

A Feasibility Study Exploring a Novel Interoceptive Body Awareness Intervention to Support Student Mental Health

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ABSTRACT

The aim of this study was to investigate the feasibility of The BodyMind Approach (TBMA) (Payne, 2021), a novel, interoceptive body awareness programme, for a non-clinical, small sample of students, who self-identified as being stressed and anxious.

Students are experiencing record levels of mental health problems, with pressures in recent years fuelled by new biopsychosocial stresses (Ramón-Arbués et al., 2020). Interoceptive body awareness potentially plays an essential role in mental health, mediating between stress and emotion. Embodied interventions such as TBMA may enhance interoceptive awareness, leading to reduced stress.

An ethnically diverse sample of 5, female, postgraduate students were opportunistically recruited from the University of Hertfordshire. The TBMA programme was facilitated on campus once a week over four weeks. Qualitative, semi-structured interviews were conducted and thematically analysed to explore participants' views. Self-Report Questionnaires were scored pre and post TBMA programme, for Depression (PHQ9), Anxiety (GAD7), Stress (PSS), Wellbeing (WEMWBS), Body Awareness (BAQ), Body Perception (BPQ), and Interoceptive Awareness (MAIA). This was primarily to explore the feasibility and acceptability of employing these quantitative measures. Saliva samples were also collected pre and post intervention to measure cortisol.

Findings revealed themes of "Embodiment"; "Enhanced Interoceptive Awareness" and "Enhanced Wellbeing". These findings were supported by the questionnaire scores which suggested decreased depression, anxiety and stress with improved wellbeing and interoceptive body awareness. The cortisol measures were inconclusive.

In conclusion, findings show promise for the feasibility and acceptability of TBMA. The next step proposed is to test for effectiveness in a larger, controlled trial.

1. INTRODUCTION

Students are experiencing record levels of mental health problems (Ramón-Arbués et al., 2020). Studies carried out in the past decade have revealed rates of depression among University students as ranging from 23.2% to 79%, anxiety from 17.1% to 86.3% and stress from 20.2% to 72.9% (Asici & Sari, 2022). Rates of suicide and attrition have also risen dramatically over the last decade (Payne & Brooks, 2019). A World Health Organisation survey conducted on a sample of 13,984 participants across eight countries found a third of all first year university students reported a mental health disorder as defined by DSM-IV criteria (Auerbach et al., 2018). Academic, social and personal pressures including establishing new relationships and changes in eating and sleeping habits have all been identified as stressors affecting student mental well-being (Deckro et al., 2002; Robotham & Julian, 2006). Universities fulfilling targets to widen participation and reduce disparities in access, success and progression for students from disadvantaged socioeconomic and ethnic backgrounds (HESA, 2017), has meant that many historically underrepresented students are the first of their family to go to university (Henderson et al., 2020). Such students are unprepared for the life changes they will face (Hindle et al., 2021), frequently working fulltime alongside their degree, weighed down by parental expectation, home responsibilities and financial obligations (Pascarella et al., 2004). Pressures to achieve good results, uncertainty over future careers and, more recently, increased competition for a reduced number of graduate jobs, have also been linked to anxiety and depression (Beiter et al., 2015; Segrin & Flora, 2000; Shackle, 2019). Occasionally stress has been further evidenced to be a predictor of hopelessness and suicide ideation (Dixon et al., 1992; Smith et al., 2022). Problems in student mental health are frequently further exacerbated by changes in behaviour patterns with regards to dietary habits (Hudd et al., 2000) and substance use (e.g., alcohol, cigarettes, drugs) (Dvorak et al., 2013). Behavioural addictions

(e.g., eating disorders, cyber addiction) (Tavolacci et al., 2013), have also been shown to change as a result of stress (Naquin & Gilbert, 1996) - all of which have long term health implications.

Specific stressors experienced by students (e.g., exams), have been linked to raised cortisol levels (Weekes et al., 2006). Cortisol, a stress hormone released through activity of the hypothalamic-pituitary-adrenal (HPA) axis, shows elevated concentrations in response to stress, after taking into account circadian rhythms (Koncz et al., 2021). While certain amounts of stress may result in enhanced performance and motivation (Koncz et al., 2021), accelerated brain processing (Hancock & Warm, 1989) and improved memory consolidation (Cahill et al., 2003), stress has also been evidenced to hamper memory retrieval. Thus updating of new information may be impaired and learning behaviours changed from flexible and cognitive-based towards rigid and “habit-like” (Vogel & Schwabe, 2016), potentially making study less rewarding for students. Furthermore, raised cortisol levels sustained over the long term have been shown to negatively impact health (Lovell et al., 2011), potentially affecting the immune and cardiovascular systems (McEwen, 2004) and causing damage to the hippocampal regions of the brain (Sapolsky et al., 1990; Sapolsky, 1996). Stress has been further implicated in causing medically unexplained symptoms (MUS) such as Irritable Bowel Syndrome, headaches, backache and fibromyalgia for which tests and scans are otherwise normal (Muehsam et al., 2017; Payne, 2021). The painful, worrying and debilitating physical symptoms of such health problems may in turn have a negative effect on mental health (Koncz et al., 2021), indeed, psychological disorders such as depression and anxiety have been revealed to be characterised by raised cortisol levels (Dettenborn et al., 2012; McEwen, 2004).

The university years have been identified as a time many students are living away from home for the first time and changing their health behaviours, with the possibility of these behaviours becoming set for life (Tavolacci et al., 2013). Hence they offer a crucial “developmental window” (Doron et al., 2015) during which to identify potential mental health risks and to establish protective, healthy habits. Studies reveal that only a small percentage of students experiencing mental health problems seek therapy (Garlow et al., 2008) with only 15% of those suffering depression with suicide ideation undergoing treatment (Downs & Eisenberg, 2012). Reasons given by students for not seeking help include a preference for coping with stress alone; believing that stress is a normal part of

the university experience; not perceiving their needs as serious and not having time to get help (Downs & Eisenberg, 2012). According to Byrom (2018), almost 50% of university students feared that being in treatment would involve negative judgment from their institution and peers. Furthermore, a NatWest survey (2021), found that only 18% of students thought their university provided adequate mental health support. Universities are therefore faced with the challenge of engaging students to support their mental health and wellbeing before stress potentially escalates to anxiety and depression.

Interoceptive awareness has become increasingly recognised as playing an essential role in mental health (Khalsa et al., 2018). Interoception is the nervous system's ability to sense, interpret and react to internal bodily signals such as pain, hunger, temperature and emotion (Herbert & Pollatos, 2012; Smith et al., 2022). It is the perception of physical internal sensations related to organ function (e.g., respiration, heart) and the autonomic nervous system which regulates emotions necessary for social integration and survival (e.g., affection intimacy, fear, aggression) (Craig, 2002; 2009; 2014). Interoceptive awareness involves the processing of these mostly unconscious perceptions so that they become conscious (Cameron, 2001) which enables a greater responsiveness to potentially stressful changes in the external environment (Herbert & Pollatos, 2012). As Darwin highlighted in his (Paulus et al., 2019)*Origin of Species* (1859) it is not the strongest or most intelligent species which survive, but the most responsive to changes in environment (Megginson, 1963) so the importance of effective interoceptive awareness cannot be overstated (Paulus et al., 2019). Problems in the body's ability to map its internal landscape and its relationship to the external world is considered to be a defining feature of mental dysfunction (Khalsa et al., 2018; Paulus et al., 2019; Smith et al., 2022), since effective emotion regulation involves appropriate sensitivity to and interpretation of physiological responses to stressful events (Füstös et al., 2013). Hence it has been proposed that interoceptive awareness mediates the relationship between stress and emotion (Craig, 2002) and between anxiety and the intensity of unpleasant feelings (Pollatos et al., 2007). Interoceptive awareness may be reduced by stress, anxiety, and adverse life experiences which, over time, begins to hinder cues from the body from being effectively interpreted (Porges, 2011). Hence the chronic, biopsychosocial stresses experienced by many students during their time at university risks deregulating their stress response (Payne, 2021; Taylor et al., 2011) and interoceptive awareness (Schulz & Vögele, 2015).

William James (1884, 1890) famously proposed that we do not run from a bear because we are scared of it, we feel scared because our body physically reacts to the bear first, suggesting that environmental stimulus triggers specific somatic, visceral and vascular reactions (e.g., increased heart rate, goosebumps, etc.) and that the perception of these reactions mediates emotional experience. Research which originally revealed an ascending pathway to the cortex in monkeys conveying homeostatic sensory activity from bodily tissue (Craig, 2002) has expanded to encompass the notion of a homeostatic sensorimotor hierarchy. According to Cechetto and Shoemaker (2009), this homeostatic sensorimotor hierarchy coincides with the 'central autonomic network' the 'emotional motor system,' and much of the classical 'limbic system,' therefore underpinning both human awareness and mental illness (Craig, 2009, 2014). This biological explanation for interoceptive awareness has implications for therapy with researchers proposing that bottom up, body-based therapies may be a more direct way of manipulating the interoceptive system (e.g., Damasio, 1999; Paulus et al., 2019). Embodied cognition is an approach to therapy which has roots in motor behaviour and emphasizes that cognition typically involves acting with a physical body on an environment in which that body is immersed. Embodied interventions such as Dance Movement Therapy (Payne et al., 2020; Rodríguez-Jiménez et al., 2022) and the BodyMind Approach (TBMA) (Payne, 2021) may thus enhance interoceptive awareness, which has been found to reduce stress and cortisol levels in students (Rodríguez-Jiménez et al., 2022).

Much of the recent research recommends settings-based interventions to help students learn how to manage their mental health more effectively, so that they are better prepared to emerge into a world of uncertain futures (Hughes & Spanner, 2019; Rodríguez-Jiménez et al., 2022). Several of these studies propose that supporting student mental health while students are at University would potentially reduce the number who may go on to develop problems and will later rely on overstretched mental health services (Fernandez et al., 2016; Hughes & Spanner, 2019). Upsher et al., (2022) suggest that universities should implement strategies to reach larger groups of students through preventative interventions which support mental wellbeing, rather than relying on one-to-one counselling services. Group interventions piloted in universities over the past decade have mainly tended to focus on mindfulness programmes (e.g., de Vibe et al., 2018; Nicksic Sigmon et al., 2022; Novak et al., 2020; Regehr et al., 2013; Smith et al., 2022). Mindfulness, defined as “an

awareness of internal states and surroundings” (*APA Dictionary of Psychology*, 2022) that arises through purposeful attention in the present moment, has been evidenced to enhance interoception (Smith et al., 2022). However, it can be challenging for young minds to achieve mindfulness when distracted by stress, anxiety, trauma or chronic pain (Price & Hooven, 2018). Embodiment practice has been proposed as a more accessible route to mindfulness and thus interoception, with neuroscientific research revealing that emotions and cognitions are embodied (Craig, 2002; Porges, 2011; Shapiro & Spaulding, 2021). Nevertheless only a few studies aimed at addressing student mental health have adopted a bottom-up, embodied approach (Hakkim et al., 2021; Koch et al., 2014; Rodríguez-Jiménez et al., 2022). Fewer studies have focused on targeting general, university student populations (e.g., Payne, 2021) as opposed to, for instance, nursing or medical students (e.g., Delaney et al., 2016; Greeson et al., 2015; Lavadera et al., 2020; Stillwell et al., 2017), or engineers (e.g., Rodríguez-Jiménez et al., 2022) or explored findings using qualitative interviews along with validated questionnaires, and cortisol measures.

The novel, interoceptive body awareness intervention being assessed in this study was a programme of facilitated embodiment sessions drawing from The BodyMind Approach (TBMA), a research-informed, evidenced-based intervention which combines mindful embodied practices with behaviour change strategies (Payne, 2021; Payne et al., 2020). TBMA is a biopsychosocial embodiment practice, underpinned by phenomenology (Fuchs, 2012) and neuroscientific research (Fuchs & Koch, 2014). This approach focuses on body awareness and self-reflection using verbal and physical practices, an approach derived from Dance Movement Psychotherapy (DMP) (Jeong et al., 2005; Levy, 1988; Meekums, 2008; Payne, 1992, 2006, 2009). The aim of TBMA is to enhance sensitivity to body awareness and to encourage the experience of new perceptions within a supportive environment (Payne, 2009). TBMA has been used to explore the relationship between interoceptive body awareness for the management of medically unexplained symptoms and mental health (Payne, 2021; Payne & Brooks, 2018, 2018, 2020). It has also been proposed as a means of exploring a potential relationship between students’ management of stress, their mental health and medically unexplained symptoms (Payne, 2021). This novel approach may, potentially enable new coping strategies which have implications for stress and wellbeing (Payne, 2009, 2021). Building on the former research, this study invited students to attend one weekly session of TBMA over four weeks. A study was conducted in

parallel, at Newcastle University, employing a Yoga embodiment intervention, however their results will not be presented here.

Qualitative research methods are arguably, the best approach for a study of students' interoceptive body awareness, as they focus on the exploration of participants' experiences and feelings through language (Povee & Roberts, 2014). Hence, in this study, semi-structured, in-depth interviews were conducted to explore participants' impressions of the TBMA intervention and whether, in their opinions, it had affected their interoceptive body awareness and sense of wellbeing. The other area of focus was to consider participants' views on what attracted them to the study and how acceptable they found the providing the saliva sample for cortisol analysis and answering the questionnaires. The seven, validated, self-report questionnaires employed, were selected carefully to measure participants' stress, anxiety, depression, interoceptive body awareness and wellbeing (Desmedt et al., 2022; Peters et al., 2021). Questionnaire results pre and post programme of intervention were recorded along with cortisol levels; however, it is important to note that this was for the purpose of exploring the feasibility of using these measures to investigate the outcomes of the intervention, not to test the effectiveness of the intervention itself.

The objectives of a feasibility study are generally to determine whether an intervention warrants further examination, whether anything in the study process requires modification and whether the findings may be relevant and potentially illuminating (Bowen et al., 2009; Orsmond & Cohn, 2015). Hence, the specific objectives of this feasibility study were to investigate the outcomes of the Qualitative analysis concerning: (1) recruitment and commitment to the programme of intervention, (2) data collection and analysis procedures, (3) participants' impressions of the intervention and assessment measures, (4) participants' impressions of their own interoceptive body awareness and feelings of stress, anxiety and wellbeing, which may or may not have changed as a result of the programme of intervention. The overall aim of this study was to investigate the feasibility of TBMA, a novel, interoceptive body awareness programme, for a non-clinical, small sample of students who self-identify as being stressed and anxious.

2. METHODS

2.1 Participants

Participants were recruited opportunistically from the University of Hertfordshire general student population. Students who self-identified as stressed were accepted for the study if they met the necessary conditions which included not having had depression or been clinically diagnosed with a psychiatric disorder or been on medication for their mental health. Data was drawn from five, female participants, over the age of 18, all postgraduate students. Two of the five participants were also the project's researchers (MSc Psychology students). This insider/ outsider research perspective was considered appropriate for this study to help encourage trust within the group and commitment to the programme (Dwyer & Buckle, 2009; Hellawell, 2006; Labaree, 2002).

2.2 Ethics

Ethical approval was obtained from the University of Hertfordshire Health Science SLMS/PGT/UH/04966) prior to recruitment, complying with standards as depicted in the 1964 Declaration of Helsinki. (Appendix A)

2.3 Design

A qualitative methodology was employed for this feasibility study, using semi-structured, face-to-face, interviews via Zoom, to enable in-depth exploration of the topic area. The interviews lasted for approximately thirty to forty minutes and followed a schedule of questions, designed to explore the participant's perceptions and experiences, conducted during the week following the final session of the intervention (Appendix B). Thematic analysis (TA) was performed to identify patterns across the transcripts which might yield "social as well as psychological interpretations of data" (Braun & Clarke, 2006) (Appendices C1, C2). TA is considered an especially appropriate method of analysis for applied research in health and well-being domains (Braun & Clarke, 2014). This analysis was cross-checked

for inter-rater reliability with fellow MSc Psychology student on this study to enhance validity (Lange, 2011).

Quantitative measures were also recorded (questionnaire scores and cortisol levels) to assess the feasibility of a repeated measures, mixed method approach for a possible future study.

2.4 Recruitment Methods

Permission was granted from the Dean of Students to recruit students from across the University of Hertfordshire and from the Interim Head of Student Well-Being to advertise through Student Well-Being. Direct requests were made to relevant programme leaders for them to advertise the study to students on their MSc modules (Research Methods in Psychology, Clinical Psychology, Occupational Psychology, Sports Psychology, Psychology Conversion). Specific permissions were also granted to distribute leaflets promoting the study strategically around the College Lane campus, focusing on the Academic Support Unit (ASU), the Student Union, the Psychology Student Zone, the Learning Resources Centre (LRC), the Careers Centre, the Science and Sports Science buildings. The study was advertised electronically on a screen in the Education Department on De Havilland Campus and through Canvas (the University's online portal). An announcement was also posted online as University News on StudyNet. Undergraduate and Postgraduate Psychology students were contacted through personal WhatsApp groups and through emails describing the intervention. The study was also pitched in person to the Clinical Doctorate in Psychology cohort and to students in various locations across the University. An announcement was sent to parttime MSc Psychology students offering 2% of their participation credit to sign up for the study. No other incentive was offered for taking part in the study. The electronic and printed copies of the leaflet used to advertise the study, displayed a graphic suggesting interoceptive body awareness, along with basic information about the intervention along with a contact email address, phone number and a link to the online software Qualtrics screening survey (Appendix D).

2.5 Data Collection

Potential participants who expressed an interest in signing up, were sent a Qualtrics link which took them to an online information sheet about the study (Appendix E), followed by an invitation for their consent to answer questions about their eligibility to take part (Appendix F). Once consent was given, participants were required to submit their email address and were able to proceed with the Qualtrics survey which included answering questions about their mental health (Appendix G). Potential participants were required to answer questions to screen for any criteria that would exclude them from the study. Any whose answers indicated that they met one or more of the exclusion criteria were not permitted to continue with the study beyond this screening stage and no further information about them was gathered or stored. The aim was to recruit up to twelve participants (deemed to be the maximum number for group cohesion).

Eligible participants were emailed the Information Sheet again, along with details about the first session. They were invited to attend four, 90-minute sessions of an interoceptive body awareness programme, scheduled once a week over four weeks. Since saliva samples were being collected at the first and last interventions, participants were instructed to not to eat anything for 30-minutes before these sessions and to only drink water up to 15-minutes before these sessions so as not to interfere with the cortisol testing. Participants were also informed that the first and last sessions would be longer for completing a survey and collecting saliva. They were asked to bring a laptop or mobile with which to complete the questionnaires online through Qualtrics before the first and after the final sessions (although hard copies were available). A further reminder email was sent to participants the night before each session.

The location selected for the intervention was a room on the University of Hertfordshire's de Havilland Campus, with enough space, ventilation, natural light, and privacy to comfortably accommodate the group for active, embodiment sessions. At the start of the first session, participants completed hard copy consent forms, and were then sent an email with a Qualtrics link. There followed a series of demographic questions regarding their personal characteristics such as age bracket, gender, ethnicity, and year/level of study at the University of Hertfordshire (Appendix H). Participants were then

asked to complete seven, questionnaires online which took approximately 15 minutes. Scores were obtained at baseline and again at the end of the programme.

2.6 Procedure

Intervention

The 90-minute sessions in interoceptive body awareness were facilitated by a professional, qualified Dance Movement Psychotherapist. She guided the sessions using “The BodyMind Approach” (TBMA) which integrates body and mind within a social setting (Payne, 2009, 2020, 2021; Payne & Brooks, 2018). Sessions comprised of activities such as body-mindfulness, dance movement, sensory awareness, emotional self-regulation, breathing, acceptance self (body) compassion, along with drawing and writing about experiences (Appendix I). Participants were made aware that they could withdraw from the practice at any time and at the end of the study, they were sent a debrief sheet which included information about mental wellbeing support services in the unlikely event they should be required. (Appendix J).

During each session, the group typically began by sitting in a circle with feet planted on the ground, becoming aware of their bodies, and noticing breathing. Asked to remove their shoes, they would walk around the room, becoming sensitive to the texture of the ground underfoot whilst feeling their hearts beating, connecting body movement with internal rhythms. Music was also used to encourage authentic, improvised movement. Group members were asked to encounter other group members and mirror their movements. Group exercises varied each week, however at the end of each session, participants were invited to select art materials and draw or write about how they saw themselves - metaphorically or otherwise.

2.7 Measures

2.7.1 Qualitative Measures

In the week following the fourth session, participants were invited for an interview over Zoom, conducted by one of the project supervisors. The interview was audio recorded and subsequently transcribed for thematic analysis. The interview questions followed a semi-

structured schedule and explored the participant's experience of the sessions, the data collection methods, and how connected they felt with their body. (Appendix B).

Qualitative Data Analysis

The qualitative data was transcribed and analysed using Thematic Analysis in six phases, as delineated by Braun and Clarke (2006). The first phase involved becoming familiar with the data, re-reading the transcript, and making notes. The second phase involved generating codes for specific segments of data which displayed interesting features (Appendix C1), and the third phase consisted of collating these coded pieces of data into themes with quotes to support them. The fourth phase involved two stages: discovering a coherent pattern from the collated coded extracts from which to create a "candidate 'thematic map'" (Braun & Clarke, 2006) and repeating this process to consider the themes in relation to the data set as a whole. Phase five consisted of defining and refining these themes and creating sub-themes where appropriate, creating theme labels which were succinct yet comprehensively descriptive (Appendix C2). The researchers collaborated to cross-check themes and sub-themes for inter-rater reliability. This researcher's analysis was performed using NVivo 12 software which facilitated the process of collecting, organising, analysing and visualising the transcript data (Appendix K). Finally, phase six involved capturing the essence of the data in a concise, logical, and compelling narrative with themes supported by graphic, extract examples which illuminate facets of the research question (Braun & Clarke, 2006). Throughout the analysis, this researcher remained aware of herself as a researcher/participant in the study (Dwyer & Buckle, 2009). This involved maintaining an awareness of researcher bias throughout, whilst appreciating that participating in the TBMA sessions afforded a privileged, invaluable experiential understanding of the intervention (Hellawell, 2006). Sensitivity to potential bias was enhanced by this researcher's training as a counsellor and coach.

An awareness of "insider" bias was maintained throughout the subsequent data collection and analysis phases. To ensure objectivity, all interviews were conducted by one of the project supervisors. Interview questions had been written by the researchers several weeks earlier. However, they had not been reviewed since so that they would retain their novelty until interviews took place. During the interview process and when answering the questionnaires, attempts were made to respond as honestly and openly as possible, with no

consideration of study outcomes. When analysing the interview transcripts, an awareness of providing equal consideration to all data was maintained.

2.7.2 Quantitative Measures

The aim of employing quantitative measures at this feasibility stage aim was not to look for effects, but to merely observe results. Seven, validated, self-report questionnaires were used in this study.

Patient Health Questionnaire (PHQ-9) (Kroenke & Spitzer, 2002). (Appendix L).

The PHQ-9 measured for the potential existence and severity of depressive symptoms. Nine statements were scored using a four-point Likert scale ranging from 'not at all' ("0") to 'nearly every day' ("3"). Higher scores potentially indicated increasing symptoms with possible scores ranging from 0 to 27. Scores of 0–4 indicated no depressive symptoms, 5–9 mild, 10–14 moderate, 15–19 moderately severe, 20–27 severe depressive symptoms.

Generalized Anxiety Disorder Scale (GAD-7) (Spitzer et al., 2006). (Appendix M).

The GAD-7 measured for the potential existence and severity of generalised anxiety. Seven items were scored using a four-point Likert scale ranging from 'not at all' ("0") to 'nearly every day' ("3"). Higher scores potentially indicated increasing symptoms with possible scores range from 0 to 21. Scores of 5, 10, and 15 are the cut-off points for mild, moderate, and severe anxiety.

The Perceived Stress Scale (PSS) (Cohen et al., 1983). (Appendix N).

The PSS-10 was used. Ten statements were scored to assess a participant's perceived stress during the past month using a five-point Likert scale ranging from 'never' ("0") to "very often" ("4"). 0-13 would be considered low stress, 14-26 moderate stress and 27-40 would be considered high perceived stress.

The Body Awareness Questionnaire (BAQ) (Shields et al., 1989). (Appendix O).

The BAQ measured for self-reported attentiveness to non-emotive, normal body functions- specifically sensitivity to rhythms and body cycles, the ability to sense subtle changes in normal functioning, and the ability to predict bodily reactions.

Eighteen items were scored using a seven-point Likert scale ranging from “Not at all true of me” (“1”) to “Very True of me” (“7”) with higher scores indicating greater Body Awareness.

Body Perception Questionnaire (BPQ) (Porges, 1993a). (Appendix P).

The BPQ Very Short Form (VSF) used in this study was a condensed 12-item version of the 26-item scale used to assess sensitivity for internal bodily functions. High values potentially reflected hypersensitivity to internal bodily functions while low values reflected hyposensitivity.

Multidimensional Assessment of Interoceptive Awareness (MAIA) (Mehling et al., 2012). (Appendix Q).

The MAIA-2 is a thirty-seven-item measure of interoception which operates across 8 domains: Noticing, Not-Distracting, Not-Worrying, Attention Regulation, Emotional Awareness, Self-Regulation, Body Listening, and Body Trust. Items were scored on a six-point Likert scale ranging from ‘Never’ (“0”) to “Always” (“5”). Higher ratings are indicative of greater awareness of bodily signals; lower scores suggesting more interoceptive dysfunction.

Warwick-Edinburgh Mental Wellbeing scale [WEMWBS] (Tennant et al., 2007). (Appendix R).

The WEMWBS, was used to assess mental wellbeing and consisted of 14 positively worded wellbeing statements. Items were scored on a five-point Likert scale ranging from ‘none of the time’ (“1”) to ‘all of the time’ (“5”). Possible scores ranged from 14 to 70, with higher scores potentially indicated enhanced mental wellbeing.

Quantitative Data Analysis

Participants’ total and mean pre and post scores were calculated for each questionnaire in Excel (Appendix T). Calculations were according to individual Likert scales (as described above) and various questionnaire keys for reverse scoring. SPSS was subsequently used for descriptive calculations. (Appendix U).

2.7.2a Saliva collection and cortisol testing

A saliva sample was collected from each participant at the end of the first session and again at the end of the final session.

To account for circadian rhythms which influence cortisol levels (Clow et al., 2004; Hellhammer et al., 2009) it was essential that saliva collection occur at the same time of day on both occasions. Participants were required to passively drool into a tube for 3-5 mins until a minimum of 5ml saliva had been collected.

The saliva collection tubes were packaged and transported to be analysed by a technician in the Institute of Sport, University of Hertfordshire.

The samples were double centrifuged on the same day to eradicate human cells, so the samples were no longer classified as human tissue, which allowed them to be stored at -20°C until analysis.

Samples were analysed in duplicate using a 96-well salivary IgA enzyme immunosorbent, by diluting the samples with assay buffer according to Enzyme-Linked Immunosorbent Assay (ELISA) specifications (Thermo Fisher Scientific Inc., US) (Appendix S1). Ready-made standards were used, and colour change was analysed on a plate reader (Multiskan™ FC Microplate Photometer, Thermo Scientific, USA) at 450nm to obtain the optical density of each well. (Appendix S2). Absorbance values of each well could then be analysed and concentrations interpolated from the calibration curve using a curve fitting software (SigmaPlot). (Appendix S3).

3. RESULTS

3.1. Demographics

Participants were 5, female, postgraduate students from the University of Hertfordshire. Three were 45+, one was 36-45 and one was 18-25. Three were Caucasian, one was Asian, and one was African. All were English speaking. Two were researcher/ participants. One participant was able to participate in only 2 out of 4 interventions. Qualitative data was collected from this participant, along with pre. /post questionnaire results, but not cortisol measures.

3.2. Recruitment

The aim had been to recruit up to twelve participants who self-identified as stressed and anxious. Eight candidates who applied did not meet the mental health criteria and were excluded from the study. A further four potential candidates were unable to attend all scheduled intervention dates so were excluded on this basis.

3.3. Qualitative Interview Findings

The analysis of findings divided into:

- Feedback relating to the feasibility / acceptability of the study.
- Themes/ subthemes which emerged from the data through TA (Braun & Clarke, 2006) relating to the intervention (Appendices C1, C2).

3.3.1. Feasibility/ Acceptability Findings

Motivations for attending the Intervention

The main reason given for signing up to the study included wanting to discover ways of coping with stress and anxiety, "What grabbed me was...how it said about "stress", and I think, "anxiety in students." With that I've just been sitting my exam - so I was like "yep, that's really relevant to me.""

(Participant D, lines 6-8) *"I was very interested and intrigued in how self-awareness could reduce stress and anxiety..."* (Participant E, lines 2-3) A few participants were intrigued by "interoception", mentioned in the flyer. *"I was also very interested in interoception and understanding what happens and how it, how it can benefit potentially."* (Participant C, lines 15-16).

Impressions of the Intervention

Participants highlighted the enjoyable quality, the benefits they felt and the uniqueness of TBMA. *"It's very different. it's not what I expected - but it's hugely beneficial"* (Participant E, lines 294-295) *"I think this one is different from all other exercises that I've ever done"* (Participant B, line 335). One participant felt it might not be "everyone's cup of tea" (Participant E, line 300) despite enjoying it herself. A few specified that what made it different from other exercises or therapies they had tried was the improvised nature of TBMA which necessitated mindfulness *"Yoga can become a quite automatic... with this...you're mirroring somebody else's movements and you don't know what those movements are going to be. You're kind of quite mindful throughout the movement."* (Participant C, lines 162-167). Some commented on the fact that the exercise did not seem strenuous whilst still generating positive effects *"No pain after the exercise that makes it unique"* (Participant B, line 447)

Participants also remarked on the facilitator's supportive approach *"...she just put me completely at ease"* (Participant D, line 207) *"...she was very open so that made me feel encouraged..."* (Participant E, line 214). They thought the 90minute session length was appropriate, mentioning how time seemed to fly by; *"I was happy with the length"* (Participant D, line 384) *"I couldn't believe it was an hour and a half...because it felt like five minutes."* (Participant E, lines 317-318). However, most felt that four sessions were not enough to gain optimal effect and eight sessions would be better *"it would be good to know what eight sessions would do"* (Participant C, line 408) *"I don't think you can do any less. I think eight would have been really good"* (Participant E, lines 400-401)

Acceptability of Measures

In general, participants thought the range and number of questionnaires were appropriate for the intervention. *"The questions were really straightforward to understand, and I didn't really have a problem answering"* (Participant D, lines 309-310); *"...they were all relevant in their own ways"* (Participant C, line 430). The most relevant according to three participants was the BAQ *"The most appropriate one? Probably body awareness"* (Participant D, line 333). Two participants thought there might be an overlap between questionnaires and felt that the PHQ9 (depression) may possibly have

been less relevant for them. *"I don't know if the depression one was really that valuable."* (Participant E, lines 354-355).

Saliva Collection

Views focused on the challenge of creating 5mls of saliva following the 90-minute active session with no water. *"We've been moving around, and we couldn't have water- it was like, "I have no saliva!"* (Participant D, line 345)

One participant highlighted the problem of drinking coffee ahead of the session. *"I made the mistake of having a coffee before in the morning"* (Participant E, lines 383).

Participants felt self-conscious about drooling into a tube, but appreciated being spaced apart around the room. *"We were all sitting at different tables we weren't looking at each other"* (Participant D, lines 351-352).

3.3.2. Thematic findings

Two main research questions were explored:

- Did the intervention change participants' body awareness?
- Did participants think the intervention helped with their stress, anxiety and wellbeing?

Through thematic analysis, seven subthemes were identified which could be grouped into three main themes. (Table 1).

Table 1.

Summary of thematic analysis for TBMA Intervention

Theme	Sub-theme
1. Embodiment	1.1 Mirroring 1.2 Reduced Inhibition 1.3 Stress Management through Movement
2. Enhanced interoceptive Awareness	2.1. Body Awareness 2.2 Breathing Awareness
3. Enhanced Wellbeing	3.1 Relaxed Feelings 3.2 Energised Feelings

Theme 1. Embodiment

Embodiment described the way participants' feelings and thoughts appeared to be influenced by their bodies interacting with the environment. Three subthemes emerged from this theme.

1.1. Mirroring

For one participant, exercises which involved mirroring movements was "the biggest standout thing" (*Participant C, line 234*) about TBMA. All mentioned feelings of connectivity between paired up group members.

"...the person has to interpret, to sort of understand what the other person is doing and that sort of made me feel connected to the other person."

(*Participant A, lines 37-38*)

"When we spoke about it afterwards, they said that they actually felt like what movements, I was going to do, and they could actually feel the hands moving, even though their hands weren't moving."

(*Participant E, lines 148-151*)

The mirroring of movement also appeared to encourage group cohesiveness.

"When someone did the actions and we copied as a group, it was wonderful. We just felt like energies - our energies - were entwined"

(*Participant D, lines 161-163*)

1.2. Reduced Inhibition

Participants commented on the inhibition they felt moving freely at the start of the programme, in contrast with how much more comfortable they felt at the end.

"it's easy to feel -well I did anyway-to feel inhibited. But I felt very comfortable actually, by the end, and really didn't feel self-conscious at all."

(*Participant C, lines 368-369*)

For some, normal feelings of shyness were reduced and that released an ability to be physically expressive, even playful.

"When judgment is removed, you're relaxed, then activity to do something"

(*Participant B, line 82*)

"I would actually take my mom to a dementia class afterwards...I was joining in feeling really uninhibited...that was so much, thanks to this class...it allowed me to be a lot freer."

(*Participant C, lines 368-369*)

“...it reminded me of you know, when I was a child, I just kept dancing around the garden, you know, like completely just free movement...”

(Participant D, lines 205-208)

1.3. Management of Stress through Movement

Moving spontaneously also appeared to calm nervous, bodily sensations.

“I just had to sit an MCQ exam today which for me is really stressful and I've noticed...I'm moving more to try and relieve the feeling of butterflies in my stomach and the bodily sensations of stress. And I wasn't half as stressed this time”

(Participant D, lines 19-24)

Furthermore, the act of observing movement improvised by another group member and imitating the movement, seemed to prevent the mind from wandering. This made the movement mindful, thereby alleviating feelings of stress.

“During the session... ..You move the same way your partner is moving, so...you're not thinking of anything...I was just enjoying the moment...They took away your worries.”

(Participant B, lines 238-242)

“You are doing this exercise...and you're focused on what the other person's doing...so the thinking part of the worrying and stressful part goes away”

(Participant C, lines 98-99)

Theme 2. Enhanced interoceptive Awareness

Enhanced interoceptive awareness was a strong theme to emerge from the data and comprised of two subthemes.

2.1. Body Awareness

Participants observed an increased sensitivity to and connectivity with their bodies.

“...it kind of taught me to be more aware of bodily sensations.... Yeah, and to focus on them and not try to distract from it.” *(Participant D, lines 253-254)*

This included taking notice of internal bodily sensations: paying attention to posture and noticing cues for hunger.

“I'm a bit more aware of my posture sitting at my desk because I do tend to suffer from backache a bit if I've been working”

(Participant C, lines 56-57)

“... I can tend to pick on the cue when I'm hungry now - when I need to eat.”

(Participant D, lines 71-72)

One participant believed this new body awareness enabled her to overcome a foot injury she had suffered from for years.

"I wasn't really able to walk for about two years since I had that injury (plantar fasciitis), but now I'm walking barefoot around the house and the garden and things like that" (Participant E, lines 69-79)

2.2. Breathing Awareness

The unique breathing method taught by the facilitator was frequently highlighted.

What was interesting was the technique, I was taught in the sessions was different to the other breathing techniques I've been taught" (Participant D, lines 30-33)

This awareness of breathing felt energising according to several participants.

"I tried to do a bit of breathing because I noticed immediately after the first, few sessions, that I would be very energised." (Participant E, lines 96-97)

One participant said that the breathing technique learned helped her to manage her anxiety and is a technique she would consider using in the future.

"I do have anxiety so the breathing exercises and all that sort of helped me, and I think that would help me in the future as well."
(Participant A, lines 179-182)

Theme 3. Enhanced Wellbeing

This theme described the improvements to general wellbeing experienced by group members and comprised of two subthemes.

3.1. Relaxed Feelings

Participants noted how they felt calmer, less anxious, and more relaxed since the intervention which even seemed to influence sleep quality in one case.

"I would somehow feel very calm, instead of like more of a person that's got like a nervous energy all the time" (Participant E, lines 99-100)

"I would wake up in a kind of an anxious state and I would say that since the sessions I've definitely been able to wake up in a nicer way and sleep on longer" (Participant C, lines 98-99)

3.2. Energised Feelings

Participants also commented on feeling energised (sometimes twice as much) following the interventions. One described it as feeling "fresh and light" inside.

"You start to recognize the pattern that "Oh, I am feeling energized at the end of each of these sessions." (Participant C, lines 368-369)
"My energy was probably a four (before) and I'd say probably about eight after the session."

(Participant D, lines 225-227)

One participant commented that techniques learned through TBMA helped her to power through the day instead of relying on sugary snacks.

“Now...I won't have the sugar intake. I'll rest or listen to my body- and then I feel energized”

(Participant D, lines 124-125).

Another found this new energy made her more productive.

“I have a lot of energy to go on with the rest of the day or do stuff.” (Participant A, line 225)

3.4. Quantitative Measures

Questionnaire scores were recorded for all 5 participants pre and post programme of intervention (Tables 2 and 3). The purpose of these questionnaires was not to test the effectiveness of the intervention rather to suggest the feasibility and acceptability of using these measures for future studies. Also, to explore which, if any, might be appropriate in helping to answer the research questions (see above).

Table 2.

Mean scores (SD) of PHQ9 (for Depression), GAD7 (for Anxiety), PSS (for Stress) and WEMWBS (for Wellbeing) Questionnaires Pre and Post TBMA Intervention

PHQ9, GAD7, PSS, WEMWBS Scores						
Questionnaires	Pre Intervention			Pre Intervention		
	N	MEAN (SD)	RANGE	MEAN (SD)	RANGE	DIFFERENCE
PHQ9	5	3.60 (3.91)	10.00	1.00 (.71)	2.00	-2.6
GAD7	5	4.60 (4.56)	12.00	2.20 (2.95)	7.00	-2.4
PSS	5	15.20 (8.23)	19.00	9.00 (2.34)	6.00	-6.2
WEMWBS	5	36.40 (7.23)	19.00	42.20 (6.76)	17.00	+5.8

The lower mean scores for the first 3 measures (PHQ9, GAD7, PSS) and higher mean score for the WEMWBS post intervention are all in a positive direction post intervention. (Table 2)

This suggests levels dropped following four weeks of TBMA for depression, general anxiety, and stress, corresponding with an improvement in wellbeing over this period.

Table 3.

Mean Scores (SD) of the BAQ (Body Awareness), BPQ (Body Perception) and MAIA Questionnaire with Subscales (Interoception) Pre and Post TBMA Intervention

<u>BAQ, BPQ, MAIA & MAIA Subscales Scores</u>						
Questionnaires	Pre- Intervention			Post- Intervention		
	N	<u>MEAN (SD)</u>	<u>RANGE</u>	<u>MEAN (SD)</u>	<u>RANGE</u>	<u>DIFFERENCE</u>
BAQ	5	80.20 (18.79)	46.00	97.80 (9.78)	25.00	+17.60
BPQ	5	31.40 (11.30)	30.00	33.60 (9.24)	20.00	+2.20
MAIA (Overall)	5	92.00 (16.81)	44.00	119.40 (20.51)	48.00	+27.40
<i>MAIA Subscales</i>						
Noticing	5	2.95 (1.46)	3.75	3.85 (.28).	.75	+.90
Non-Distracting	5	2.67 (1.60)	3.67	2.67 (1.12)	3.17	0
Not Worrying	5	2.88 (1.07)	2.00	2.56 (.74)	2.60	-.32
Attention Regulation	5	2.20 (.75)	2.00	3.03 (.80)	1.72	+.83
Emotional Awareness	5	3.36 (.41)	1.00	4.32 (.46)	1.20	+.96
Self-Regulation	5	2.60 (.60)	1.50	3.80 (.65)	1.75	+1.2
Body Listening	5	1.67 (1.29)	3.00	2.93 (1.04)	2.33	+1.26
Trusting	5	2.27 (3.00)	2.33	3.67 (.97)	2.34	+1.4

Nearly all body awareness, body perception and interoception scores mean scores increased from pre to post intervention (Table 3) which suggest improvements in interoceptive body awareness during this period.

The most noticeable appreciation in MAIA subscale mean score was for “Body Listening” (actively listening to the body for insight).

Table 4.

Participant Cortisol Levels in pg/mL Pre and Post TBMA Intervention

	N	Cortisol Pre-Intervention pg/mL	Cortisol Post-Intervention pg/mL	Difference pg/mL
Participant 1	4	389.07	479.98	+90.01
Participant 2	4	879.11	1271.27	+392.16
Participant 3	4	296.18	251.47	-44.71
Participant 4	4	697.03	586.13	-110.90

Saliva was collected from 4 out of the 5 participants for cortisol testing, pre and post intervention (Table 4). These results were inconclusive with cortisol concentrations in saliva (pg/mL) shown to increase for two participants - in one case by 392.16pg/mL from 879.11pg/mL. However, for participants 3 and 4, cortisol levels dropped by similar amounts relative to their baseline levels: by 44.71pg/mL from 296.18pg/mL and by 110.9pg/mL from 697.03pg/mL respectively.

4. DISCUSSION

The main aim of this study was to investigate the feasibility and preliminary efficacy of TBMA, a novel interoceptive body awareness intervention programme, for a non-clinical sample of students who self-identified as stressed and anxious.

Recruitment was strategic and comprehensive, however, the final number of five participants was lower than anticipated for this study. This could mainly be attributed to strict mental health exclusion criteria and the timing of the intervention within the academic term. The limited time frame for ethics approval meant that mental health exclusions included specifications such as, not having been under the care of a psychiatrist or be taking a prescribed medication for a mental health condition. Seven students who applied to take part were excluded for these reasons. Regarding the timing of the study, most students had already left University for the summer following exams, or were accustomed to studying from home since the pandemic. Other interested students were dissuaded by the time commitment involved for no financial or academic reward. The study was scheduled too late in the academic calendar for most Psychology students to gain participation credits. Furthermore, the intervention timetable prohibited commitment for four, known, working students. Despite recruitment difficulties, four out of five participants completed the entire programme of TBMA intervention, and all five completed interviews and questionnaires (but not saliva collection). This was in part due to the researchers sending regular reminder emails.

Most applicants who responded to the advertising flyer, wanted to discover new ways of coping with their stress and anxiety. Some were curious about the intervention itself and the concept of interoception. The abstract image of a body and wording for the advertisement conveyed a moderately scientific impression (Appendix D). The words “Mental Health” were replaced with “Wellbeing” to avoid the possibility of deterring prospective candidates (Payne, 2021). Despite taboos around Mental Health diminishing in recent years assisted by digital media awareness campaigns (Latha et al., 2020), students arguably conceptualise mental health as more “clinical” and serious while “wellbeing” relates to every day experience (Laidlaw et al., 2016).

The parallel study conducted at Newcastle University experienced similar recruitment problems with higher attrition. They recruited three participants despite their flyer focusing on the wellbeing aspects of yoga. Hence, the timing of the study, resulting in students' reluctance to travel to campus, is likely to have been the main reason for recruitment problems.

Two of the five participants were also the researchers for this study. Halling and Goldfarb (1991) argue that being an embodied observer involves being affecting and becoming affected by what is being observed. However, to be an embodied researcher requires full and thoughtful involvement. Advantages of personal involvement arguably included a deeper understanding of the intervention and insight into participants' perspectives (Hellowell, 2006). Furthermore, it was considered that a group of five participants was preferable to three for group cohesiveness. However, it is impossible to discount the potential drawbacks of researcher participation (Labaree, 2002). These included the possibility of other group members perceiving an inequality in status for the researcher/ participants, suggested by their existing familiarity with each other, and the nature of the study (if not with the intervention itself). Despite attempting to mitigate the perception of such possible biases by not displaying familiarity between researchers or with the facilitator, researcher involvement in the intervention may have subtly affected the group dynamic.

Participant feedback suggested they enjoyed the group sessions, noting the intervention was unique and proposing eight sessions for optimal benefits. Highlighted was the supportive **facilitation** conducted by a psychotherapist. It has been proposed that managing MUS, (frequently exacerbated by/ leading to stress/ anxiety/depression) through a facilitated group, might be more appealing to students than one-to-one counselling/ psychotherapy (Payne, 2021).

The process of data collection and analysis was efficient and researcher/ insider reflexivity was maintained throughout. Findings broadly divided into feedback relating to the feasibility/acceptability of the study and themes/ subthemes which emerged through thematic analysis of the data (Braun & Clarke, 2006). Participants responded favourably to the range and number of **questionnaires**. However, two participants felt that the PHQ9 was less relevant to them. This questionnaire is generally used to assess clinical depression

which, arguably, is not experienced by most students who might identify themselves as “depressed”. For there to be “reliable change” there would need to be a change of six **PHQ9** points or more, according to IAPT data (Payne & Brooks, 2017). A similar point has been made regarding the **GAD7** for anxiety, where a change of four points is advised from having participated in an intervention (Payne & Brooks, 2017). Although here there were insufficient participants to report any “reliable change”, it is useful to observe that participants’ scores, already in the low range dropped by 2.6 (depression) and 2.4 (anxiety) following the intervention. Also, as noted previously, many students do suffer from severe depression (Beiter et al., 2015). Hence, a study which has ethics clearance to attract this cohort would arguably find the PHQ9 and GAD7 useful. For instance, (Lange, 2011), observed a significant reduction in depression in their student study, suggesting embodiment intervention (DMT) potentially modulated serotonin and dopamine production. The **PSS** proved useful, registering a noteworthy difference in scores which fell from 15.2 which was within the moderate range of 14-26 pre intervention, to 9 which was within the low range (0-13) post intervention. Indeed, this post intervention PSS was lower than the normative score for women which is 13.34 (20-39years) and 12.99 (40-59years) (Klein et al., 2016). Three participants found the **BAQ** most appropriate, which was arguably reflected in the post intervention increase in body awareness scores. Higher BAQ scores for women have been linked to a tendency to be introspective regarding bodily sensitivities, rather than a general concern with bodily presentation (as has been shown to be the case for men) (Shields et al., 1989). The mean increase in overall **MAIA** scores arguably suggests a positive correlation between body awareness and interoceptive awareness. Important to note, however, is that heightened body awareness may also be maladaptive, potentially resulting in psychosomatic problems. (Mehling et al., 2011). Nevertheless, an increase in Body Listening scores (as was found here) generally implies greater response to and, arguably, management of, bodily signals. (Mehling et al., 2011).

Two participants commented on an overlap between certain questionnaires used to assess interoceptive awareness. Indeed, an overlap between the BAQ and the MAIA has been observed in other studies (Ferentzi et al., 2021). However, whereas the BAQ is concerned with both viscerosensation (interoceptive signals from visceral organs) and proprioception (awareness of body’s movement/ location) with no distinction (Horváth et al., 2021); the MAIA only includes viscerosensitive awareness modalities, but exclusively and

in greater depth (Vig et al., 2022). The **BPQ**, on the other hand, is concerned with interoceptive accuracy (Garfinkel et al., 2015). Hence, there is arguably room for all three questionnaires (BAQ, MAIA, BPQ), despite the slight overlap, in any future study.

Overall, the procedure for saliva collection ran smoothly despite participants' feelings of self-consciousness and slight dehydration. **Cortisol**, a glucocorticoid hormone known to increase in stressful circumstances, is generally considered to be a relatively straightforward way to observe physiological change brought about by stress (Dimolareva et al., 2018). However, the inconclusive results here align with Weekes et al. (2006), who found that psychological measures of stress did not correlate with cortisol during periods of examination stress. Adrenaline has been proposed as a more accurate measure of psychological stress, since it does not habituate to repeated psychosocial stressors (Gerra et al., 2001). The expected diurnal pattern for cortisol is an increased level in the morning which declines throughout the day (Sjörs et al., 2014). However, this pattern can be influenced by other circumstances, such as stressful life events (Grupe et al., 2021); socio-economic status (Lupien et al., 2001) and illness (Couture-Lalande et al., 2014). A flatter diurnal cortisol slope, for instance, has been associated with anxiety, depression and less positive affect (van Eck et al., 1996). Hence, for salivary cortisol to provide an accurate indication of TBMA's potential effect on stress, several measures should be taken during the day, at the same times each day to create an individual cortisol profile for each participant. Segerstrom et al. (2017) recommend 10 slopes and 50 residuals (5 tests a day over 10 days) to account for intraindividual variability. According to Gu et al. (2022), a minimum sample size of 40 would be required for a robust cortisol result from saliva.

Two research questions were explored through thematic analysis: *whether the TBMA intervention changed participants' interoceptive body awareness*, and *whether participants thought the intervention helped with their stress, anxiety, and wellbeing*.

Embodiment described the way thoughts and feelings were expressed and understood through movement. Many students, (mostly young adults) find it hard to verbalise their innermost emotions and cognitions. These might be buried deep, unacknowledged, or possibly associated with trauma (Payne, 2021). Research demonstrates how bodily postures, sensations, gestures, and expressions may influence the evaluation of situations, other people and memories (Fuchs & Koch, 2014). For instance, Strack et al., (1988) showed happy feelings were encouraged when individuals held a pen between their teeth in a way which

activated smiling muscles. Cuddy et al., (2015) demonstrated how job seekers who stood in power poses ahead of an interview were more likely to get hired. Hence embodied interventions circumnavigate the stigma of verbally communicating emotion. (Payne, 2021).

“Mirroring” (which emerged as a subtheme) was described here as enabling feelings of group cohesiveness and connectivity between paired up group members. Since the discovery of mirror neurons in Macaques (Rizzolatti & Craighero, 2004), studies have revealed how a Mirror Neuron System (MNS) in humans, comprised of the premotor cortex and anterior intraparietal sulcus, is engaged when perceiving the physical motion of others (Van Overwalle & Baetens, 2009). It has also been proposed that if a specific proprioceptive input to the brain is associated with an emotion, observation of this movement enacted by someone may elicit a similar emotion (Shafir, 2016). Hence, the embodied simulation that occurs during motor observation, may be considered a cornerstone of emotional empathy (Nummenmaa et al., 2014). Fuchs and Koch, (2014) propose that every social encounter involves two cycles of embodied affectivity becoming intertwined, the affordances and resonance of each being continuously modified by the other. Findings suggest that TBMA facilitates such encounters, enabling bonding between group members who might otherwise feel isolated. Numerous studies reveal the importance of social relationships for mental health (Andersen et al., 2021) particularly for University students, where loneliness can be a problem (Byrom, 2018). The social connections made in this study may arguably have contributed to the increase in wellbeing scores and decrease in depression and anxiety scores.

Mirroring may have also helped participants to overcome feelings of self-consciousness regarding how they moved their bodies, which may have contributed to the **“reduced inhibition”** experienced. It is culturally accepted that in movement classes (e.g., Yoga, Tai Chi, etc.), participants follow a teacher’s prescribed movements. However, less familiar to most is free, spontaneous, movement which is an expression of the self (Payne & Brooks, 2019). The ‘Mirroring exercise’ arguably enables participants to express subjective movement while not feeling judged, within a supportive framework which makes it acceptable (Ho, 2005). Practice of embodied exercises such as mirroring, may potentially help students overcome various psychological barriers which inhibit help seeking behaviour (Byrom, 2018; Gulliver et al., 2010).

Participants also expressed how playful, mindful **movement** helped to **manage stress**. Damasio (1999), proposed that the body relays proprioceptive and interoceptive afferent signals to the brain conveying its current state, which then generates feelings and emotion. According to this theory, feelings of stress can be regulated through interoceptive awareness of bodily movement. This was arguably supported by the **enhanced interoceptive awareness** reported by participants scores, coinciding with the higher MAIA and BAQ scores and lower PSS post TBMA intervention.

Since Damasio's original study (1999) much research has supported the concept that a fundamental requirement for the creation of feelings is the mapping of the body state in the Central Nervous System (CNS) (Craig, 2002; Khalsa et al., 2018; Paulus et al., 2019). Here, an enhanced perception of **body awareness** was described by participants who started noticing their hunger pangs, posture, or, in one case, reported being able to overcome an injury to walk barefoot for the first time in years. Regarding noticing hunger, for instance, a prior physiological problem (e.g., hypoglycaemia) might have been sensed through recently enhanced interoceptive awareness and mapped in the CNS. This may have enacted corrective homeostatic changes (e.g., visceral motility, salivation, etc.), leading to the mapping of new interoceptive parameters after feeding (Damasio & Carvalho, 2013). This may possibly have prompted reduced reliance on sugary snacks as described by one participant. The increase in Body Perception and MAIA "Body Listening" scores here arguably support such a hypothesis. Problems in student mental health are frequently exacerbated by poor dietary habits (Hudd et al., 2000). Learning to eat well (i.e., to recognise genuine hunger cues and not rely on junk food) may be seen as an essential part of student self-efficacy (Tavolacci et al., 2013).

Participants' enhanced interoceptive awareness was also expressed through their **awareness of breathing**. Meuret et al.'s (2018) study on anxiety-induced dyspnoea revealed the potential importance of interoceptive awareness for controlling panic attacks through breathing. The insular cortex integrates respiratory, cardiovascular, and emotional activity. Hence slow, guided breathing can produce cardiorespiratory synchronization, tissue oxygenation and improved mood (Strigo & Craig, 2016). This may arguably have contributed to the **enhanced wellbeing** and **relaxed feelings** experienced by participants. Embodiment therapies have been evidenced to generate both relaxed and energised feelings (Jeong et al., 2005; Shafir et al., 2016). Furthermore, high arousal movements such as jumping and

dancing to music, have been shown to decrease negative affect in depression (Koch, 2007). The improved wellbeing scores observed here, corresponding with lower depression scores, arguably supports this research.

Overall, interview findings suggest a relationship between the TBMA embodied intervention and greater interoceptive awareness. Participants also thought that TBMA intervention reduced their stress, anxiety, and improved wellbeing. No direct connection can be assumed between greater interoceptive awareness and mental health, since the sample was too small to look for effects. Nevertheless, the themes and subthemes to emerge through TA suggest that TBMA's embodiment practice both enhanced interoceptive body awareness and relieved stress, reduced anxiety, while increasing feelings of social connectivity and wellbeing. These findings were supported by the questionnaire scores which suggested decreased depression, anxiety, and stress, and improved wellbeing and interoceptive body awareness. The cortisol measures were inconclusive.

Limitations and Recommendations

The **small sample size** (N=5) was the main limitation of this study, primarily due to cautious **Mental Health exclusion criteria** and the **timing of the interventions**, as discussed. Future studies would be encouraged to consider the **academic term** when scheduling the intervention (possibly ahead of exams to potentially help with stress, but not too close which may discourage time commitment). **Participation credits** could also be considered and/ or **vouchers** to encourage commitment to the study. **More time** could be allowed for **ethics procedures** to enable **wider mental health inclusion**. A longer timeframe would also allow the **ASU and Wellbeing department** to **identify students** who might **benefit from this intervention** ahead of recruitment. A **power analysis** could be conducted to enable mixed methods (once analysis method has been chosen and effect size estimated). A **control group** is recommended to rigorously explore effects of the intervention (Kinser & Robins, 2013). This plan for a future, bigger study may involve collaborating with Newcastle University.

Recruitment efforts here were rigorous. However, a future study could **test recruitment materials for feedback** ahead of printing/ distribution. A further suggestion would be to set up **Instagram/ Facebook/ Twitter accounts** to advertise through the University social media feeds.

The **all-female demographic** arguably reflects that help seeking is generally lower for men than women (e.g., Oliver et al., 2005). Future studies could seek to **recruit** from **male student support groups**.

The mature mean age of participants for this study also limited generalising findings, since Mental Health problems typically peak between 16-24 years, (corresponding with the median student age) (Payne, 2021). Future studies would be advised to **target more Undergraduate students**. **Researcher/ participation** was considered an advantage for this feasibility study. However, **biases** may have arguably limited findings as discussed.

Budget limitations here only enabled **four facilitated interventions and two sets of cortisol analysis procedures**. Hence **cortisol circadian rhythms** could not be established for participants as discussed. Furthermore, the **cohort** was **too small** for a **reliable cortisol** comparison. The **recommendation** would be to **collect 5 saliva samples** from **every participant** at the **same time points throughout the day over 8 intervention days**. Gu et al. (2022) recommend a minimum of **40 participants**. **Home cortisol testing kits** could be considered if budget permits.

In conclusion, findings here show promise for the feasibility and acceptability of TBMA as an intervention which enhances physiological resources and a sense of belonging, two of the most essential requirements leading to self-actualisation (Maslow, 1943; Payne & Brooks, 2019). The next step should be to test the intervention for effectiveness in a larger, controlled trial.

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6. APPENDICES

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Appendix A

Ethics Approval Notification



HEALTH, SCIENCE, ENGINEERING AND TECHNOLOGY ECDA ETHICS APPROVAL NOTIFICATION

TO [REDACTED]
CC [REDACTED]

FROM Dr Simon Trainis, Health, Science, Engineering & Technology ECDA Chair DATE 20/05/2022

Protocol number: **aLMS/PGT/UH/04966(1)**

Title of study: A pilot study exploring a novel interoceptive body awareness

intervention to support student mental health

Your application to modify and extend the existing protocol as detailed below has been accepted and approved by the ECDA for your School and includes work undertaken for this study by the named additional workers below:

Professor [REDACTED] University of Hertfordshire is a second supervisor on this project.

Modification: detailed in EC2.

General conditions of approval:

Ethics approval has been granted subject to the standard conditions below:

Original protocol: Any conditions relating to the original protocol approval remain and must be complied with.

Permissions: Any necessary permissions for the use of premises/location and accessing participants for your study must be obtained in writing prior to any data collection commencing. Failure to obtain adequate permissions may be considered a breach of this protocol.

External communications: Ensure you quote the UH protocol number and the name of the approving Committee on all paperwork, including recruitment advertisements/online requests, for this study.

Invasive procedures: If your research involves invasive procedures you are required to complete and submit an EC7 Protocol Monitoring Form, and copies of your completed consent paperwork to this ECDA once your study is complete.

Submission: Students must include this Approval Notification with their submission.

Validity:

This approval is valid: From: 20/05/2022 To: 30/09/2022

Please note:

Failure to comply with the conditions of approval will be considered a breach of protocol and may result in disciplinary action which could include academic penalties. Additional documentation requested as a condition of this approval protocol may be submitted via your supervisor to the Ethics Clerks as it becomes available. All documentation relating to this study, including the information/documents noted in the conditions above, must be available for your supervisor at the time of submitting your work so that they are able to confirm that you have complied with this protocol.

Should you amend any aspect of your research or wish to apply for an extension to your study you will need your supervisor's approval (if you are a student) and must complete and submit a further EC2 request.

Approval applies specifically to the research study/methodology and timings as detailed in your Form EC1A or as detailed in the EC2 request. In cases where the amendments to the original study are deemed to be substantial, a new Form EC1A may need to be completed prior to the study being undertaken.

Failure to report adverse circumstance/s may be considered misconduct.

Should adverse circumstances arise during this study such as physical reaction/harm, mental/emotional harm, intrusion of privacy or breach of confidentiality this must be reported to the approving Committee immediately.

Appendix B

Interview Schedule of Questions

Interview Schedule – *This is a semi structured interview, so further questions and prompts will be led by the participant's responses. The schedule here is indicative of the type of questions that will be asked.*

Thank you for agreeing to be interviewed today. This interview is being audio recorded to allow for transcription and will be anonymised as indicated on the consent form. Are you happy to proceed with the interview?

Thank you. I have some questions for you about your experience of the programme

What brought you to these sessions?

How had you been feeling before the sessions started?

How in tune would you say you were with your body prior to these sessions? Can you give an example of that? How would you say this may have changed (if at all) since these sessions?

How were you able to relax previously? Could you pick up on your body's signals when you needed to relax? Could you give me an example of when you knew you needed to relax? How would you say this might have changed (if at all) since these sessions?

How could you tell if you were hungry? Were you able to pick up on your body's signals that you were hungry? Can you give an example of that? How would you say this might have changed (if at all) since this programme?

How were you able to tell when your body felt comfortable or uncomfortable? Can you give an example of that? How would you say this might have changed (if at all) since this programme?

How could you tell when you slept well? What would it feel like when you woke up in the morning? Can you give an example of that? How would you say this might have changed (if at all) since this programme?

Further Prompts:

- When might you have noticed your breathing previously? Can you give an example of that? How would you say this might have changed (if at all) since this programme?
- What have you noticed previously regarding the way your body affects your mind? Can you give an example of that? How would you say this might have changed (if at all) since this programme?

- Can you think of an example of when your mind might have affected your body?
How would you say the relationship between your mind and body might have changed (if at all) since this programme?

What did you experience during the body awareness sessions?

What? / When?/ How?/ Why?

How did you feel during the sessions?

What? / When?/ How?/ Why?

Further questions:

- How comfortable did you feel during the sessions? (examples)
- How connected did you feel with your body during the sessions?
- What (if anything) sticks in your mind about the sessions?

What were your thoughts about the practices?

Were they helpful or unhelpful?

What did you experience being part of a group?

How comfortable did you find the group experience (1-10)?

What were your thoughts about the facilitation of the sessions?

How helpful did you find it?

How has this experience been comparable to anything you might have experienced previously? (e.g. meditation/ yoga/ psychotherapy etc)

How did you feel immediately after the sessions? (On a scale of 1-10)

- What was your mood like?
- How energized did you feel?
- How relaxed did you feel?
- How healthy did you feel following the sessions?

How did you feel a week following the session? (On a scale of 1-10)

What would you say were your biggest takeaways from the sessions?

Why/ In what way?

How likely are you to continue the practices you have learned moving forward? (On a scale of 1-10)

What would help you continue the practices, if you would like to?

How likely are you to recommend these sessions to a family member/ friend? (On a scale 1-10)

What might you say?

Is there anything else you would like to share about your experience?

Questions about Data collection

You may have noticed that the questions were grouped according to questions on your interoceptive awareness; your body awareness; your body perception; your well-being and your levels of anxiety and depression. We would be interested to hear your thoughts about the different data collection tools we've used.

- How did you feel about the different questionnaires?
- Were you aware of the differences?
- How did you respond to the way they were "themed"?
- Which of the questionnaires did you find most appropriate for you?
- Which (if any) of the questionnaires didn't feel like a good fit for you?

How did you feel about giving your saliva and the way it was collected?

Appendix C1

Coding Transcript (example page)

Interview transcript – MSc Psychology Advanced Project

ANONYMISED TRANSCRIPT OF INTERVIEW - PARTICIPANT 'D'

1. **INTERVIEWER** - Now I put this...right recordings on...I've got to do
2. the transcript now. Live transcript. Okay. Okay, so what first of all,
3. motivated you to want to come to the program?
4. **PARTICIPANT** - And so, a couple of emails popped up throughout
5. the month -erm- telling me about this study and what interested-
6. what grabbed me was...how it said about stress and I think anxiety in
7. students. With that I've just been sitting my exam - so I was like yep
8. that's really relevant to me.
9. **INTERVIEWER** - Okay yeah
10. **PARTICIPANT** - And I like the idea of movement and helping with
11. internal bodily systems. And how they are linked so yeah I was really
12. interested.
13. **INTERVIEWER** - Oh great Okay, and how would you say you've been
14. feeling- you already said you were bit stressed, because you've been
15. doing exams so you were feeling obviously stress before the sessions.
16. And what did you think, then, after the sessions after the program in
17. terms of your- your stress levels and how you manage your stress
18. and so on.
19. **PARTICIPANT** - So this is really interesting because I just had to sit
20. an MCQ exam today and which for me is really stressful and I've
21. noticed since starting to study now that I've implemented breathing
22. techniques and and I'm dancing and I'm moving more to try and
23. relieve the feeling of butterflies in my stomach in the bodily
24. sensations of stress. And I wasn't half as stressed this time.
25. **INTERVIEWER** - Oh. Well that's really good to hear ..., and I like
26. your examples of the way the body expresses the stress butterflies
27. and so on. And how in tune were you, with your body though, prior

Author
Feelings of stress pre intervention

Appendix C2

Collating Codes into themes

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Appendix C2

Process of Coding: Participant Quotes to Codes Collecting in Themes & Subthemes

1. Enhanced Interoceptive Awareness

(i) Body Awareness

"...it kind of taught me to be more aware of bodily sensations. Yes, and yeah and to focus on them and not try to distract from it."
(Participant D, lines 253-254)

"If you experience stress levels, as we do, and possibly bit of anxiety, you're not really aware of the feelings in your body, and if you want to understand a bit more of how to deal with these feelings that these sessions would be perfect- for understanding how your body works- your internal states."
(Participant D, lines 286-291)

"I could say that I was completely disconnected from my body, actually- but now I'm moving more towards it, if that makes sense."
(Participant E, lines 110-112)

"Later on as another session went on, I used to get more and more comfortable and I used to enjoy, like, Yeah, and I will feel very fresh and very light and active after the session"
(Participant A, lines 8-10)

"you will actually learn how to understand your body processes or how to get in contact with your body, and to experience the feeling of freshness within inside."
(Participant A, lines 262-263)

"I began to pay attention more to my body. hmm yeah I used to do that before but on a greater level, now I've been going through the training"
(Participant G, lines 7-9)

"I felt more like I say more attune and akin with myself"
(Participant E, lines 45-46)

"I felt quite sort of bulky and awkward the first week, but then, as we went on it got better and better."
(Participant E, lines 51-52)

"The biggest change for me was I had plantar fasciitis on the bottom of my foot, and then Silvana, I think it was

Author
Intervention teaches not to distract from bodily sensations

Author
Intervention helps connect bodily feelings to stress and anxiety

Author
Enhanced connection with body since intervention

Author
Body feels more comfortable and lighter

Author
Intervention helps connect with body processes

Author
More attention to body since intervention

Author
Body felt more comfortable as sessions progressed

Author
Intervention led to awareness of less bodily pain

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Reduced Inhibition

"We got exercises when we closed our eyes and someone was watching so I was very self-conscious. Yeah first couple of times we did it. Towards the end not so much, but the first few times..."
(Participant D, lines 178-180)

69

Author
Loss of inhibition as sessions progressed

"You start to realize that it isn't just coincidence, this isn't just coincidence that you are feeling more open, connected with others, less inhibited, more relaxed"
(Participant C, lines 368-369)

"I would actually take my mom to a dementia class afterwards...I was joining in feeling really uninhibited...that was so much, thanks to this class...it allowed me to be a lot freer."
(Participant C, lines 368-369)

"I was able to be a lot, just freer and not really think about if it looked good, or if it was coordinated in any way"
(Participant C, lines 368-369)

"It's easy to feel -well I did anyway-to feel inhibited. But I felt very comfortable actually by the end and really didn't feel self-conscious at all."
(Participant C, lines 368-369)

"later on...I used to get more and more comfortable"
(Participant A, line 243)

"what I found was with the dance and the music playing and dancing with other people we mirrored each other- how my inhibitions had dropped how I was smiling"
(Participant D, lines 56-58)

Author
Reduced inhibition over programme

Author
Reduced inhibition allowed freer movement

Author
Freer movement- loss of inhibition

Author
Reduced self-consciousness-feeling comfortable

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Feeling Energised

"It felt very light and active. Yeah, and I would feel like I have a lot of energy to go on with the rest of the day or do stuff."
(Participant A, lines 224-225)

Author
Intervention creates feeling of energy

"my energy level at the beginning to be up about five, then increase to say eight."
(Participant B, line 81)

Author
Energy increase following intervention

"...it didn't feel like we did that much in terms of exercise, but yet you feel quite weirdly energized, relaxed."
(Participant C, lines 278-279)

Author
Feel energised without much exercise

"...you start to recognize the pattern that "Oh, I am feeling energized at the end of each of these sessions"
(Participant C, lines 368-369)

Author
Feel energised after each session

"...when I get tired in the afternoon that energy and I'm like "wow I'm really tired, I could use a nap right now," whereas before, I'd probably just have some sweets, or some sugar to power through...now I kind of- I won't have the sugar intake. I'll rest or listen to my body- and then I feel energized. Half hour an hour after that feeling remains."
(Participant D, lines 120-125)

Author
Using learned techniques to boost low energy levels

"...when I'm moving, I feel more energized. Yeh it's, a big link..."
(Participant D, lines 150-151)

Author
Movement creates feelings of energy

"My energy was probably a four (previously) and I'd say probably about eight after the session."
(Participant D, lines 225-227)

Author
Double the energy after the intervention

"And the movement with the songs that were played...I just instantly and smiling and happy and joyous. And when I'm moving, I feel more energized. Yeh it's, a big link, I think, between the movement and the music...movement it plays a big part I think in internal states..."
(Participant D, lines 149-152)

Author
Movement creates feelings of energy

"...when I'm moving, I feel more energized."
(Participant D, lines 150-152)

Author
Movement creates feeling of energy

"...during the session we, we used to do few activities and then we would ask to, you know, sit and write or draw or something about what was your experience...I just decided to draw, colours, and so good, because I don't know, I felt like an energy around me...and that I could see that energy around me in colours"
(Participant A, lines 243-248)

Author
Felt energy (as colours)

"I noticed immediately after the first, few sessions, that I would be very energized after the sessions."
(Participant E, lines 96-98)

Author
Feeling energised after interventions

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5. Enhanced WellBeing

Feeling Relaxed

"I would somehow feel very calm, instead of like more of a person that's got like a nervous energy all the time, but I had like a calm energy, like a calmness..."
(Participant E, lines 99-101)

Author
Intervention was calming

"watching my partner made me feel very calm and then I drew a picture and...my tree had roots. So that was quite nice- which I interpret as, you know, I had roots as I felt more grounded because they were a lot of ground up exercises..."
(Participant E, lines 186-191)

Author
Intervention was calming and grounding

"I wake up in a kind of an anxious state, definitely, and I would say that since the sessions I've definitely been able to wake up in a nicer way and sleep on longer."
(Participant C, lines 98-99)

Author
Feeling less anxious leads to better sleep

"...you are doing this exercise and you're focused on your breathing and you're focused on what the other person's doing and it keeps you quite, you know...keeps you engaged in the action. Is that're, and so the thinking part of the worrying and stressful part goes away"
(Participant C, lines 98-99)

Author
Mindful movement results in stress reduction

"I would compare it to like when you go traveling, you know- as opposed to going on holiday - so when you, when you get to sort of one week you think - "Ooh, I feel, relaxed now". When you get to two weeks, you go "Ooh, I thought I was relaxed then - no now I'm relaxed". Then when you get a month later, you think "I thought I was relaxed then- no this is it." This is it when you start to notice things, like the shape of your footprints in the sand or you just notice things you didn't before, because you are in that state of mind..."
(Participant C, lines 401-407)

Author
Growing relaxation over the weeks

"I'm dancing and I'm moving more to try and relieve the feeling of butterflies in my stomach in the bodily sensations of stress. And I wasn't half as stressed this time."
(Participant D, lines 22-24)

Author
Dancing/ Movement relieves stress

"...after the program after the training. I began to see because out walking the first day of the training after the exercises, I felt ...I'm so relaxed, relaxed, relax, then the second episode, it became better too..."
(Participant B, lines 92-94)

Author
Felt relaxed following intervention

"...when judgment is removed, you're relaxed...you can focus more, and you can do what you need to do more effectively"
(Participant B, lines 82-86)

Author
Intervention helps to remove judgment (brain is create relaxation)

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(Participant D, lines 56-59)

Managing Stress through Breathing

"I do have anxiety so the breathing exercises and all that sort of helped me, and I think that would help me in the future as well...So, yes, especially the breathing exercises a different way of breathing..."
(Participant A, lines 179-182)

"I do suffer with anxiety, so my ways of relaxing myself would be deep breathing"
(Participant A, lines 56-57)

"I've just been working on my assignment so it was stressful, I didn't get as stressed as I usually feel like you know. Okay, I need to stop, and you know like take deep breaths, maybe I think that is because of these sessions that happened."

67

(Participant A, lines 88-90)

...that was a quite stressful situation and to reach there on the time was a constant pressure I had on my head... So that just sort of gave me anxiety... I think (now) I would maybe like, just relax myself from the start...I would like maybe prepare myself by doing those exercises at home, and ... (If) I think that it's going to happen again, just before, like when I'm waiting at the bus stop, I could maybe do some breathings...like, just hand movements or something and then maybe I would relax.
(Participant A, lines 72-83)

"The biggest takeaway...? Just how important breathing is to regulate your um your internal states"
(Participant D, lines 251-252)

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you're focused on what the other person's doing and it keeps you quite, you know, keeps you engaged in the action...and so the thinking part of the worrying and stress goes away, while you're involved, I suppose, in the movement. You're, not just in a posture like in yoga you're actually following the movement, so you didn't have time to think of anything else...and you don't know what's coming next, it's the spontaneity of somebody else's decision.
(Participant C, lines 178-185)

"when we spoke about it afterwards, they said that they actually felt like what movements, I was going to do, and they could actually feel the hands moving, even though their hands weren't moving."
(Participant E, lines 148-151)

4. Managing Stress

Managing Stress through Movement

"the movement which get you in contact with your body sensations and, like, focusing on your body movements and like focusing on your breath..."
(Participant A, lines)

"After these sessions, I think I would involve the things that I've learned there to sort of implementing my anxiety and see if it works, because I found this was more relaxing compared to what I usually do when I go through anxiety"
(Participant A, lines 59-61)

"During the session...there was a time where you're paired...You move the same way your partner moving, so you just focus on that too, you're not thinking of anything...I was just enjoying the moment...They took away your worries. I wasn't even thinking of anything out there at all."
(Participant B, lines 238-242)

I just had to sit an MCQ exam today and which for me is really stressful and I've noticed since starting to study now that I've implemented breathing techniques and and I'm dancing and I'm moving more to try and relieve the feeling of butterflies in my stomach in the bodily sensations of stress. And I wasn't half as stressed this time.
(Participant D, lines 19-24)

"...what I found was with the dance and the music playing and dancing with other people we mirrored each other- how my inhibitions had dropped how I was smiling how my body felt different it was less stressed."
(Participant D, lines 56-59)

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“What I found was with the dance and the music playing and dancing with other people we mirrored each other- how my inhibitions had dropped how I was smiling”
(Participant D, lines 56-58)

Empathetic Movement/ Mirroring

“There was these two exercises like one was like we just have to stand in front of one person and just like move hands with the other person and we’ll just move along the way, the person’s moving, without touching the person, so that sort of made me feel like to be... I just got connected to the other person and it just felt like at times, words are not required to like, you know, feel connected to another person...it does like movement, also it can make us get closer and understand people better.”
(Participant A, lines 28-33)

“...and the person has to interpret, to sort of understand what the other person is doing and that sort of made me feel connected to the other person because you sort of understood what the other person’s trying to do and you without even ... Participant without using any words, giving any description of my body movement. Yeah, without them giving any description you got to know what the person’s doing.”
(Participant A, lines 37-41)

the exercises where, we were standing in front of a partner mirroring what we’re doing...is for me, the biggest standout thing.
(Participant C, lines 228-234)

It was, it was a bit awkward to begin with, because I’m with strangers and I’m dancing. But a part of it was that, when we mirror each other so when someone did the actions and we copied as a group, it was wonderful when someone did the actions and we copied as a group, it was wonderful. We just felt like energies - our energies - were entwined”
(Participant D, lines 159-163)

“I just felt so connected with my partner and watching her move her hands and her body and what she did it was really, really great.”
(Participant E, lines 183-185)

“I’ve done quite a lot in the past of yoga and things like that, and I was trying to think what’s different about this and what I think it is. Is that whereas yoga can become a quite automatic, you know, you know the poses, and the sun salutation and though you’re supposed to be mindful, while doing them, your mind can easily wander and buzz around, whereas I think with this, what was interesting for me was the fact that because a lot of the time you’re kind of mirroring somebody else’s movements and you don’t know what those movements are going to be, you’re kind of quite mindful throughout the movement.”

Author
Dancing, mirroring led to happier feelings

Author
Connecting to others through mirroring movement

Author
Mirroring connects you with people

Author
Mirroring was the standout aspect of TBMA

Author
Mirroring helped overcome inhibition

Author
Mirroring connected the group

Author
Mirroring connects you with people

Author
Mirroring makes you present

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Facilitation

“I actually liked the way she made all of us, interact with each other. Like...it was not very forceful, it was very casual. It was like, it was a very friendly way, how she was trying to motivate us and she’s like, ‘it’s okay, you know, just do whatever you feel like, it’s okay, if you don’t like, also it’s okay to say anything.’”
(Participant A, lines 199-201)

Yes, and so initially my biggest fear was dancing in front of strangers, and you know the inhibitions like Oh, my goodness, help, but she just put me completely at ease she was lovely just so friendly and welcoming.
(Participant D, lines 205-208)

“she was very open so that made me feel encouraged like I could also be a little more open”
(Participant D, lines)

“And I actually like the way she, you know, made this more interactive and got more, made it more fun, like.”
(Participant A, lines 37-41)

65

Author
Facilitator encouraged bonding

Author
Facilitator helped to overcome inhibitions with group

Author
Facilitator encouraged openness

Author
Facilitator encouraged interactivity with the group

“...the more you do it, the more you realise there’s more to it - the more you realize, how skilful it is in making it feel like it’s improvised as it goes along. There is a genuine kind of sort of supporting of the group spirit in that, in that process.”
(Participant C, lines 37-41)

3. Embodiment
Free Movement

“...it reminded me of you know, when I was a child, I just kept dancing around the garden, you know, like completely just free movement...”
(Participant D, lines 205-208)

Author
Facilitator subtly supported group

Author
Moving freely like being a child

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(Participant D, lines 161-163)

"when we first started there was a lot of individual differences between us - which was great and it's it probably brought me together with people that I would never spoken to in everyday life, which was nice."

(Participant D, lines 195-198)

"the more we connected as a group and the more comfortable I felt."

(Participant E, line 125)

"we changed partners a lot -and that was also kind of good, because you felt more like relaxed."

(Participant E, line 128)

"I think, for me it was about the people that were in the group were very non-judgmental and just like very supportive and positive and - yeah it's just really good."

(Participant E, lines 132-134)

"I was working with one specific person and I felt very connected to them when we were doing the movements, so that when we just looked at each other- not stared but looked – and I felt a bit uncomfortable, but then we did those kind of hand movements and then I felt very connected to the person."

(Participant E, lines 143-147)

"...they could feel it so that is like very, very connected and I've never experienced something like that, before. And it felt very peaceful. Also, in watching this other person I felt very calm watching them."

(Participant E, lines 153-154)

"...when I showed the group my art they said that the apples looked like hearts. And that made me feel - that was a very special moment, because it made me feel really held."

(Participant E, lines 191-194)

"I think it was just a really wonderful experience of being in it- in a group of people where we were all in the moment and we were all doing unconscious movements that we- you know felt in the moment..."

(Participant E, lines 284-287)

"seeing the other people letting themselves go, so to speak, that kind of gives you that boost of confidence."

(Participant E, lines 173-175)

Author
Group brought different types of people together

Author
Connection with group members felt comfortable

Author
Changing partners helped connection with the group

Author
Felt supported and not judged by group

Author
Movement helped connect with group members

Author
Connecting with group members felt calming

Author
Group cohesion through metaphor

Author
Group bonding felt present

Author
Loss of inhibition with group leads to increased confidence

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The biggest takeaway...Just how important breathing is to regulate your um your internal states..."

(Participant D, lines 251-252)

"I tried to do a bit of breathing because I noticed immediately after the first, few sessions, that I would be very energized"

(Participant E, lines 96-97)

2. Group Cohesion

Connecting With Others

"So there was these two exercises...like one was like we just have to stand in front of one person and...we'll just move along the way, the person's moving, without touching the person, so that sort of made me feel...connected to the other person"

(Participant A, lines 28-31)

"I sort of don't like to talk to people a lot. So, I'm like, enjoy it. So, yeah, it's just that part, but yes, I know once I go there within the next 10 minutes, I am good"

(Participant A, lines 194-196)

"...the person has to interpret, to sort of understand, what the other person is doing and that sort of made me feel connected to the other person because you sort of understood what the other person's trying to...without even...using any words, giving any description of my body movement. Yeah, without them giving any description you got to know what the person's doing."

(Participant A, lines 37-41)

"I was focusing on my, my partner, because we had to look at our partner...to see the beauty of God in her, some things I never noticed in the past months we've been together because I knew her, and then I could see. Oh she is so lovely. I could see, the beauty of God in her."

(Participant B, lines 262-264)

"Generally, I felt, 9/10 very comfortable and yeah, I mean we were very different characters all of us, and yet I felt very connected, very uninhibited with them. yeah, I thought it was interesting how connected and how well, I felt like I got a sense of them by the end of it, given there are only four sessions."

(Participant C, lines 259-261)

"You start to realize that it isn't just coincidence, this isn't just coincidence that you are feeling more open, connected with others, less inhibited, more relaxed..."

(Participant C, lines 259-261)

Author
Importance of breathing to regulate emotion

Author
Breathing makes energised

Author
Connecting to the group through mirroring movement

Author
Overcoming social anxiety to connect with others

Author
Feeling connected to your partner

Author
Feeling spiritually connected with partner

Author
Feeling connected and uninhibited with the group

Author
Feeling connected with others in the group and less inhibited

Author

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“I do have anxiety so the breathing exercises and all that sort of helped me and I think that would help me in the future as well.”
(Participant A, lines 179-182)

“I never knew this kind of breathing that we’ve been taught in the session.”
(Participant A, lines 111-112)

“When my body feels comfortable, I noticed that my breathing is balanced...”
(Participant B, lines 92)

“I think I’m more aware of my breathing and yes, I think that’s been the main change in in terms of. Um I try and sort of tune into that at times in the day and sort of realize if I’m feeling a bit anxious or anything like that, I do try to take it back to the breathing and also, particularly the way of breathing that Silvana described sort of inflating your belly when you’re breathing, breathing in that kind of thing.”
(Participant C, lines 52-56)

“...I think, as a takeaway from this...being more mindful of taking time out in the day, to always check in on my breath.”
(Participant C, lines 337-344)

“I practice meditation and yoga and I’ve learned about breathing techniques. What was interesting was the technique, I was taught in the sessions was different to the other breathing techniques I’ve been taught”

63

Author: Breathing helped anxiety

Author: Different breathing technique

Author: Balanced breathing when body comfortable

Author: Using breathing technique for anxiety

Author: Becoming more mindful of breathing

Author: Different breathing technique

(Participant D, lines 30-33)

I adjust my posture as well and I bring my shoulders back and I link it with my breathing because it was taught, we were taught to breathe from the stomach...When you’re upright it’s a lot more lung capacity...
(Participant D, lines 92-96)

The biggest takeaway...Just how important breathing is to regulate your um your internal states...

Author: Breathing techniques linked with posture

Author: Importance of breathing to regulate emotion

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“I could really feel different sensations in my body to before and after.”
(Participant D, lines 92-93)

“the way I consume food and when I’m hungry that definitely has changed. I can tend to pick on the cue when I’m hungry now - when I need to eat.”
(Participant D, lines 69-72)

I do tend to feel hungry a lot so I can’t say that changed that much.
(Participant E, lines 62-63)

“...so yeah I-I tend to slump forward a lot so I’m more aware of it, and then I’m like okay sit up. So when I slump I notice about being over the laptop a lot of aches and pains because it’s that slumped movement, but I noticed when I’m upright my core, muscles feel nice- I just feel more- I don’t feel so tense in my body.”
(Participant D, lines 100-103)

how connected with your body, would you say you were in the scale of say nought to 10.
Participant- On a scale of zero to 10. Yeah, before. So, I would say like maybe two, yeah two. And after the session I could say maybe eight.

(i) Awareness of breathing

“I found it difficult to pay attention to my breathing while doing other things, but because of that training, I made an effort afterwards to pay attention to my breathing”
(Participant B, lines 17-19)

...as another session went on, I used to get more and more comfortable...because of the kind of activities that were done there, the movement which get you in contact with your body sensations and, like, focusing on your body movements and like focusing on your breath.
(Participant A, lines 8-16)

“...you feel like doing good, so I think it’s mainly because of focusing on the breath and just focusing on how our body reacts when we breathe in and breathe out.”
(Participant A, lines 18-19)

Author: Body awareness change pre/ post intervention

Author: Increased awareness of bodily (hunger) cues

Author: No increased awareness of hunger cues

Author: Awareness of posture when sitting

Author: Pay attention to breathing

Author: Feel comfortable through focusing on breath

Author: Focusing on the benefits of breathing

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Appendix D

Recruitment Advert

Connect your mind and body for wellbeing

We are recruiting student participants experiencing stress or anxiety to take part in a new research study investigating how increasing body awareness (interoception) may support wellbeing.

What?

Small group sessions led by a trained facilitator guiding you in ways to enhance your interoception

When?

Monday mornings, 6th, 13th, 20th and 27th June 2022

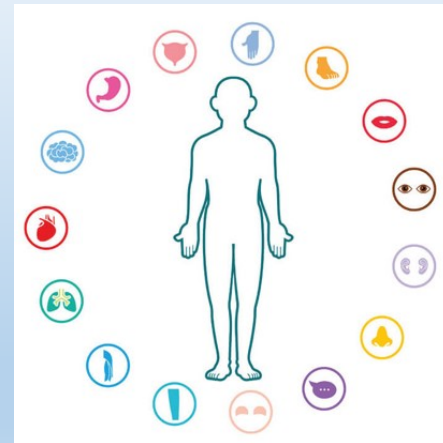
Where?

De Havilland Campus, University of Hertfordshire

If you would like to take part, or for more information, please email Shirley on sl200am@herts.ac.uk or call Lori on 07488389479

or go to https://herts.eu.qualtrics.com/jfe/form/SV_ahqMRWwhDdbTMnY

*This research study has been approved by the University of Hertfordshire Health, Science, Engineering and Technology Ethics Committee with Delegated Authority, UH protocol number aLMS/PGT/UH/04966(1)



Appendix E

FORM EC6: PARTICIPANT INFORMATION SHEET

1 Title of study

A pilot study exploring a novel interoceptive body awareness intervention to support student mental health

2 Introduction

You are being invited to take part in a study. Please take the time to read the following information carefully and discuss it with others if you wish. Do not hesitate to ask us anything that is not clear or for any further information you would like to help you make your decision. The University's regulation, UPR RE01, 'Studies Involving the Use of Human Participants' can be accessed via this link:

<https://www.herts.ac.uk/about-us/governance/university-policies-and-regulations-uprs/uprs>

(after accessing this website, scroll down to Letter S where you will find the regulation)

Thank you for reading this.

3 What is the purpose of this study?

The aim of this study is to investigate the feasibility of a new, interoceptive body awareness programme for students who self-identify as stressed and anxious in a non-clinical sense. Interoceptive awareness is the ability to sense internal signals from the body. These signals can play a role in emotion expression and regulation. Recent research suggests that learning to understand and respond appropriately to signals from the body may be a useful strategy to help cope with stress and anxiety. The present study aims to explore how acceptable students find the new interoceptive body awareness programme, and the measures used to assess stress and anxiety.

4 Do I have to take part?

It is completely up to you whether or not you decide to take part in this study. If you do decide to take part, you will be asked to sign a consent form. Agreeing to join the study does not mean that you have to complete it. You are free to withdraw at any stage without giving a reason. A decision to withdraw at any time, or a decision not to take part at all, will not affect any treatment/care that you may receive (should this be relevant).

5 Are there any age or other restrictions that may prevent me from participating?

Participants must be over 18 and be students at the University of Hertfordshire. You will not be eligible to participate in the study if in the last 6 months you have been under the care of a consultant psychiatrist, taking medication for a clinically diagnosed mental health condition, or experienced a complex trauma or complex bereavement, or if you have ever been diagnosed with an eating disorder, clinical depression or a psychiatric condition. You must be available to take part in the sessions on Mondays in June 2022.

6 How long will my part in the study take?

If you decide to take part in this study, you will be involved mainly on Monday mornings in June 2022. This breaks down into:

- Questionnaire completion, saliva collection, and interoception body awareness sessions from 9.30 – 12 pm (approximately) on 6th & 27th June 2022.*
- Interoception body awareness sessions from 10 – 11.30 am (approximately) on 13th & 20th June.*
- A Zoom or on campus (as you prefer) interview for about one hour, scheduled in the week of 27th June 2022 following the final session.*
- A follow up questionnaire taking about 20 minutes to complete 2-3months after the last session.*

7 What will happen to me if I take part?

You will be sent a link to this information sheet online and asked to click to confirm your consent to answer some questions to ascertain whether you are eligible to take part, including questions about your mental health. If you are eligible, you be sent the information sheet again and consent form by email and asked to sign to give your consent to take part in the study. You will be asked some questions about your age, gender, ethnicity and year/level of study at the University of Hertfordshire. If the study is oversubscribed, you may be put on a waiting list and invited to take part only if other participants drop out before the sessions start.

*The 4 x weekly sessions will be held on the University de Havilland campus on the **6th, 13th, 20th, 27 June 2022, each session lasting between 1.5 - 2.5 hours.** Following arrival at the first session, you will be asked to complete questionnaires online on your phone or another device (by following a link) that ask how you are feeling. Paper copies of the questionnaires will be provided if you do not have a device to access the internet with you. This should take about 15-20 minutes.*

Next you will be asked to provide a saliva sample by drooling into a tube. This is done by tilting your head forwards and dribbling into the saliva test tube. Do not try to 'cough up' saliva. It should collect in the mouth naturally when the head is tilted forwards and can then be drooled into the tube. This may take around 3 mins, or up to 5 mins if you are dehydrated, to collect 10 mls of saliva. We ask you not eat or drink, or undertake vigorous exercise, for at least one hour before the first session, except for water that may be drunk up to 15 minutes before the saliva collection. The saliva samples will be analysed later in the laboratory to measure levels of the hormone cortisol.

After this, you will take part in a class, led by a professional psychotherapist, providing training in interoception body awareness techniques, for example body-mindfulness, movement, sensory awareness, emotional self-regulation, acceptance and self (body) compassion, mindful movement in the moment and relaxation. The class will be with a group of up to 12 students and will take place in a well-ventilated room with the chairs widely spaced. The second and third sessions will involve the interoception body awareness training only, not the questionnaires or saliva samples.

Following the final (4th) session you will be asked to complete the questionnaires again online and give a second saliva sample, which should take no more than 20-30 minutes overall.

You will then be asked to schedule an interview (either on-line or in-person on campus) with a researcher in the week of the last intervention (w/c 27th June) to talk about your experience of the sessions. The interview should take around 30-45 minutes.

Two to 3 months following the sessions, you will be contacted by email and asked to complete the questionnaires online again which should take around 15-20 minutes to complete.

8 What are the possible disadvantages, risks or side effects of taking part?

There are no foreseeable risks or disadvantages of taking part. The questions to check your eligibility, including questions about your mental health, and completing the questionnaires that ask about your feelings, may make you feel uncomfortable. You may possibly feel uncomfortable about being part of a group, however if this is the case, you are encouraged to discuss this with the facilitator or researchers.

9 What are the possible benefits of taking part?

Taking part in the interoception body awareness sessions may enhance your body mindfulness, sensory awareness, emotional self-regulation, self (body) compassion and relaxation. You may be interested to learn about these techniques.

10 How will my taking part in this study be kept confidential?

The data collected in this study will be anonymised and stored electronically, in a password-protected environment on the University of Hertfordshire One Drive. Your personal data will be stored electronically in the password-protected environment on the University of Hertfordshire One Drive for up to 5 years after which time it will be deleted.

11 Audio-visual material

Interviews will be audio recorded, then transcribed after which the audio recording will be destroyed. The transcript of the interview will be stored anonymously in a password-protected environment on the University of Hertfordshire One Drive.

12 What will happen to the data collected within this study?

After the data has been collected names will be replaced with an anonymity code. The anonymized data will be stored electronically, in a password-protected environment on the University of Hertfordshire One Drive. Your personal details may be kept for up to 5 years after which time they will be deleted. The anonymised data may be kept indefinitely.

The results of the study and/or the raw data collected (in an anonymized form) may be deposited in an open access repository, as required for publication in some journals. The location of the repository will depend on the requirements of the particular journal if the results of the study are published.

13 Will the data be required for use in further studies?

The anonymised data may be reanalysed in future research or used in conjunction with data collected from a different group of participants as part of a future ethically approved study.

14 Who has reviewed this study?

This study has been reviewed by:

- *The University of Hertfordshire Health, Science, Engineering and Technology Ethics Committee with Delegated Authority*

The UH protocol number is XXXX

15 Factors that might put others at risk

Please note that if, during the study, any medical conditions or non-medical circumstances such as unlawful activity become apparent that might or had put others at risk, the University may refer the matter to the appropriate authorities and, under such circumstances, you will be withdrawn from the study.

16 Who can I contact if I have any questions?

If you would like further information or would like to discuss any details personally, please get in touch with us by email: [REDACTED], sl20aam@herts.ac.uk or [REDACTED] lt21abo@herts.ac.uk.

Although we hope it is not the case, if you have any complaints or concerns about any aspect of the way you have been approached or treated during the course of this study, please write to the University's Secretary and Registrar at the following address:

Secretary and Registrar
University of Hertfordshire
College Lane
Hatfield
Herts
AL10 9AB

Thank you very much for reading this information and giving consideration to taking part in this study.

Appendix F

Stage 1 consent

In order to check that you are eligible to take part in this study, we need first to ask you to confirm some information about yourself. This includes asking you about your mental health. As explained in the Information Sheet, you will not be eligible to take part in the study if in the last 6 months you have been under the care of a consultant psychiatrist, taking medication for a clinically diagnosed mental health condition, or experienced a complex trauma or complex bereavement, or if you have ever been diagnosed with an eating disorder, clinical depression or a psychiatric condition.

Do we have your consent to ask you about your mental health and other information to establish if you are eligible to take part in the study?

Yes, I consent to giving the information required to determine whether I am eligible to take part in the study: ☐

No, I do not consent to giving the information required and will not proceed with the study: ☐

Appendix G

Exclusion Criteria

Participation in this study is subject to the following criteria.

To establish your eligibility for this study, please can you confirm the following: (check the box to confirm the statement is correct)

- You are at least 18 years of age ☐
- You are currently a student at the University of Hertfordshire ☐
- You are fluent in English ☐
- You have not been under the care of a consultant psychiatrist in the past 6 months ☐
- You have not been taking medication for a clinically diagnosed mental health condition ☐
- You have not been diagnosed with a psychiatric disorder ☐
- You have not been diagnosed with an eating disorder ☐
- You have never been diagnosed with clinical depression ☐
- You have not experienced a complex trauma in the past 6 months ☐
- You have not experienced a complex bereavement in the past 6 months ☐
- You are available to attend 4 sessions at the University of Hertfordshire de Havilland campus on: MONDAY 6th, 13th, 20th, 27th June 2022 (*sessions from 9.30 am – 12 noon approximately on 6th & 27th June; from 10 am – 11.30 am approximately on 13th & 20th June 2022.* ☐
- You will you be available for a follow up Zoom call lasting no more than 1 hour at a time of your choosing during the week commencing 27/06/22 ☐

Thank you for your responses. We are only able to take a maximum of 12 participants for this study. If it should be oversubscribed, you will be placed on a waiting list, and we will contact you.

Stage 2 consent (word document returned by email or hard copy)

**UNIVERSITY OF HERTFORDSHIRE
ETHICS COMMITTEE FOR STUDIES INVOLVING THE USE OF HUMAN PARTICIPANTS
(‘ETHICS COMMITTEE’)**

**FORM EC3
CONSENT FORM FOR STUDIES INVOLVING HUMAN PARTICIPANTS**

I, the undersigned *[please give your name here, in BLOCK CAPITALS]*

.....
of *[please give contact details here, sufficient to enable the investigator to get in touch with you, such as an email address]*

.....
hereby freely agree to take part in the study entitled **A pilot study exploring a novel interoceptive body awareness intervention to support student mental health**

UH Protocol number

1 I confirm that I have been given a Participant Information Sheet (a link to which was provided with this form) giving particulars of the study, including its aim(s), methods and design, the names and contact details of key people and, as appropriate, the risks and potential benefits, how the information collected will be stored and for how long, and any plans for follow-up studies that might involve further approaches to participants. I have also been informed of how my personal information on this form will be stored and for how long. I have been given details of my involvement in the study. I have been told that in the event of any significant change to the aim(s) or design of the study I will be informed and asked to renew my consent to participate in it.

2 I have been assured that I may withdraw from the study at any time without disadvantage or having to give a reason.

3 In giving my consent to participate in this study, I understand that voice recording will be made of the interview for the purpose of transcribing the content. After the voice recording has been transcribed, the audio recording will be destroyed. The transcript will be anonymized and stored electronically in a password protected environment on the University of Hertfordshire One Drive.

4 I have been given information about the risks of my suffering any harm or adverse effects and I agree to complete any required health screening questionnaire in advance of the study.

5 I have been told how information relating to me (data obtained in the course of the study, and data provided by me about myself) will be handled: that the data will be stored securely on the University of Hertfordshire One Drive, that access to the data will be limited to the researchers, that any personal identifying information will be deleted after 5 years, that anonymized data may be stored indefinitely and that if the study results are published in a journal, the anonymized data may be published in an open access repository (freely available online) if required by the journal for publication.

6 I understand that if there is any revelation of unlawful activity or any indication of non-medical circumstances that would or has put others at risk, the University may refer the matter to the appropriate authorities.

Signature of participant.....Date.....

Signature of (principal)
investigators.....Date.....
Names of (principal) investigators [REDACTED]

Appendix H

Demographic questions

What is your age?

- 18-25
- 26-35
- 36-45
- Over 45
- Prefer not to say

How would you describe your gender?

- Male
- Female
- Other (with a blank entry field for the participant to self-identify)
- Prefer not to answer

What year at the University of Hertfordshire are you in?

- 1st year Undergraduate
- 2nd year Undergraduate
- 3RD year Undergraduate
- 1st year Postgraduate (MSc)
- 2nd year Postgraduate (MSc)
- PhD/Doctorate student

What is your ethnic background?

- White / Caucasian
- Asian - Eastern
- Asian - Indian
- Hispanic
- African-American
- Native-American
- Mixed race
- Other (.....Please self-identify)
- I prefer not to say

Is English your first language?

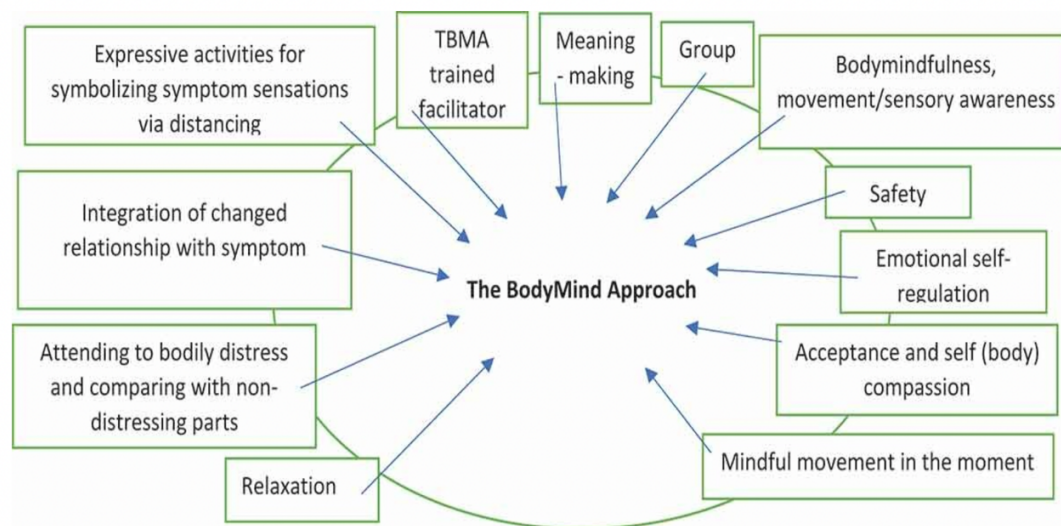
- Yes
- No

Do you consider yourself to have a disability?

- Yes
- No
- I prefer not to say

Appendix I

Figure 1. TBMA Model (Payne, 2021)



Appendix J

Debrief

A pilot study exploring a novel interoceptive body awareness intervention to support student mental health

(UH ethics protocol number XXXXXXXXX)

The study you have just participated in is designed to examine the impact of interoceptive body awareness intervention on mental health. There *were no right or wrong answers*. You may have felt that the TBMA sessions made no difference to your body awareness or stress levels and that opinion is just as valid and important as if you felt that the sessions had enhanced your body awareness and that this in turn had an effect on your stress levels.

We were interested in your experience of the programme - how you felt before, during and following the TBMA sessions: how connected you felt with your body; how you felt about being part of a group; how you felt about the facilitator; how relaxed you felt etc. However you may have experienced the sessions, we respect your feelings and thoughts and are grateful that you offered them to this study.

We were also interested in whether your experience on this programme has had any relationship with your stress and anxiety levels. It may be that you noticed no difference in how stressed or anxious you feel having completed the programme, and that opinion is as valid as if you had noticed a difference. Our interest is in your subjective experience.

Please remember that all of your answers to the questionnaires and interviews are completely anonymous and stored in a secure GDPR compliant, password protected location. All personal details will be destroyed once the data collection phase has been completed. Names will be replaced with a code. The raw data will be securely destroyed following the publication of the research, before 5 years post study completion.

If you have felt uncomfortable or distressed at any time during this study, please do not hesitate to inform the investigators: [redacted] and [redacted] with any of your concerns. Please also remember you have the right to withdraw your data from this study at any time up to the completion of the study.

You can also access free advice and extra support through the University Well-Being Services

<https://ask.herts.ac.uk/student-wellbeing>

The Samaritans hotline also offers a safe place for you to talk about anything that is bothering you. You can contact Samaritans on 116 123 at any time or visit the website for more details. <https://www.samaritans.org/>

The researchers will also be happy to disclose the findings of the study once these are analysed and supply you with a summary upon request.

If you are interested in further self-help guides to improve your mental health, please see below.

- www.nhs.uk/mental-health/self-help/guides-tools-and-activities/mental-wellbeing-audio-guides/
- www.nhs.uk/mental-health/self-help/guides-tools-and-activities/breathing-exercises-for-stress/

If you have concerns, or questions about this research, please feel free to contact us for any further details: at s120aam@herts.ac.uk lt21abo@herts.ac.uk, or contact Dr Lucy Annett at the Dept. of Psychology and Sports Science (University of Hertfordshire) on email address l.e.annett@herts.ac.uk, or tel. [redacted]

Thank you once again for your help

Appendix K

NVIVO (example page) Coding Transcripts into “Nodes”

The screenshot displays the NVIVO software interface for a project titled "A pilot study exploring a novel interoceptive body awareness intervention to support student mental health". The interface is divided into several panels:

- Left Panel (Navigation):** Contains a tree view under "DATA" with folders for "Files", "CODES", "CASES", "NOTES", "SEARCH", and "MAPS". Under "CODES", the "Nodes" folder is expanded, showing a list of nodes including "IMPRESSIONS OF INTER..." (which is selected and highlighted in blue).
- Center Panel (Transcript):** Displays a transcript for "ParticipantE". The text is numbered from 92 to 118. Several segments of the transcript are highlighted in yellow, indicating they have been coded. These segments include:
 - Line 96: "in the week I tried to do a bit of breathing because I noticed"
 - Line 97: "immediately after the first, few sessions, that I would be very energized"
 - Line 100: "calm, instead of like more of a person that's got like a nervous"
 - Line 101: "energy all the time, but I had like a calm energy, like a calmness"
 - Line 111: "disconnected from my body, actually- but now I'm moving more"
 - Line 112: "towards it, if that makes sense."
- Right Panel (Coding Density):** Shows a vertical bar chart representing the density of coding across the transcript. The chart has a purple bar at the bottom, corresponding to the "IMPRESSIONS OF INTER..." node. To the right of the chart, a list of nodes is shown, including "TAKEAWAYS FROM THE INTERVENTION", "DIFFICULTY OF DROOL COLLECTION", "RELEVANCE OF QUESTIONNAIRES", "SELF-ACCEPTANCE", "FEELING INHIBITED", "COMPARISON WITH ALTERNATIVE THERAPIES", "CONNECTION WITH GROUP MEMBERS", and "ENHANCED BODY AWARENESS".

The bottom status bar indicates "0 item selected" and shows the current path: "DATA > Files > INTERVIEWS > ParticipantE".

Appendix L

PHQ9 – Patient Health Questionnaire

PHQ-9 Depression

Over the last 2 weeks, how often have you
been bothered by any of the following problems?

(Use “✓” to indicate your answer”

	Not all	at Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things.....	0	1	2	3
2. Feeling down, depressed, or hopeless.....	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much.....	0	1	2	3
4. Feeling tired or having little energy.....	0	1	2	3
5. Poor appetite or overeating.....	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down.....	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television.....	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual.....	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way.....	0	1	2	3

Column totals ____ + ____ + ____ + ____

= Total Score ____

Appendix M

GAD7 – General Anxiety Disorder Assessment

GAD-7 Anxiety

Over the <u>last 2 weeks</u> , how often have you been bothered by the following problems? (Use "✓" to indicate your answer"	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 _____

Appendix N

PSS-10 – Perceived Stress Scale

For each question choose from the following alternatives:

0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

- _____ 1. In the last month, how often have you been upset because of something that happened unexpectedly?
- _____ 2. In the last month, how often have you felt that you were unable to control the important things in your life?
- _____ 3. In the last month, how often have you felt nervous and stressed?
- _____ 4. In the last month, how often have you felt confident about your ability to handle your personal problems?
- _____ 5. In the last month, how often have you felt that things were going your way?
- _____ 6. In the last month, how often have you found that you could not cope with all the things that you had to do?
- _____ 7. In the last month, how often have you been able to control irritations in your life?
- _____ 8. In the last month, how often have you felt that you were on top of things?
- _____ 9. In the last month, how often have you been angered because of things that happened that were outside of your control?
- _____ 10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Appendix O

BAQ – Body Awareness Questionnaire

Body Awareness Questionnaire (Shields, Mallory & Simon, 1989)

Instructions:

Listed below are a number of statements regarding your sensitivity to normal, nonemotive body processes. For each statement, select a number from 1 to 7 that best describes how the statement describes you and place the number in the box to the right of the statement.

	Not at all true of me						Very true of me
	1	2	3	4	5	6	7
1.	I notice differences in the way my body reacts to various foods.						☐
2.	I can always tell when I bump myself whether or not it will become a bruise.						☐
3.	I always know when I've exerted myself to the point where I'll be sore the next day.						☐
4.	I am always aware of changes in my energy level when I eat certain foods.						☐
5.	I know in advance when I'm getting the flu.						☐
6.	I know I'm running a fever without taking my temperature.						☐
7.	I can distinguish between tiredness because of hunger and tiredness because of lack of sleep.						☐
8.	I can accurately predict what time of day lack of sleep will catch up with me.						☐
9.	I am aware of a cycle in my activity level throughout the day.						☐
10.*	I <i>don't</i> notice seasonal rhythms and cycles in the way my body functions.						☐
11.	As soon as I wake up in the morning, I know how much energy I'll have during the day.						☐
12.	I can tell when I go to bed how well I will sleep that night.						☐
13.	I notice distinct body reactions when I am fatigued.						☐
14.	I notice specific body responses to changes in the weather.						☐
15.	I can predict how much sleep I will need at night in order to wake up refreshed.						☐
16.	When my exercise habits change, I can predict very accurately how that will affect my energy level.						☐
17.	There seems to be a "best" time for me to go to sleep at night.						☐
18.	I notice specific bodily reactions to being overhungry.						☐

Note: * indicates a reversed scored item.

Appendix P

BPQ – Body Perception Questionnaire

Body Perception Questionnaire Body Awareness Very Short Form

Stephen W. Porges © 1993, 2015

Please rate your awareness on each of the characteristics described below. Select the answer that most accurately describes you.

During most situations I am aware of:

		Never	Occasionally	Sometimes	Usually	Always
1	My mouth being dry	☐	☐	☐	☐	☐
2	How fast I am breathing	☐	☐	☐	☐	☐
3	A swelling of my body or parts of my body	☐	☐	☐	☐	☐
4	Muscle tension in my arms and legs	☐	☐	☐	☐	☐
5	A bloated feeling because of water retention	☐	☐	☐	☐	☐
6	Goose bumps	☐	☐	☐	☐	☐
		Never	Occasionally	Sometimes	Usually	Always
7	Stomach and gut pains	☐	☐	☐	☐	☐
8	Stomach distension or bloatedness	☐	☐	☐	☐	☐
9	Tremor in my lips	☐	☐	☐	☐	☐
10	The hair on the back of my neck "standing up"	☐	☐	☐	☐	☐
11	An urge to swallow	☐	☐	☐	☐	☐
12	How hard my heart is beating	☐	☐	☐	☐	☐
		Never	Occasionally	Sometimes	Usually	Always

Appendix Q

MAIA – Multidimensional Assessment of Interoceptive Awareness

Below you will find a list of statements. Please indicate how often each statement applies to you generally in daily life.

	Circle one number on each line					
	Never					Always
1. When I am tense I notice where the tension is located in my body.	0	1	2	3	4	5
2. I notice when I am uncomfortable in my body.	0	1	2	3	4	5
3. I notice where in my body I am comfortable.	0	1	2	3	4	5
4. I notice changes in my breathing, such as whether it slows down or speeds up.	0	1	2	3	4	5
5. I ignore physical tension or discomfort until they become more severe.	0	1	2	3	4	5
6. I distract myself from sensations of discomfort.	0	1	2	3	4	5
7. When I feel pain or discomfort, I try to power through it.	0	1	2	3	4	5
8. I try to ignore pain	0	1	2	3	4	5
9. I push feelings of discomfort away by focusing on something	0	1	2	3	4	5
10. When I feel unpleasant body sensations, I occupy myself with something else so I don't have to feel them.	0	1	2	3	4	5
11. When I feel physical pain, I become upset.	0	1	2	3	4	5
12. I start to worry that something is wrong if I feel any discomfort.	0	1	2	3	4	5
13. I can notice an unpleasant body sensation without worrying about it.	0	1	2	3	4	5
14. I can stay calm and not worry when I have feelings of discomfort or pain.	0	1	2	3	4	5
15. When I am in discomfort or pain I can't get it out of my mind	0	1	2	3	4	5
16. I can pay attention to my breath without being distracted by things happening around me.	0	1	2	3	4	5
17. I can maintain awareness of my inner bodily sensations even when there is a lot going on around me.	0	1	2	3	4	5
18. When I am in conversation with someone, I can pay attention to my posture.	0	1	2	3	4	5

MAIA – Multidimensional Assessment of Interoceptive Awareness (Cont.)

How often does each statement apply to you generally in daily life? Circle one number on each line

	Never					Always
19. I can return awareness to my body if I am distracted.	0	1	2	3	4	5
20. I can refocus my attention from thinking to sensing my body.	0	1	2	3	4	5
21. I can maintain awareness of my whole body even when a part of me is in pain or discomfort.	0	1	2	3	4	5
22. I am able to consciously focus on my body as a whole.	0	1	2	3	4	5
23. I notice how my body changes when I am angry.	0	1	2	3	4	5
24. When something is wrong in my life I can feel it in my body.	0	1	2	3	4	5
25. I notice that my body feels different after a peaceful experience.	0	1	2	3	4	5
26. I notice that my breathing becomes free and easy when I feel comfortable.	0	1	2	3	4	5
27. I notice how my body changes when I feel happy / joyful.	0	1	2	3	4	5
28. When I feel overwhelmed I can find a calm place inside.	0	1	2	3	4	5
29. When I bring awareness to my body I feel a sense of calm.	0	1	2	3	4	5
30. I can use my breath to reduce tension.	0	1	2	3	4	5
31. When I am caught up in thoughts, I can calm my mind by focusing on my body/breathing.	0	1	2	3	4	5
32. I listen for information from my body about my emotional state.	0	1	2	3	4	5
33. When I am upset, I take time to explore how my body feels.	0	1	2	3	4	5
34. I listen to my body to inform me about what to do.	0	1	2	3	4	5
35. I am at home in my body.	0	1	2	3	4	5
36. I feel my body is a safe place.	0	1	2	3	4	5
37. I trust my body sensations.	0	1	2	3	4	5

Appendix R

WEMWBS – Warwick-Edinburgh Mental Wellbeing Scales

The Warwick–Edinburgh Mental Well-being Scale (WEMWBS)

Below are some statements about feelings and thoughts.

Please tick the box that best describes your experience of each over the last 2 weeks

STATEMENTS	None of the time	Rarely	Some of the time	Often	All of the time
I've been feeling optimistic about the future	1	2	3	4	5
I've been feeling useful	1	2	3	4	5
I've been feeling relaxed	1	2	3	4	5
I've been feeling interested in other people	1	2	3	4	5
I've had energy to spare	1	2	3	4	5
I've been dealing with problems well	1	2	3	4	5
I've been thinking clearly	1	2	3	4	5
I've been feeling good about myself	1	2	3	4	5
I've been feeling close to other people	1	2	3	4	5
I've been feeling confident	1	2	3	4	5
I've been able to make up my own mind about things	1	2	3	4	5
I've been feeling loved	1	2	3	4	5
I've been interested in new things	1	2	3	4	5
I've been feeling cheerful	1	2	3	4	5

Warwick–Edinburgh Mental Well-being Scale (WEMWBS)

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Appendix S1

Cortisol Analysis (Performed by L. Baker- Lab Technician, University of Hertfordshire)

Cortisol Analysis Method

Participants were asked to passively drool into a saliva test tube until 5-10ml of saliva had been collected. A time limit on sample collection was used, for saliva flow rate to be calculated and accounted for in later analysis.

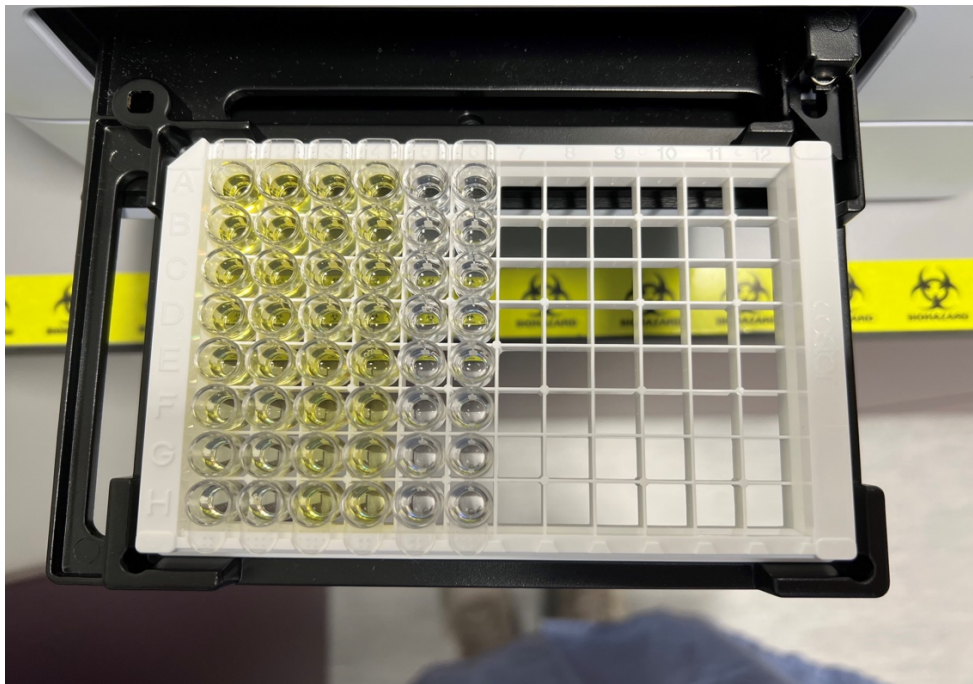
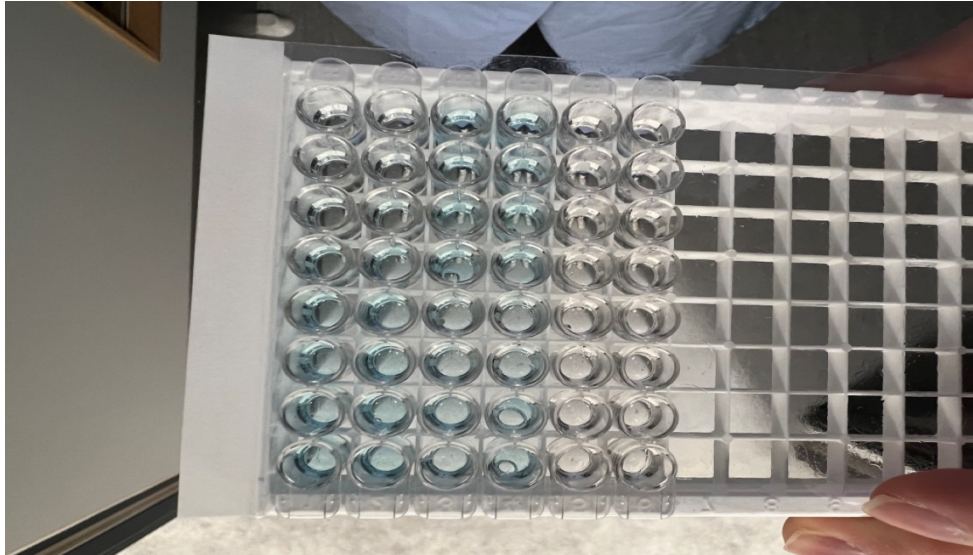
Saliva flow rate (ml/min) was determined by weighing individual saliva samples. The density of saliva was assumed to be 1.0 g·mL⁻¹ (Chicharro et al., 1998). Samples were aliquoted into Eppendorf tubes and double centrifuged at 4000 g for 10 minutes, to make acellular. Once the supernatant had been removed, samples were aliquoted into new Eppendorf tubes and stored at -20°C until analysis.

After thawing, samples were centrifuged and then analysed in duplicate using a human 96-well salivary IgA enzyme immunosorbent assay (ELISA). Ready-made standards (concentrations: 1,600; 800; 400; 200; 100; 50; and 0 pg/mL cortisol.) were used to create a seven-point standard calibration curve. This ELISA followed the 'sandwich' principle, where standards, controls and samples were added to wells pre-coated with highly purified human IgA. After the addition of goat anti-human IgA conjugated to horseradish peroxidase (HRP) and substrate solution (TMB), colour change was analysed on a plate reader (Multiskan™ FC Microplate Photometer, Thermo Scientific, USA) at 450nm to obtain the optical density of each well. Absorbance values of each well could then be analysed; the zero-absorbance value was subtracted from the unknown samples' absorbance value and concentration was then interpolated from the calibration curve using a 4-parameter logistic curve method (SigmaPlot) (Figure 3).

Appendix S2

Figure 3.

Photographs of ELISA Test being performed to analyse Cortisol Concentrations

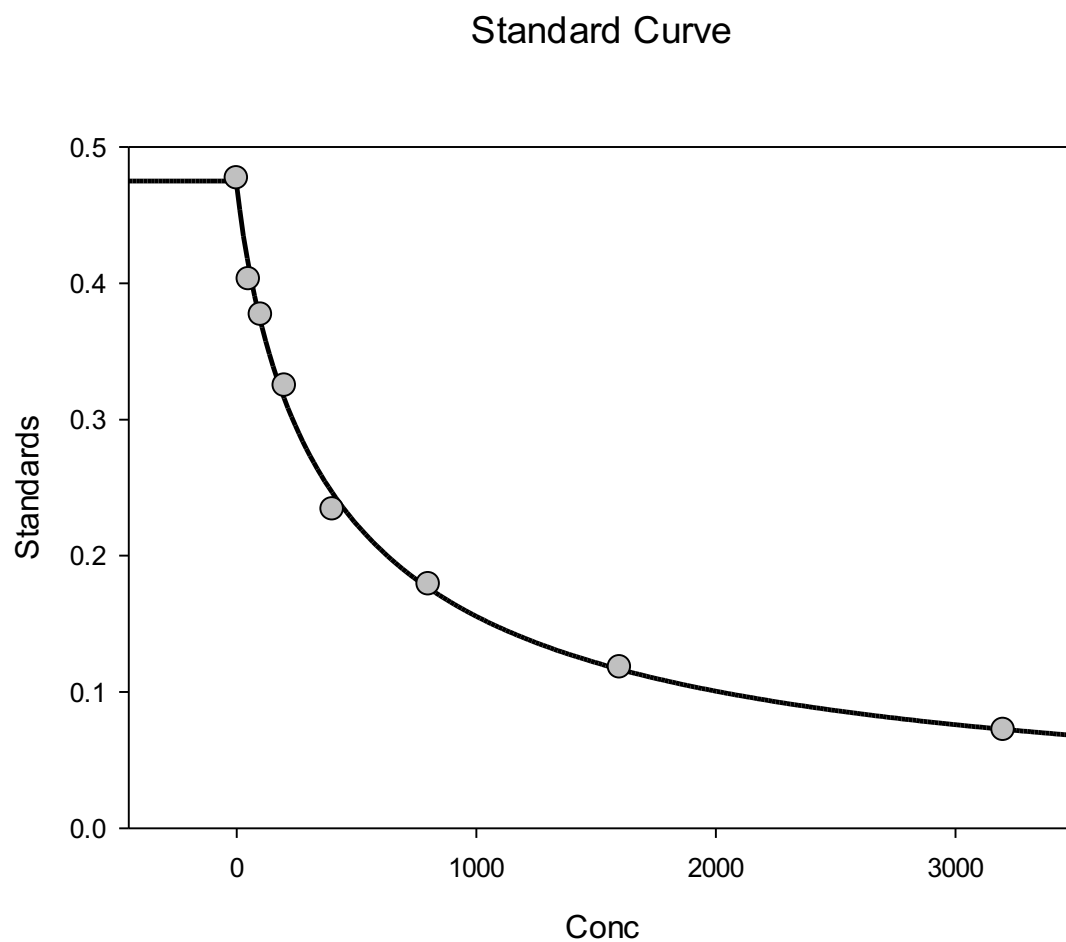


- Blue is the substrate, yellow is the stop solution.
- The gradient in colour in first two rows is the calibration (going up in concentration).
- All samples were run in duplicate

Appendix S3

Figure 4.

Graph showing Standard Calibration Curve for interpolating cortisol concentrations



Appendix T

Example Excel data showing participants' individual question scores and mean scores for MAIA subscales pre intervention.

(PHQ9, GAD7, BAQ, BPA, MAIA on different Excel pages as bottom tabs indicate)

ExcelPRE-INTERVENTION RESULTS OF QUESTIONNAIRES - Saved

Search (Option + Q)

HomeInsertDrawPage LayoutFormulasDataReviewViewAutomateHelp

Paste

Cut

Copy

Format Painter

Calibri

11

A⁺

A⁻

B

I

U

D

Align Center

General

\$

%

00

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Conditional Formatting

Format As Table

Styles

Insert

Delete

Format

AutoSum

Clear

Sort & Filter

Find & Select

Analyze Data

Clipboard

Font

Alignment

Number

Styles

Cells

Editing

Share

Comments

Catch up

MAIA-36MAIA-37TOTAL SCORESNOTICING SUBSCALENOT DISTRACTINGNOT WORRYINGATTENTION REGULATIONEMOTIONAL AWARENESSSELF-REGULATIONBODY LISTENINGTRUSTING

Circle one Circle one number on each line numbered 1 - never to 5 - always - I trust my body sensations

3261004.53.671.82.5732.752.672.67

34311631.672.63.0043.2532.33

434890.750.333.21.003.42.67

113722.53.6732.293.42.2500.67

4448144.003.82.14330.673

TOTAL MEAN SCORES922.952.672.882.23.362.61.672.27

Reverse scores: 1=6, 2=5, 3=4, 4=3, 5=2, 6=1

A) Noticing Awareness of uncomfortable, comfortable & neutral body sensations: Q1+Q2+Q3+Q4/4

B) Not Distracting: Tendency not to ignore or distract oneself from sensations of pain/ discomfort: Q5 (R)+ Q6(R)+ Q7(R)+ Q8(R)+ Q9(R)+ Q10(R) /6

C) Not Worrying: Tendency not to worry or experience emotional distress with sensations of pain or discomfort: Q11(R)+Q12(R)+Q13 +Q14 +Q15(R)/5

D) Attention Regulation: Ability to sustain & control attention to body sensations: Q16+Q17+Q18+Q19+Q20+Q21+Q22/7

E) Emotional Awareness: Awareness of connection between body sensations & emotional states: Q23+Q24+Q25+Q26+Q27/5

F) Self Regulation: Ability to regulate distress by attention to body sensations: Q28, Q29, Q30, Q31/ 4

G) Body Listening: Active Listening to body for insight: Q32, Q33, Q34 / 3

H) Trusting: Experience of ones body as safe & trustworthy: Q35, Q36, Q37/ 3

ORIGINAL DATA DOWNLOAD QUALTRIC

QUALTRICS- ALL QUESTIONNAIRES

PHQ9

GAD7

PSS

BAQ

BPQ (VSF)

MAIA

WEMBS

+

Appendix U

SPSS data files showing participants' scores (PHQ9, GAD7,BAQ, BPA, MAIA, MAIA subscores) pre and post TBMA intervention and Individual Cortisol Measures Pre and Post intervention

Questionnaires_data.sav [DataSet1] - IBM SPSS Statistics Data Editor

1 : MAIA_NOTWORRY... 2.40 Visible: 32 of 32 Variables

	PHQ9_PRE	PHQ9_POST	GAD7_PRE	GAD7_POST	PSS_PRE	PSS_POST	BAQ_PRE	BAQ_POST	BPQ_PRE	BPQ_POST	MAIA_PRE	MAIA_POST	MAIA_NOTWORRYING_PRE	MAIA_NOTWORRYING_POST	MAIA_NOTDISTRACTING_PRE	MAIA_NOTDISTRACTING_POST
1	3.00	1.00	5.00	.00	10.00	8.00	108.00	98.00	46.00	44.00	100.00	131.00	4.50	4.25	3.67	2.67
2	4.00	2.00	4.00	3.00	23.00	13.00	90.00	108.00	37.00	43.00	116.00	133.00	3.00	3.75	1.67	1.00
3	10.00	1.00	12.00	7.00	24.00	8.00	67.00	95.00	26.00	29.00	89.00	111.00	.75	4.00	.33	2.83
4	1.00	1.00	.00	1.00	14.00	9.00	74.00	105.00	16.00	24.00	72.00	135.00	2.50	3.50	3.67	2.67
5	.00	.00	2.00	.00	5.00	7.00	62.00	83.00	32.00	28.00	83.00	87.00	4.00	3.75	4.00	4.17
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Data View Variable View

Questionnaires_data.sav [DataSet1] - IBM SPSS Statistics Data Editor

22 : MAIA_TRUSTING... Visible: 32 of 32 Variables

	MAIA_NOTWORRYING_PRE	MAIA_NOTWORRYING_POST	MAIA_ATTENTIONREGULATION_PRE	MAIA_ATTENTIONREGULATION_POST	MAIA_EMOTIONALAWAWARENESS_PRE	MAIA_EMOTIONALAWAWARENESS_POST	MAIA_SELFREGULATION_PRE	MAIA_SELFREGULATION_POST	MAIA_BODYLISTENING_PRE	MAIA_BODYLISTENING_POST	MAIA_TURSTING_PRE	MAIA_TURSTING_POST	WEMBS_PRE	WEMBS_POST	CORTISOL_PRE	CORTISOL_POST
1	1.80	2.40	2.57	3.86	3.00	4.00	2.75	4.00	2.67	4.00	2.67	4.00	38.00	43.00	389.07	479.96
2	2.60	1.80	3.00	2.43	4.00	4.40	3.25	3.75	3.00	3.67	2.33	4.33	33.00	42.00	879.11	1271.27
3	3.20	1.80	1.00	2.86	3.40	4.40	1.75	4.00	2.00	1.67	2.67	2.33	34.00	31.00	296.18	251.47
4	3.00	4.40	2.29	3.86	3.40	5.00	2.25	4.50	.00	3.33	.67	4.67	29.00	48.00	697.03	586.13
5	3.80	2.40	2.14	2.14	3.00	3.80	3.00	2.75	.67	2.00	3.00	3.00	48.00	47.00		
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