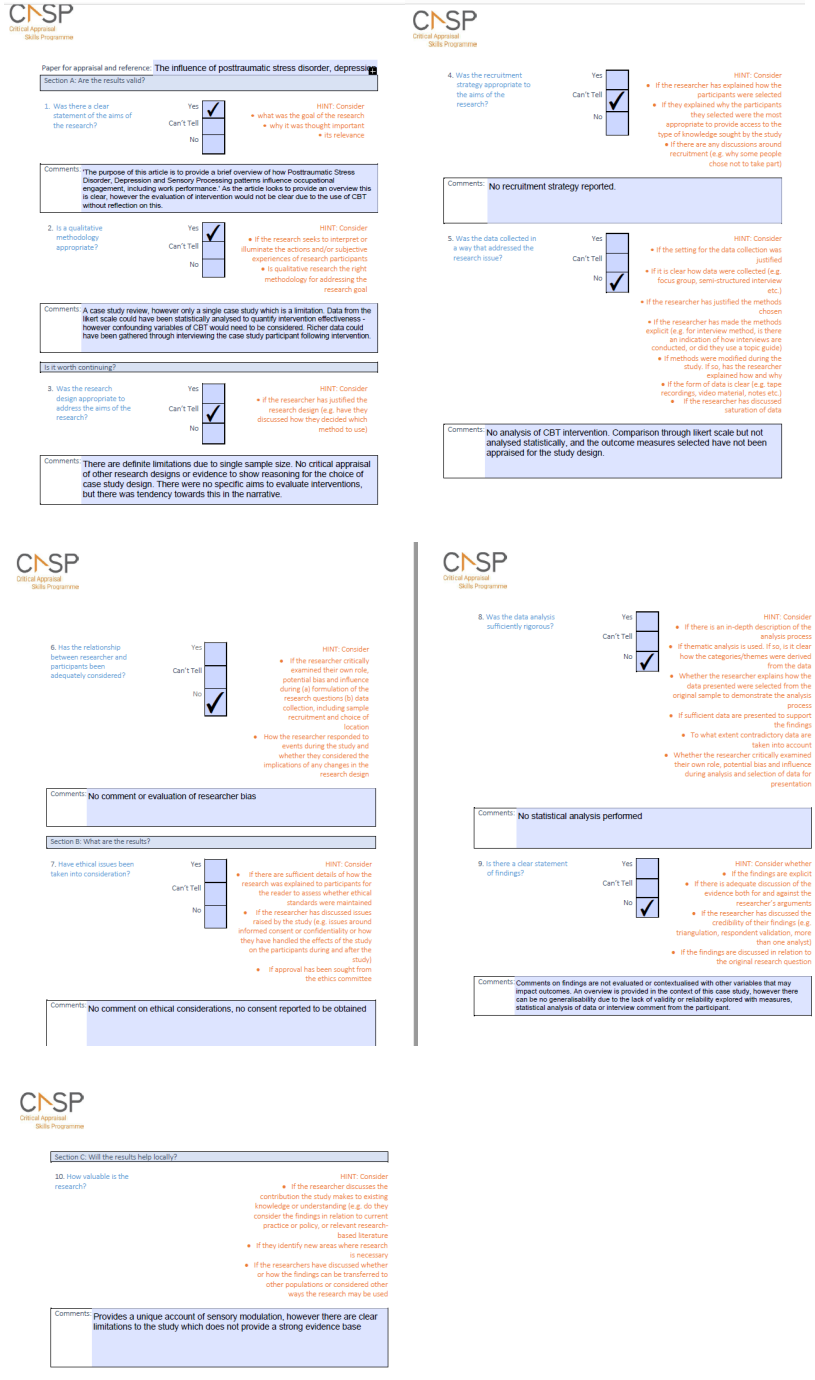
Appendices

Appendix 1

CASP example



CASP Critical Appraisal Skills Programme

Paper for appraisal and reference: The influence of posttraumatic stress disorder, depression

Section A: Are the results valid?

1. Was there a clear statement of the aims of the research?
Yes ✓ / Can't Tell / No
HINT: Consider
- what was the goal of the research
- why it was thought important
- its relevance

Comments: "The purpose of this article is to provide a brief overview of how Posttraumatic Stress Disorder, Depression and Sensory Processing patterns influence occupational engagement, including work performance." As the article looks to provide an overview this is clear, however the evaluation of intervention would not be clear due to the use of CBT without reflection on this.

2. Is a qualitative methodology appropriate?
Yes ✓ / Can't Tell / No
HINT: Consider
- If the research seeks to interpret or illuminate the actions and/or subjective experiences of research participants
- Is qualitative research the right methodology for addressing the research goal

Comments: A case study review, however only a single case study which is a limitation. Data from the likert scale could have been statistically analysed to quantify intervention effectiveness - however confounding variables of CBT would need to be considered. Richer data could have been gathered through interviewing the case study participant following intervention.

Is it worth continuing?

3. Was the research design appropriate to address the aims of the research?
Yes / Can't Tell ✓ / No
HINT: Consider
- if the researcher has justified the research design (e.g. have they discussed how they decided which method to use)

Comments: There are definite limitations due to single sample size. No critical appraisal of other research designs or evidence to show reasoning for the choice of case study design. There were no specific aims to evaluate interventions, but there was tendency towards this in the narrative.

CASP Critical Appraisal Skills Programme

4. Was the recruitment strategy appropriate to the aims of the research?
Yes / Can't Tell ✓ / No
HINT: Consider
- If the researcher has explained how the participants were selected
- If they explained why the participants they selected were the most appropriate to provide access to the type of knowledge sought by the study
- If there are any discussions around recruitment (e.g. why some people chose not to take part)

Comments: No recruitment strategy reported.

5. Was the data collected in a way that addressed the research issue?
Yes / Can't Tell / No ✓
HINT: Consider
- If the setting for the data collection was justified
- If it is clear how data were collected (e.g. focus group, semi-structured interview etc.)
- If the researcher has justified the methods chosen
- If the researcher has made the methods explicit (e.g. for interview method, is there an indication of how interviews are conducted, or did they use a topic guide)
- If methods were modified during the study. If so, has the researcher explained how and why
- If the form of data is clear (e.g. tape recordings, video material, notes etc.)
- If the researcher has discussed saturation of data

Comments: No analysis of CBT intervention. Comparison through likert scale but not analysed statistically, and the outcome measures selected have not been appraised for the study design.

CASP Critical Appraisal Skills Programme

6. Has the relationship between researcher and participants been adequately considered?
Yes / Can't Tell / No ✓
HINT: Consider
- If the researcher critically examined their own role, potential bias and influence during (a) formulation of the research questions (b) data collection, including sample recruitment and choice of location
- How the researcher responded to events during the study and whether they considered the implications of any changes in the research design

Comments: No comment or evaluation of researcher bias

Section B: What are the results?

7. Have ethical issues been taken into consideration?
Yes / Can't Tell / No
HINT: Consider
- If there are sufficient details of how the research was explained to participants for the reader to assess whether ethical standards were maintained
- If the researcher has discussed issues raised by the study (e.g. issues around informed consent or confidentiality or how they have handled the effects of the study on the participants during and after the study)
- If approval has been sought from the ethics committee

Comments: No comment on ethical considerations, no consent reported to be obtained

CASP Critical Appraisal Skills Programme

8. Was the data analysis sufficiently rigorous?
Yes / Can't Tell / No ✓
HINT: Consider
- If there is an in-depth description of the analysis process
- If thematic analysis is used. If so, is it clear how the categories/themes were derived from the data
- Whether the researcher explains how the data presented were selected from the original sample to demonstrate the analysis process
- If sufficient data are presented to support the findings
- To what extent contradictory data are taken into account
- Whether the researcher critically examined their own role, potential bias and influence during analysis and selection of data for presentation

Comments: No statistical analysis performed

9. Is there a clear statement of findings?
Yes / Can't Tell / No ✓
HINT: Consider whether
- If the findings are explicit
- If there is adequate discussion of the evidence both for and against the researcher's arguments
- If the researcher has discussed the credibility of their findings (e.g. triangulation, respondent validation, more than one analyst)
- If the findings are discussed in relation to the original research question

Comments: Comments on findings are not evaluated or contextualised with other variables that may impact outcomes. An overview is provided in the context of this case study, however there can be no generalisability due to the lack of validity or reliability explored with measures, statistical analysis of data or interview comment from the participant.

CASP Critical Appraisal Skills Programme

Section C: Will the results help locally?

10. How valuable is the research?
HINT: Consider
- If the researcher discusses the contribution the study makes to existing knowledge or understanding (e.g. do they consider the findings in relation to current practice or policy, or relevant research-based literature
- If they identify new areas where research is necessary
- If the researchers have discussed whether or how the findings can be transferred to other populations or considered other ways the research may be used

Comments: Provides a unique account of sensory modulation, however there are clear limitations to the study which does not provide a strong evidence base

Appendix 2

Rolfe et al (2021) reflective model.

Reflection 2 -The impact of the crisis in Afghanistan

What? Currently, the events occurring in Afghanistan have been triggering for a lot of the UK military veterans. This has coincided with the running of the groups in which I am collecting data for this research project.

So What? Whilst the group facilitators follow a manual to help with standardising delivery of the intervention, ethically it has been important to make space for discussions about the current affairs and provide emotional support as necessary to those veterans attending the group. This may have impacted on the delivery of the group structure for the third cohort of participants. Despite this, the essential elements of the group were delivered, but perhaps were overshadowed by the current events, or it may have been difficult for veterans to concentrate fully on what was being taught. This could then translate into how effective the intervention may be for them if they've not been able to fully attend throughout the group process. Veterans are likely to be experiencing exacerbated symptoms because of these events, which could be the reason they have accessed treatment and the stabilisation phase of treatment is the correct pathway. However, it could also contribute to exacerbated symptom experiences which could potentially translate into the data collection in terms of overreporting on the outcome measures and impact accuracy of the data.

Now What? It is important to acknowledge how these triggering events are likely to have an impact on the outcome measure data being collected from this cohort, and with no ability to control events or adapt data collection it should be acknowledged within the project. As a researcher this is a primary focus. As a clinician, ethically, ensuring that veterans receive the correct support to help them navigate managing their mental health is the priority. By not facilitating the groups, this has helped to reduce the bias and remain focused on the research priorities, allowing the facilitators to provide the clinical focus.

At this stage, the continuing impact of what is happening in Afghanistan is difficult to gauge as it is likely that more veterans will come forward struggling with their mental health, and this is reflected by the increase in contact to the 24 hour helpline that IS offered at the service. Whilst the external influences cannot be managed, contextualising it for the research project will be paramount for data analysis.

Appendix 3

Ethical approval

Est. 1841 | YORK ST JOHN UNIVERSITY

York St John University,
Lord Mayors Walk,
York,
YO31 7EX

11/03/21

School of Science, Technology, and Health Research Ethics Committee

Dear Christie,

Title of study: To evaluate the impact of a group sensory modulation intervention on mental health outcomes during the stabilisation phase of treatment for veterans experiencing trauma based mental health problems. **Ethics reference**: STHEC0031

Date of submission: 10/03/21

I am pleased to inform you that the above application for ethical review has been reviewed by the School of Science, Technology, and Health Research Ethics Committee and I can confirm a favourable ethical opinion on the basis of the information provided in the following documents:

Document	Date
Application for ethical approval form	10/03/21

Please notify the committee if you intend to make any amendments to the original research as submitted at date of this approval, including changes to recruitment methodology or accompanying documentation. All changes must receive ethical approval prior to commencing your study. You are now free to begin data recruitment and collection for the above approved study.

Yours sincerely,

Dr Daniel Madigan

Chair of the School of Science, Technology, and Health Research Ethics Committee

Appendix 4

Manual excerpt of group sensory modulation treatment

SENSORY SKILLS FOR SELF-REGULATION

GROUP 1: HOW TO USE THE SENSES

PURPOSE: To teach veterans about the sensory systems and their functions in calming, alerting and grounding.
To help veterans identify personal sensory strategies that could help them calm down, gain self-control and become grounded or energized – taking into account that every person is unique.

TIME: 90 Minutes with a 5 min breaks.

MATERIALS, EQUIPMENT AND RESOURCES:

- Animation: What is Sensory Modulation?
- Staff Sheet 1.1: Hand model of the brain.
- Staff Sheet 1.2: Discussion on senses and calming and alerting characteristics.
- Staff Sheet 1.3: Exploring the senses.
- Handout 1.1: What is sensory modulation?
- Handout 1.2: Calming and alerting strategies worksheet.
- Worksheet 1.1: Using your senses to cope
- Homework 1.1: Self-Rating Tool
- Power Point: Sensory Skills for Self-regulation – Group 1.

PROCEDURE:
Welcome (Slide 1)**, Introduction to programme** (Slide 2) **and Ground rules** (Slide 3)

Opening discussion: (Slide 4)

- What sort of things tend to help you to cope, feel better or feel calm?
- What sorts of things have you used in the past that have worked?

When they have responded, you can highlight that some of the strategies they have used are actually examples of sensory modulation, as they engage the senses. Have a few other examples as back up.

Introduce purpose of today's group: (Slide 5)

What is Sensory Modulation: (Slide 6 + 7) Explain to veterans what sensory modulation is. (*Handout 1.1).*

How does sensory modulation work: (Slide 8) Use the hand model of the brain to (*Staff Sheet 1.1*) to explain the concept of 'bottom up' approaches.

Break. 5 min – Encourage veterans to get up, move around and drink some water

Discussion on senses and how to use for calming and alerting: Review with the veterans the sensory systems – internal senses (Slide 9) and external senses (Slide 10), and general information on the calming and alerting characteristics of sensory input (Slide 11). (*Staff Sheet 1.2)*

Exploring the senses: (Slides 12 – 19) Review each sensory system and how they can be used for calming and alerting (*Staff Sheet 1.3*). Have the group members take notes on the *Coping Through the Senses* Worksheet during the discussion. (*Worksheet 1.1*)

Closing and homework: Show *Animation* to recap (Slide 20) (Animation). Give handout Calming and Alerting Strategies to veterans. Explain the self-rating tool (Slide 20) on the homework sheet to the group members and the importance of self-rating to be able to choose the appropriate sensory input and ask them to complete between sessions. *(Handout 1.2) (Homework 1.1).*

To bring to next session: Ask veterans to have the following available for the next session:
Water bottle (preferably with a spout)
A strong smell – can be perfume, peppermint, etc.
Something with a strong taste – sour ball, lemon, etc.
A small object that is calming – e.g. smooth stone, key ring, etc.

Appendix 5

Reflection from staff on pilot group facilitation

<u>At the end of Group 1</u>

What worked well today?

4 veterans out of the initial 5 turned up, all on time. MS teams worked well throughout.

We continued with the 2 facilitators delivering content and 1 supporting veterans through the group.

All veterans participated in the discussions, they agreed they liked the discussion type facilitation over powerpoint – however it is to be noted that perhaps the use of powerpoint could be used to prompt structure and provide alternative visual stimuli to help with concentration. They all gave appropriate answers to what they were going to implement at the end of the session, demonstrated they had learned from the content being delivered.

The break offered an opportunity to practice some of the techniques discussed i.e a movement break to regulate for those who enjoy movement.

The handbrain model demonstration was thorough and the veterans appeared to understand this. They also were able to relay sensory preferences they had to help ground them. Sharing these experiences meant other veterans in the group picked up on this and wanted to try and implement what they'd learned from each other.

What worked less well?

The session ran over by 30 minutes, and this caused some feelings of pressure and anxiety to rush the second half of the content. All veterans stayed for the duration of the group despite this.

My part of the facilitation became confusing through oversharing insight into individual preferences and thresholds to demonstrate the uniqueness of sensory preferences and profiles. The content structure was to share only alerting / calming sensory activities per sense so adding in more was potentially confusing for the veterans.

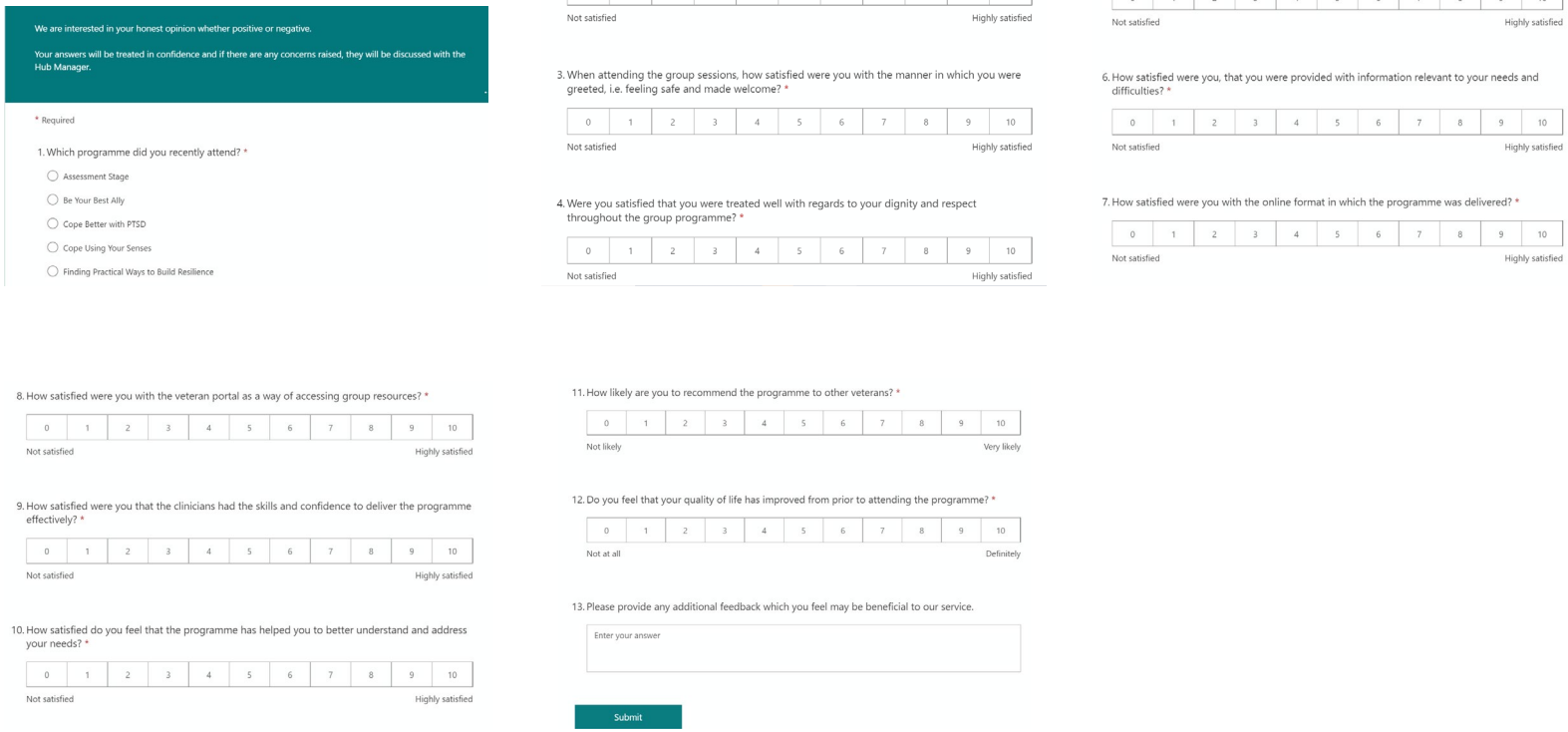
What would you change/repeat next session?

Despite agreement to use powerpoint ahead of the session, veterans agreed they preferred the discussion based approach – this caused some confusion as to the display options throughout the group for facilitators. On reflection, using powerpoint as agreed would have been useful to give a break in stimulus from the screen as well as affirming learning through seeing as well as hearing the content.

A review of the content to match the length of the session needs to happen ahead of the next groups. Using more of the slides may help with this.

Appendix 6

Service veteran feedback form



We are interested in your honest opinion whether positive or negative.

Your answers will be treated in confidence and if there are any concerns raised, they will be discussed with the Hub Manager.

* Required

1. Which programme did you recently attend? *
   - Assessment Stage
   - Be Your Best Ally
   - Cope Better with PTSD
   - Cope Using Your Senses
   - Finding Practical Ways to Build Resilience

2. How satisfied were you with the time you had to wait from initial assessment to your first group session? *

0 1 2 3 4 5 6 7 8 9 10

Not satisfied — Highly satisfied

3. When attending the group sessions, how satisfied were you with the manner in which you were greeted, i.e. feeling safe and made welcome? *

0 1 2 3 4 5 6 7 8 9 10

Not satisfied — Highly satisfied

4. Were you satisfied that you were treated well with regards to your dignity and respect throughout the group programme? *

0 1 2 3 4 5 6 7 8 9 10

Not satisfied — Highly satisfied

5. Where you satisfied that the group facilitators listened carefully to your needs and concerns? *

0 1 2 3 4 5 6 7 8 9 10

Not satisfied — Highly satisfied

6. How satisfied were you, that you were provided with information relevant to your needs and difficulties? *

0 1 2 3 4 5 6 7 8 9 10

Not satisfied — Highly satisfied

7. How satisfied were you with the online format in which the programme was delivered? *

0 1 2 3 4 5 6 7 8 9 10

Not satisfied — Highly satisfied

8. How satisfied were you with the veteran portal as a way of accessing group resources? *

0 1 2 3 4 5 6 7 8 9 10

Not satisfied — Highly satisfied

9. How satisfied were you that the clinicians had the skills and confidence to deliver the programme effectively? *

0 1 2 3 4 5 6 7 8 9 10

Not satisfied — Highly satisfied

10. How satisfied do you feel that the programme has helped you to better understand and address your needs? *

0 1 2 3 4 5 6 7 8 9 10

Not satisfied — Highly satisfied

11. How likely are you to recommend the programme to other veterans? *

0 1 2 3 4 5 6 7 8 9 10

Not likely — Very likely

12. Do you feel that your quality of life has improved from prior to attending the programme? *

0 1 2 3 4 5 6 7 8 9 10

Not at all — Definitely

13. Please provide any additional feedback which you feel may be beneficial to our service.

Enter your answer

Submit

Appendix 7

Gate Keeper Letter

Logo removed to anonymise the service

Gatekeeper Letter

Dear Sir/Madam,

Ref: To evaluate the impact of a group sensory modulation intervention on mental health outcomes during the stabilisation phase of treatment for veterans experiencing trauma based mental health problems.

I am writing to confirm that (*this service)* give approval for the above study to take place and for the recruitment of participants through its service. I will act as the gatekeeper for this study and can be contacted via email at (*removed for privacy*)

Yours sincerely,

Head of Occupational Therapy

Appendix 8

Outcome measures

GAD-7 Anxiety

Over the last two weeks, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid, as if something awful might happen	0	1	2	3

Column totals _____ + _____ + _____ + _____ =

Total score _____

GAD-7 Anxiety measure

(Spitzer *et al.*, 2006)

PCL-5 measure (Blevins *et al*, 2015)

The Occupational Therapy Group

Your Recent Experiences.....

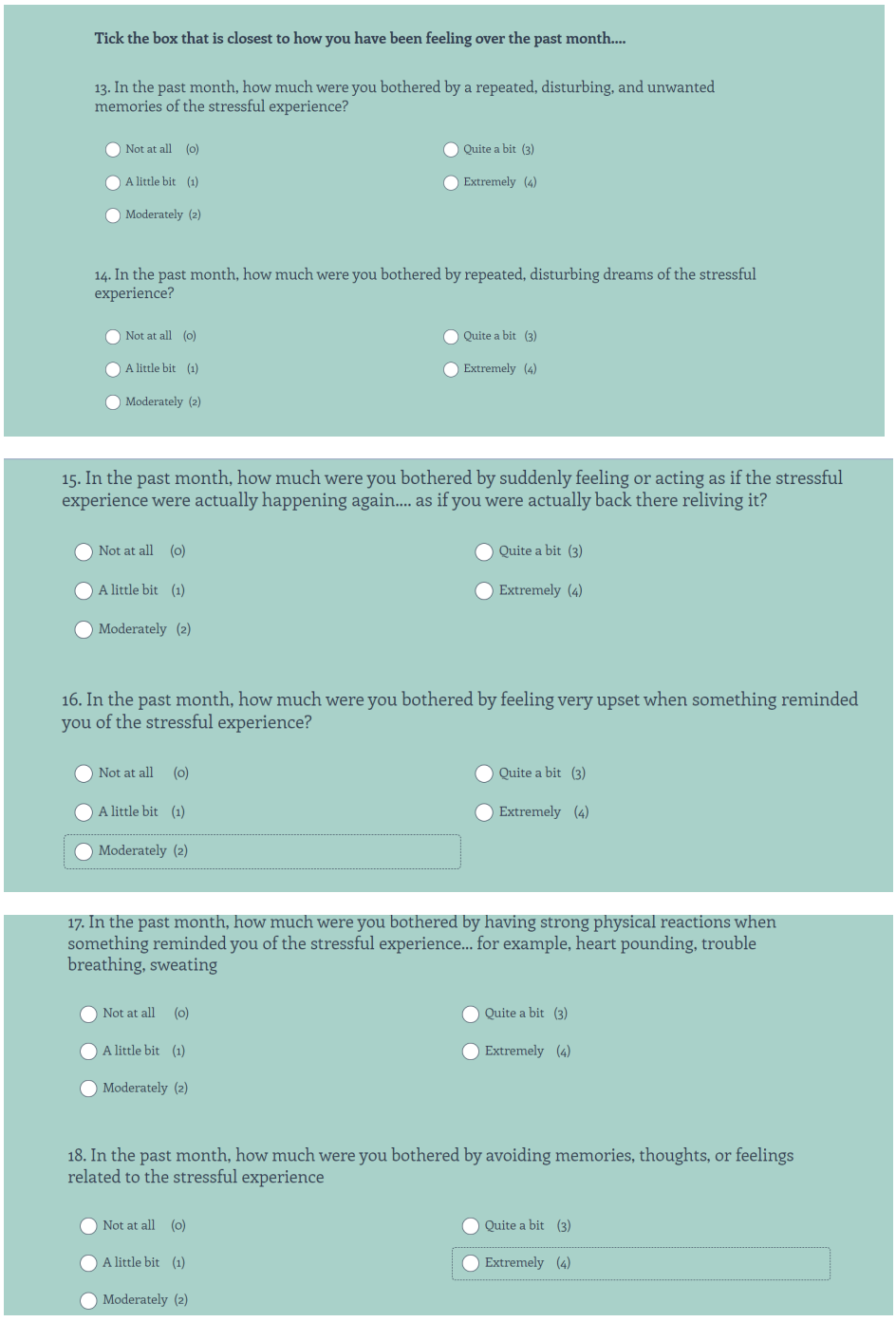
A person who has had an extremely stressful experience may have many a range of different problems as a result of the stressful experience. Some people have had more than one extremely stressful experience. For each of the questions below, keep your worst experience or event in mind, please read each problem carefully and then select one response to indicate how much you have been bothered by that problem in the past month.

12. Can you please describe the specific experience you are holding in mind:

Tick the box that is closest to how you have been feeling over the past month....

Appendix 8 cont

PCL (Blevins *et al*, 2015) cont



Tick the box that is closest to how you have been feeling over the past month....

13. In the past month, how much were you bothered by a repeated, disturbing, and unwanted memories of the stressful experience?

- ○ Not at all (0)
- ○ A little bit (1)
- ○ Moderately (2)
- ○ Quite a bit (3)
- ○ Extremely (4)

14. In the past month, how much were you bothered by repeated, disturbing dreams of the stressful experience?

- ○ Not at all (0)
- ○ A little bit (1)
- ○ Moderately (2)
- ○ Quite a bit (3)
- ○ Extremely (4)

15. In the past month, how much were you bothered by suddenly feeling or acting as if the stressful experience were actually happening again.... as if you were actually back there reliving it?

- ○ Not at all (0)
- ○ A little bit (1)
- ○ Moderately (2)
- ○ Quite a bit (3)
- ○ Extremely (4)

16. In the past month, how much were you bothered by feeling very upset when something reminded you of the stressful experience?

- ○ Not at all (0)
- ○ A little bit (1)
- ○ Moderately (2)
- ○ Quite a bit (3)
- ○ Extremely (4)

17. In the past month, how much were you bothered by having strong physical reactions when something reminded you of the stressful experience... for example, heart pounding, trouble breathing, sweating

- ○ Not at all (0)
- ○ A little bit (1)
- ○ Moderately (2)
- ○ Quite a bit (3)
- ○ Extremely (4)

18. In the past month, how much were you bothered by avoiding memories, thoughts, or feelings related to the stressful experience

- ○ Not at all (0)
- ○ A little bit (1)
- ○ Moderately (2)
- ○ Quite a bit (3)
- ○ Extremely (4)

Appendix 8 cont

PCL (Blevins *et al*, 2015) cont

19. In the past month, how much were you bothered by avoiding external reminders of the stressful experience.... for example, people, places, conversations, activities, objects, or situations?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

20. In the past month, how much were you bothered by trouble remembering important parts of the stressful experience?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

21. In the past month, how much were you bothered by having strong negative beliefs about yourself, other people, or the world.... for example, having thoughts such as... I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

22. In the past month, how much were you bothered by blaming yourself or someone else for the stressful experience or what happened after it?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

23. In the past month, how much were you bothered by having strong negative feelings such as fear, horror, anger, guilt, or shame?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

24. In the past month, how much were you bothered by loss of interest in activities that you used to enjoy?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

Appendix 8 cont

PCL (Blevins *et al*, 2015) cont

25. In the past month, how much were you bothered by feeling distant or cut off from other people?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

26. In the past month, how much were you bothered by trouble experiencing positive feelings.... for example, being unable to feel happiness or have loving feelings for people close to you?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

27. In the past month, how much were you bothered by irritable behavior, angry outbursts, or acting aggressively?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

28. In the past month, how much were you bothered by taking too many risks or doing things that could cause you harm?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

29. In the past month, how much were you bothered by being super alert or watchful or on guard?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

30. In the past month, how much were you bothered by feeling jumpy or easily startled?

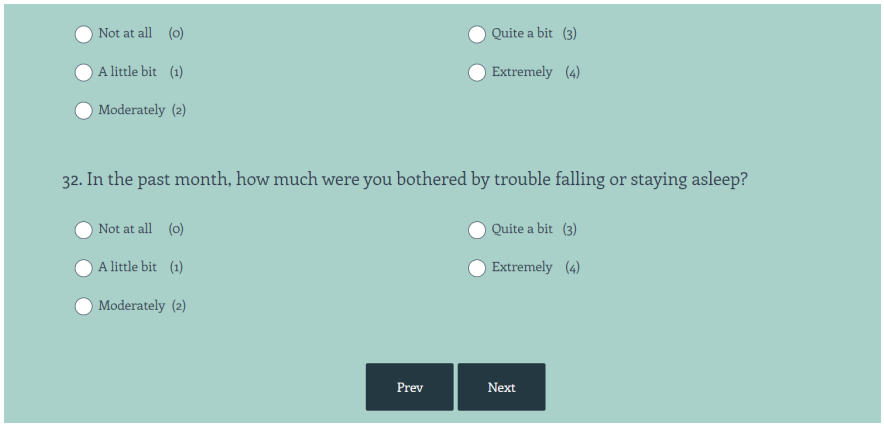
- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

31. In the past month, how much were you bothered by having difficulty concentrating?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

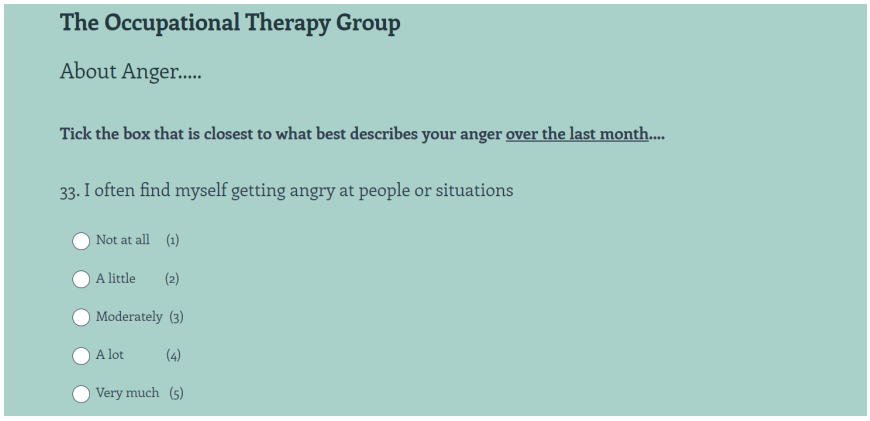
Appendix 8 cont

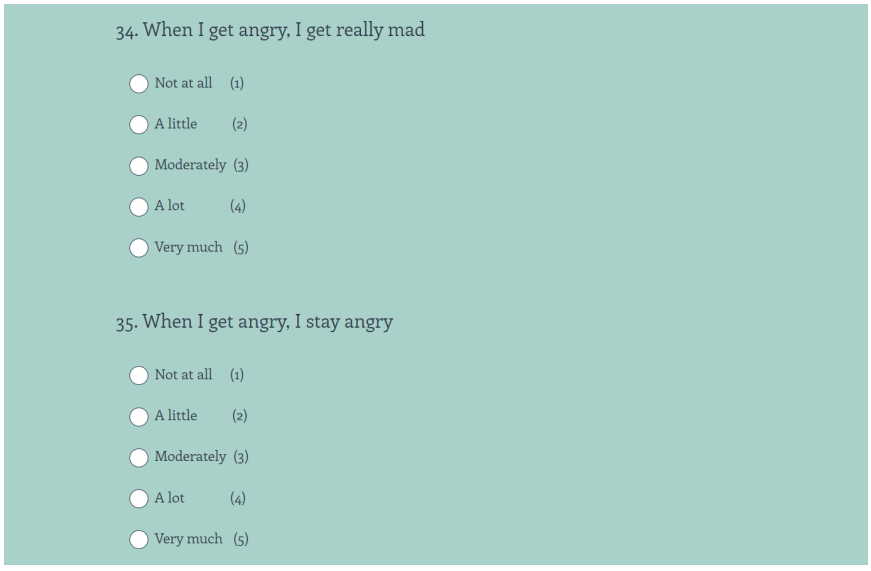
PCL (Blevins *et al*, 2015) cont



PCL-5 (Blevins *et al*, 2015) last question

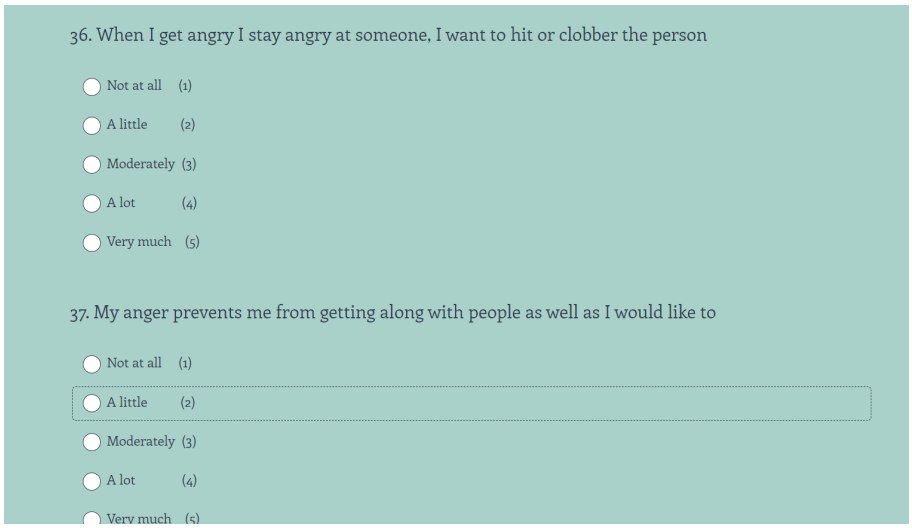
DAR-5 (Novaco, 1975)





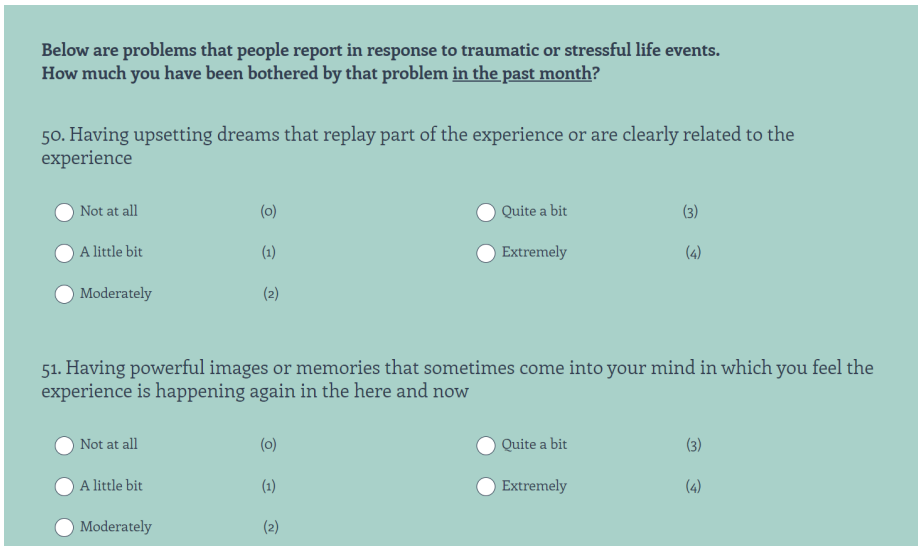
Appendix 8 cont

DAR-5 (Novaco, 1975)



DAR-5 (Novaco, 1975) last question

ITQ (Cloitre *et al*,.2018).



Appendix 8 cont

ITQ (Cloitre *et al*., 2018) cont

52. Avoiding internal reminders of the experience.... for example, thoughts, feelings, or physical sensations

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

53. Avoiding external reminders of the experience.... for example, people, places, conversations, objects, activities, or situations

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

54. Being super-alert, watchful, or on guard

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

55. Feeling jumpy or easily startled

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

Thinking about the events above, <u>in the past month</u> have the problems:

56. Affected your relationships or social life?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

57. Affected your work or ability to work?

- Not at all (0)
- A little bit (1)
- Moderately (2)
- Quite a bit (3)
- Extremely (4)

Appendix 8 cont

ITQ (Cloitre *et al.*, 2018) cont

58. Affected any other important part of your life such as parenting, or school or college work, or other important activities?

◯ Not at all	(0)	◯ Quite a bit	(3)
◯ A little bit	(1)	◯ Extremely	(4)
◯ Moderately	(2)		

Below are problems that people who have had stressful or traumatic events sometimes experience. The questions refer to ways you feel, think about yourself and relate to others.

How true is this of you?

59. When I am upset, it takes me a long time to calm down

◯ Not at all	(0)	◯ Quite a bit	(3)
◯ A little bit	(1)	◯ Extremely	(4)
◯ Moderately	(2)		

60. I feel numb or emotionally shut down

◯ Not at all	(0)	◯ Quite a bit	(3)
◯ A little bit	(1)	◯ Extremely	(4)
◯ Moderately	(2)		

61. I feel like a failure

◯ Not at all	(0)	◯ Quite a bit	(3)
◯ A little bit	(1)	◯ Extremely	(4)
◯ Moderately	(2)		

62. I feel worthless

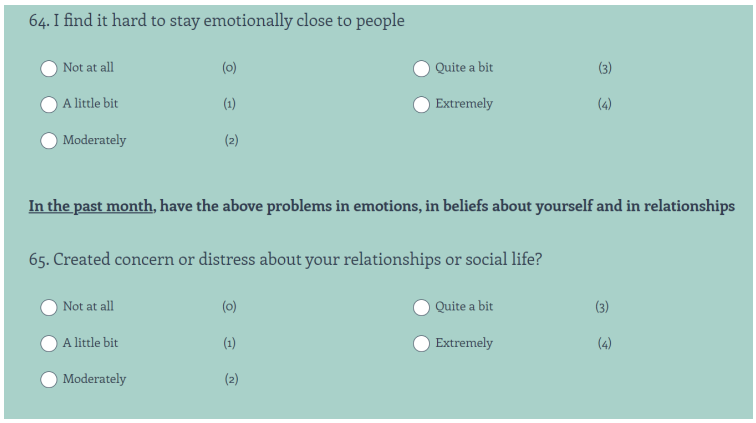
◯ Not at all	(0)	◯ Quite a bit	(3)
◯ A little bit	(1)	◯ Extremely	(4)
◯ Moderately	(2)		

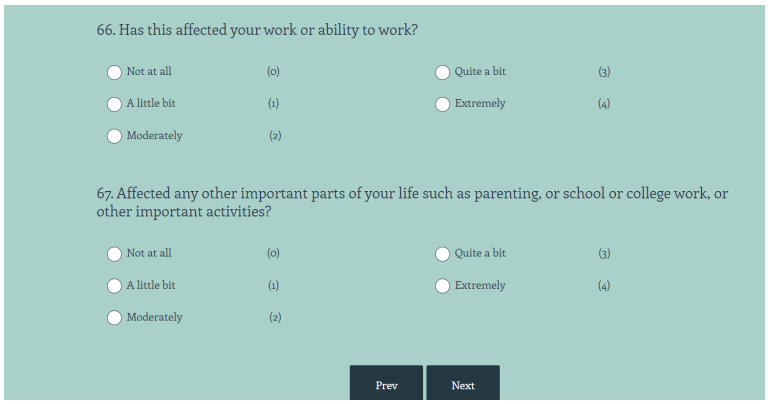
63. I feel distant or cut off from people

◯ Not at all	(0)	◯ Quite a bit	(3)
◯ A little bit	(1)	◯ Extremely	(4)
◯ Moderately	(2)		

Appendix 8 cont

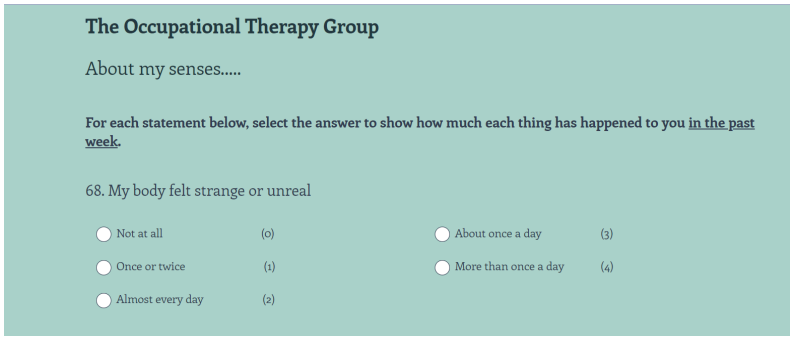
ITQ (Cloitre *et al.*, 2018) cont





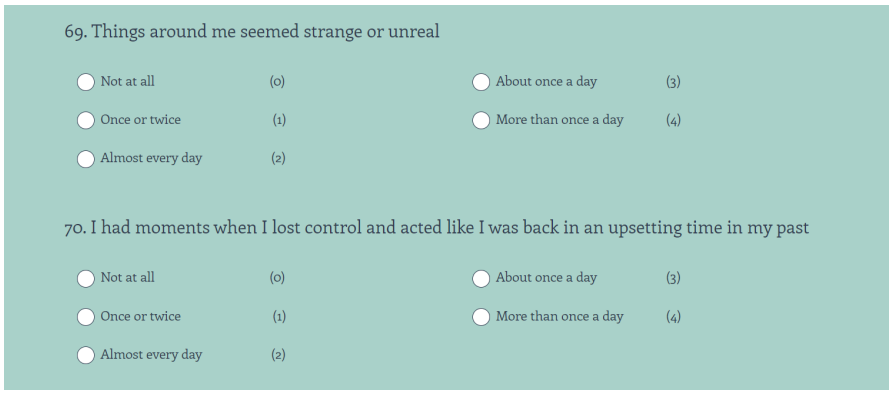
ITQ (Cloitre *et al.*, 2018) last question.

DSSB (Carlson and Putnam, 1993).



Appendix 8 cont

DSSB (Carlson and Putnam, 1993).



DSSB (Carlson and Putnam, 1993) last question.

Appendix 8 Cont

DERS-18 (Gratz and Roemer, 2004)

The Occupational Therapy Group

About how I'm feeling.....

76. I pay attention to how I feel

- Almost never (0)
- Sometimes (1)
- About half the time (2)
- Most of the time (3)
- Almost always (4)

77. I have no idea how I am feeling

- Almost never (0)
- Sometimes (1)
- About half the time (2)
- Most of the time (3)
- Almost always (4)

78. I have difficulty making sense out of my feelings

- Almost never (0)
- Sometimes (1)
- About half the time (2)
- Most of the time (3)
- Almost always (4)

79. I am attentive to my feelings

- Almost never (0)
- Sometimes (1)
- About half the time (2)
- Most of the time (3)
- Almost always (4)

80. I am confused about how I feel

- Almost never (0)
- Sometimes (1)
- About half the time (2)
- Most of the time (3)
- Almost always (4)

81. When I am upset, I acknowledge my emotions

- Almost never (0)
- Sometimes (1)
- About half the time (2)
- Most of the time (3)
- Almost always (4)

Appendix 8 cont

DERS-18 (Gratz and Roemer, 2004)

82. When I am upset, I become embarrassed for feeling that way

- ○ Almost never (0)
- ○ Sometimes (1)
- ○ About half the time (2)
- ○ Most of the time (3)
- ○ Almost always (4)

83. When I am upset, I have difficulty getting work done

- ○ Almost never (0)
- ○ Sometimes (1)
- ○ About half the time (2)
- ○ Most of the time (3)
- ○ Almost always (4)

84. When I am upset, I become out of control

- ○ Almost never (0)
- ○ Sometimes (1)
- ○ About half the time (2)
- ○ Most of the time (3)
- ○ Almost always (4)

85. When I am upset, I believe that I will remain that way for a long time

- ○ Almost never (0)
- ○ Sometimes (1)
- ○ About half the time (2)
- ○ Most of the time (3)
- ○ Almost always (4)

86. When I am upset, I believe that I'll end up feeling very depressed

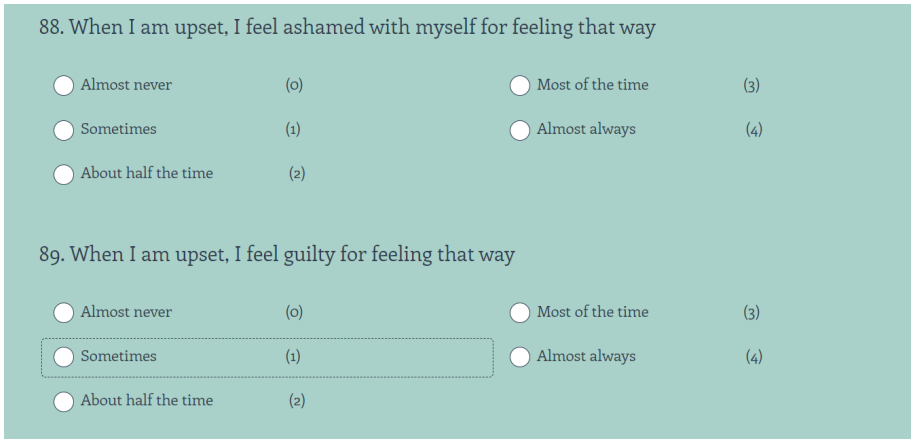
- ○ Almost never (0)
- ○ Sometimes (1)
- ○ About half the time (2)
- ○ Most of the time (3)
- ○ Almost always (4)

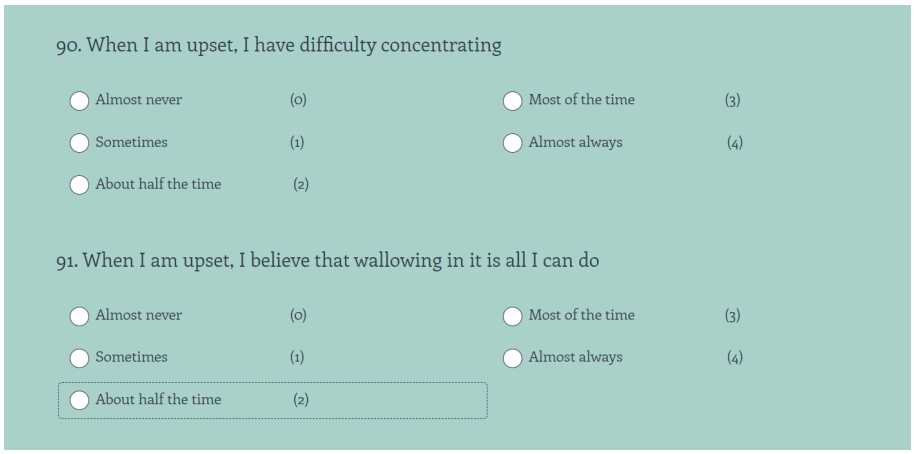
87. When I am upset, I have difficulty focusing on other things

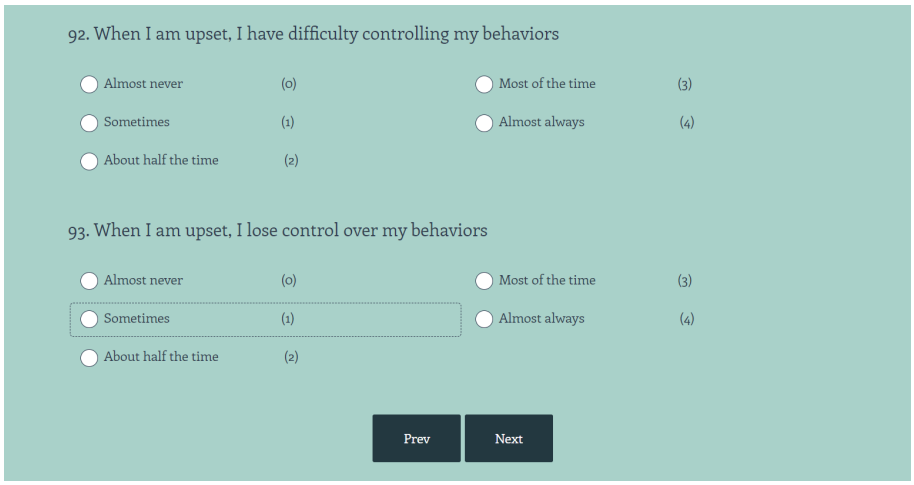
- ○ Almost never (0)
- ○ Sometimes (1)
- ○ About half the time (2)
- ○ Most of the time (3)
- ○ Almost always (4)

Appendix 8 cont

DERS-18 (Gratz and Roemer, 2004)



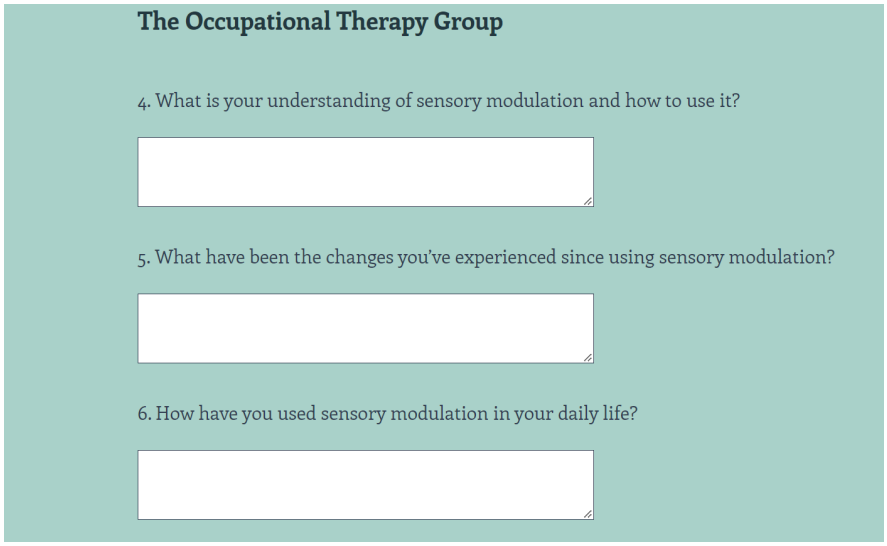




DERS-18 (Gratz and Roemer, 2004) final question

Appendix 9

Survey questions



The Occupational Therapy Group

4. What is your understanding of sensory modulation and how to use it?

5. What have been the changes you've experienced since using sensory modulation?

6. How have you used sensory modulation in your daily life?

Appendix 10

Reflection piece - Rolfe et al (2021) reflective model.

COVID-19

What? This research project was initially funded to be completed in line with a previous service model, however, there was a complete service redesign in 2020 which led to a change of service model and delivery. Further to this, the COVID-19 pandemic began in March 2020 and impacted greatly on the lives of staff and veterans across the UK.

So What? The project was adapted to align with the service delivery, the groups are being facilitated online using MS teams. This has both positive and negatives implications to consider. The positives being that more veterans can be reached due to the inclusive nature of technology not requiring travel, and most people remaining at home due to the pandemic where they are more likely to have access to their technology and some adaptability in working from home. The barriers include veterans not having access to technology, or the knowledge in how to use it with a lack of access to social support for this due to needing to remain at home.

Staff have had to adapt to facilitating groups online, and to adjust to this – the first cohort of participants were involved in a pilot group. Each staff member contributed to reflections of this pilot to help inform further groups. Themes that occurred were WIFI challenges, facilitating group discussions and timings of conversation and content.

Now What? As the project continues through the pandemic, there is scope for the groups to be facilitated face to face. This could pose differing facilitation styles and group dynamics that may impact on the participant's experiences and, therefore, the data being collected. If a face-to-face online delivery becomes available, the intervention would have to be adapted to ensure veterans would achieve the same learning outcomes despite the mode of delivery being different. Online delivery denotes more of a controlled facilitation due to the inhibition of natural social responses such as interruptions or suggestions, it could be that in person this could impact on the flow of the groups. The dynamics of being in a session together could potentially enhance group learning if veterans felt safe in each other's company, which in past clinical experiences has been the case. However, the travel element may create a barrier to consistent participation in face-to-face attendance, or increase stress and anxiety before, during and after the group if veterans have challenges with travel.

There may be more opportunity in face-to-face groups to share materials and experience the impact of different sensory tools between members. Furthermore, the very experience of being out their home environment and in a group, environment may provide more 'lived experience' of practicing and rehearsing techniques within the moment feedback from facilitators.

This could impact on the outcome measures in that veterans could overreport symptomology if they are being exposed to a more stressful experience accessing and participating a community-based group. The prescribed intervention remains the same, however the mode of delivery and ability to utilise different resources could influence the effectiveness if the intervention, which again could influence outcomes.

Therefore, if face to face delivery becomes a facilitation method, then a secondary data analysis may need to be completed as a separate sample, stipulating the differences in the methodology. This could offer useful information into which is perhaps more effective in terms of future treatment planning.

Rolfe et al (2021) reflective model.

Appendix 11

Participant information sheet

Logo removed for anonymity of the service

Participant information sheet

Sensory modulation and mental health outcomes for British military veterans

Invitation

You are being invited to take part in a research study conducted by *(this service).* The study will be published by the Lead Research Occupational Therapist for a Msc in Research through York St John University.

Background to the study

Sensory modulation is an intervention that has been introduced by the Occupational Therapy team at *(this service)*. Whilst there is evidence to support the use of sensory modulation in mental health treatment, the use of this intervention for veteran populations has not currently been explored. The aim of this study is to evaluate the effectiveness of sensory modulation on mental health outcomes for British military veterans.

Why have I been invited to take part?

As a British military veteran engaging in the stabilisation phase of treatment at *(this service)*. you have been offered sensory modulation groups. As part of these groups data will be collected at different points to evaluate the impact of the groups and this will inform the study.

What does the study involve?

If you are happy for your data to be used as part of the study, it will be used anonymously from the psychometric questionnaires you complete throughout the intervention. These questionnaires will be looking at self-rating your anxiety, anger, emotional regulation, dissociation, PTSD symptoms and well-being outcomes. You will be asked to complete these questionnaires before you begin the group process, at the end of the group process and at a 4 week follow up. At the 4 week follow up you will be invited to complete a short survey about your thoughts on the group sensory modulation program, how you may be using what has been taught and the impact this may be having for you.

Appendix 11 cont

Do I have to take part?

It is up to you whether you wish to participate. If you do, then you will be given this information sheet along with a consent form to sign. If you choose to participate but wish to withdraw consent at any time, you can do so without giving any reason. A decision to withdraw at any time or decision to take part will not impact on your standard of care you will receive from *(this service)*. or any other voluntary or statutory service. This study is entirely separate from any contact you may have with other services.

Participant information sheet

What are the discomforts or risks?

The questionnaires you are being asked to complete are routinely used in research projects and clinical practice, and we are not aware of any adverse effects being reported by completing them.

What will happen to the information you collect about me?

All information collected is kept confidential. Your answers on the questionnaires are anonymised. The information will be kept for up to 5 years after the study is complete. The data collected may be published in relevant scientific journals and presented at conferences. All personal identifiable information will be anonymised ahead of dissemination. Your answers along with other participants' responses will be analysed collectively and will not be possible to identify your answers as a result.

What are your rights?

Participation in this study is voluntary; you can refuse or withdraw from the study at any point without giving reason. Your decision to participate or not participate will not impact on the standard of care or psychological support you currently receive or in the future. It will not impact on your relationship with any healthcare, social care, or voluntary staff you are involved with. The York St John University Ethics Committee has responsibility for scrutinising proposals for research conducted by staff and students and has examined this study proposal with no objections from the point of view of research ethics.

What to do next

If you are willing to take part in the study, please sign the attached consent form. If you wish to have a copy of the overall results, please contact the Lead Researcher using the contact details below.

Complaints

If you have a concern about any aspect of this study, please contact the Lead Researcher using the details below, who will do their best to answer your questions. If you remain unhappy and wish to complain formally you can contact the *(this service)*. complaints department through the complaint's procedure.

Further Information

If you have any questions regarding the study, please do not hesitate to contact Christie Alkin or Jolandi du Preez.

Contact details: *(emails removed for anonymity of service)*.

Appendix 12

Participant consent form

Logo removed for anonymity

Patient identification number for this study:

Consent form

Group sensory modulation impact on mental health outcomes for British military veterans

Name of researcher: Christie Alkin

Please initial box

1. I confirm that I have read and understood the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my care or legal rights being affected. ☐

3. I agree to take part in the above study ☐

_____	_____	_____
Name of Participant	**Date**	**Signature**