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**University of Southampton**

Faculty of Environmental and Life Sciences

School of Psychology

**Yoga and Dialectical Behaviour Therapy**

Volume 1 of 1

by

**Halina Willis**

Thesis for the degree of Doctorate in Clinical Psychology

May 2024

Total word count: 18,935

# University of Southampton

## **Abstract**

Faculty of Environmental and Life Sciences

School of Psychology

Doctor of Psychology

Yoga and Dialectical Behaviour Therapy

by

**Halina Willis**

There is a continually growing evidence base for both yoga and dialectical behaviour therapy (DBT) as interventions leading to improved psychological outcomes. Previous research suggests conceptual commonalities between yoga and the DBT skills modules. A model presented by Bennetts (2022) postulates that yoga and DBT may target shared transdiagnostic psychological processes, in DBT via skills practice and in yoga via rehearsal of the eight limbs. However, this has not been discussed in great depth, or supported by empirical research. There are implications for further research comparing the efficacy of yoga and DBT, and the potential for more holistic interventions to be offered in clinical practice.

Chapter one presents a systematic review of mediation studies exploring the mechanisms of change in DBT. Eighteen studies were included in the review. Identified mediators were in line with the theoretical basis of DBT and existing DBT literature. Skill use, emotion regulation, mindfulness and experiential avoidance were supported as mediators between different variables in multiple studies. There was single case support for other concepts as mediators. Findings were limited by broad and overlapping constructs with regards to potential mediators, and heterogeneity in DBT interventions, outcome measures and clinical populations. Directions for future research and the clinical implications are discussed.

Chapter two presents a quantitative cross sectional study investigating the relationship between the eight limbs of yoga, the four skills modules of DBT, and mental wellbeing. A total of 204 yoga practisers (YP) and 229 non-yoga practisers (NYP) ( $N = 433$ ) were recruited to complete an online survey. Participant scores on self-report measures indicated that YPs had significantly greater levels of emotion regulation, distress tolerance, mindfulness, interpersonal satisfaction and mental wellbeing than NYPs. Each of the eight limbs of yoga correlated with at least one outcome measure. Total scores on each outcome measure were predicted by certain limbs; yama was the most consistent predictor. This study adds to existing DBT literature in evidencing a significant strong correlation between the four measures relating to the four DBT skills modules. Clinical implications and recommendations for future research are discussed.

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# Research Thesis: Declaration of Authorship

Print name: Halina Willis

Title of thesis: Yoga and Dialectical Behaviour Therapy

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

I confirm that:

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

Signature. ....Date:16.05.24

## Acknowledgements

I would like to thank my primary supervisor, Ali Bennetts, for her guidance and feedback throughout this project. I would like to thank Jo Williams, not only as my thesis supervisor but also a brilliant colleague, clinical supervisor, and friend. I would like to thank all of my other clinical supervisors who have supported me through the doctoral journey and have provided a variety of learning experiences, and the colleagues who have made each placement so enjoyable.

I would like to thank my research colleague and friend Nadine, for her support and advice, for sharing this experience with me, and for always being at the end of a Teams call when I needed it. Thank you to my tea buddy Hannah, for always checking in and drinking countless cups of tea with me.

I thank my friend Laura for introducing me to yoga, and accompanying me to numerous yoga classes. My own experiences of yoga undoubtedly sparked my interest and belief in the potential psychological benefits of yoga. To all of my friends, thank you for your sense of fun and for always making me smile, offering welcome distractions from studying.

I would like to express my gratitude to my family, for their ongoing love and support, and their belief that I can achieve anything that I set my mind to. I would particularly like to thank my husband, Lucas. We have been through this doctorate and thesis together. Your unconditional love and understanding has helped me through so much. I don't have enough words to express just how grateful I am for you.

I would finally like to thank each participant for taking the time to be part of this research.

## Abbreviations

DBT.....Dialectical Behaviour Therapy

DBT-ST           Dialectical Behaviour Therapy Skills Training

DERS.....Difficulties in Emotion Regulation Scale

DT.....Distress Tolerance

DTS.....Distress Tolerance Scale

DV.....Dependent Variable

ER.....Emotion Regulation

FIAT-Q-SF.....The Functional Idiographic Assessment Template- Questionnaire- Short Form

FFMQ.....Five-Facet Mindfulness Questionnaire

IE.....Interpersonal Effectiveness

IV.....Independent Variable

SWEMWBS.....The Short Warwick Edinburgh Mental Wellbeing Scale

TA.....Therapeutic Alliance

TAU.....Treatment as usual

RCT.....Randomised Controlled Trial

## Chapter 1 Systematic Literature Review

**Title:** What are the mechanisms of change in Dialectical Behaviour Therapy interventions for clinical populations? A systematic review of mediation studies.

**Journal specification:** This review has been prepared for submission to the following journal: Clinical Psychology & Psychotherapy. No word limit is given for review articles.

See Appendix A for author guidelines.

Word Count: 8512 (excluding abstract, figures, tables, and references)

## Abstract

**Background and Purpose:** Dialectical behaviour therapy (DBT) is an evidence based intervention offered in NHS mental health services, however, the mechanisms which lead to psychological change in DBT are not fully understood. Postulated mechanisms of change in DBT have been discussed, however, this is the first paper to systematically review mediation studies to address this question. **Methods:** A systematic search was performed following PRISMA guidelines. Studies were eligible if they included at least one direct DBT intervention in an adult sample, and in a clinical population. **Results:** Eighteen empirical studies were suitable for inclusion. The review found support for a number of mediators; the most consistently reported were skill use, emotion regulation, mindfulness and experiential avoidance. The conceptual overlap between possible mediators was recognised. Results are limited by heterogeneity in DBT interventions, outcome measures and clinical populations. **Conclusions:** Results were broadly in line with the theoretical basis of DBT and empirical investigations. Suggestions are made for future research, such as the need to establish temporal precedence in mediation analyses and operationalise DBT constructs. The review provides a basis for future research into the mechanisms of change in DBT.

## Key Practitioner Points

- Results broadly supported the theoretical basis of DBT and previous literature on the mechanisms of change in DBT.
- The most commonly supported mediators were skill use, emotional dysregulation, experiential avoidance, and mindfulness. Single case support was found for additional mediators.
- There is conceptual overlap between the mediators identified and the a to clearly define DBT constructs.
- Further research is needed to understand the distinct contribution of each proposed mediator and the interaction between these as potential mechanisms of change.

## Keywords

Dialectical behaviour therapy, systematic review, mediation, mechanisms of change, mental health

## 1.1 Introduction

This systematic review aims to address the question of what the mechanisms of change are in dialectical behaviour therapy (DBT) interventions for clinical populations. DBT was developed for chronically suicidal individuals with a diagnosis of borderline personality disorder (BPD) (Linehan, 1991). BPD (American Psychiatric Association, 2022) is also referred to as emotionally unstable personality disorder (EUPD; World Health Organization, 2019), depending on the diagnostic criteria being used, with controversy surrounding both diagnostic labels (Campbell et al., 2020a). This review will refer to BPD as this is consistent with DBT literature. Linehan et al.'s (1991) study was the first of multiple randomized controlled trials (Carter et al., 2010; Koons et al., 2001; Verheul, 2003) demonstrating the efficacy of DBT as a treatment for BPD. The evidence base has since expanded to explore the efficacy of DBT based treatments for other presentations, including generalised anxiety disorder (Malivoire, 2020), depression (Lynch et al., 2003), bipolar disorder (Jones et al., 2023), post-traumatic stress disorder (Oppenauer et al., 2023; Steil et al., 2018), bulimia nervosa (Safer et al., 2001), and binge eating disorder (Safer & Jo, 2010; Telch et al., 2001). DBT has been adapted for adolescent (Rathus & Miller, 2000), forensic (Moulden et al., 2020) and intellectual disability (Brown et al., 2013) populations.

The growing body of evidence for DBT with presentations other than BPD suggests that it targets transdiagnostic processes rather than features specific to BPD. Despite evidence regarding its efficacy and utility, there is limited research on the mechanisms of change in DBT. This needs to be explored further to better understand treatment specificity and how DBT interventions should be implemented and prioritised. APA practice guidelines (American Psychiatric Association, 2001) noted difficulties in ascertaining whether specific components of DBT lead to patient reported improvements. Literature has discussed the potential mechanisms of change (Chapman & Owens, 2020, Lynch et al., 2006; Mehlum., 2021; Rudge et al., 2020), but this has not been investigated in the format of a systematic review. Rudge et al. (2020) took a methodical approach to their literature review but evaluated the mechanisms of change in both Cognitive Behavioural Therapy (CBT) and DBT, meaning the proposed mechanisms may not be unique to DBT. Their review was further limited by the fact that they only considered BPD presentations and did not follow PRISMA guidelines. The current systematic review aims to address this gap in the literature. Understanding the transdiagnostic processes which elicit change could allow interventions and research to focus on these mechanisms, optimising the evidence base and treatment outcomes. This knowledge could

then be refined to consider if the mechanisms of change differ depending on clinical presentation or format of DBT being delivered. Understanding how change occurs in DBT could also inform our understanding of other therapeutic modalities and behaviour change more generally.

### **1.1.1 Dialectical Behaviour Therapy**

DBT is a National Institute for Health and Care Excellence (NICE, 2009) recommended treatment which can be accessed via the National Health Service (NHS), and in several other countries (Swenson, 2000). DBT is a manualised treatment with a cognitive and behavioural basis (Linehan et al., 1991). There are four elements to a standard DBT programme: individual therapy, skills training, between session skills coaching, and therapist consultation (Linehan, 2015). Research has evaluated separate components of DBT (Linehan et al., 2015) but not specifically the mechanisms of change.

Skills training consists of four modules: emotion regulation (ER), distress tolerance (DT), mindfulness, and interpersonal effectiveness (IE). ER is the “*internal and external processes responsible for monitoring, evaluating, and modifying emotional reactions (especially their intensity and timing) to accomplish goals.*” (Thompson et al., 2008, p.431). DT refers to an ability to tolerate and accept negative emotions (Linehan, 1993). Linehan (2015) defines mindfulness as the intent to live in the present moment with awareness, without judgement, and without attachment to the moment. IE refers to increasing positive social behaviours while decreasing undesirable social behaviours (Linehan, 1993).

### **1.1.2 Mechanisms of Change and Mediation**

A mechanism is defined as “*the basis for the effect, i.e., the processes or events that are responsible for the change; the reasons why change occurred or how change came about.*” (Kazdin, 2007, p. 3). Understanding what elicits change can help optimise treatment by focusing on the critical components and identifying commonalities between different therapeutic modalities. Efficacy studies can lack external validity (Glasgow et al., 2006). Identifying mechanisms of change can increase the applicability of research into clinical settings and increase our understanding of factors that may impact on the efficacy of an intervention, such as individual characteristics, which can then inform the selection of clients or therapists, or predict treatment response (Nock, 2007; Kazdin, 2007).

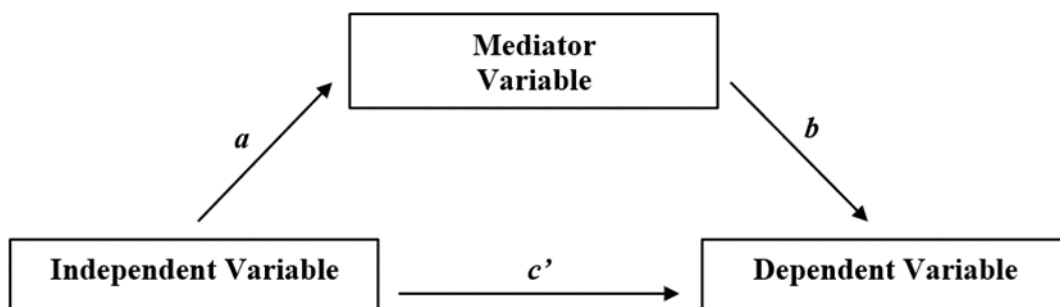
A mediator is “an intervening variable that may account (statistically) for the relationship between the independent and dependent variable.” (Kazdin, 2007, p. 3). MacKinnon et al. (2002) provide a comprehensive comparison of fourteen different methods of mediation, which fall into three categories: causal steps, difference in coefficients, and products of coefficients.

A commonly used causal steps approach to mediation is that of Baron and Kenny (1986), using a series of regression analyses. To demonstrate mediation the following four conditions must be met (see Figure 1 for pathways):

- 1) the independent variable (IV) affects the mediator (path  $a$ )
- 2) the IV affects the dependent variable (DV)
- 3) the mediator affects the DV (path  $b$ )
- 4) when the mediator is controlled for (path  $c'$ ), the relationship between the IV and the DV is less

**Figure 1**

*A Mediation Model*



If the IV has no effect on the DV when controlling for the mediator, this indicates perfect mediation. Partial mediation is indicated when the effect of the IV on the DV is reduced when controlling for the mediator (Baron & Kenny, 1986). Hayes and Rockwood (2017) critiqued Baron and Kenny’s (1986) model, suggesting that it is outdated, whilst acknowledging that the equation underpinning their approach remains important. Their paper outlines advances in mediation analysis and, particularly, the use of the PROCESS macro; a modelling tool add-on which can enable researchers to compute mediation models within SPSS or SAS (Hayes & Rockwood, 2017).



Although mediation is a first step of identifying a mechanism of change, a mediator cannot be assumed to be a mechanism. To establish a mediator as a mechanism of change there needs to be a strong and specific association between the intervention, suggested mediator, and outcome, with a theoretical basis. This should be replicable across samples using experimental conditions, with evidence that change in the mediator temporally precedes a change in outcome (Baron & Kenny, 1986; Kazdin, 2007). If studies only measure pre and post intervention outcomes, this will not demonstrate temporal precedence. If an increase in the proposed mediator leads to increased changes in outcome, this further supports the hypothesised mediator being the mechanism of change (Kazdin, 2007).

### **1.1.3 Mechanisms of Change in DBT**

The modular nature of DBT may result in heterogeneity of DBT interventions and research, making it more challenging to identify mechanisms of change. DBT is based on the biosocial theory which postulates that symptoms arise from a combination of biological sensitivities and social influences, namely dysfunctional or invalidating environments, which leads to a dysfunction in ER (Linehan, 1993). Treatment therefore focuses on skills training to reduce dysregulated emotional responses and subsequent maladaptive behaviours (Linehan, 1993). However, when DBT was developed, this theoretical basis was speculative and not based in empirical evidence (Linehan, 1993).

Clinical services offer DBT skills training (DBT-ST) without the other elements of standard DBT, with studies evaluating the efficacy of DBT-ST as a standalone intervention (Valentine et al., 2020); this supports skill use as a putative mechanism of change. Skill use has been postulated as a mechanism of change (Chapman & Owens, 2020; Mehlum, 2021; Rudge et al., 2020), as has self-control (Rudge et al., 2020) and the reduction of ineffective coping strategies (Lynch et al., 2006); which could be hypothesised as occurring via skill acquisition. The discussion of skill use as a mechanism of change is limited by the broadness of the construct; with a lack of clarity regarding whether specific skills lead to symptom change (Boritz et al., 2017). Existing discussions on mechanisms of change in DBT have focused on BPD (Chapman & Owens, 2020; Lynch et al., 2006; Mehlum, 2021; Rudge et al., 2020); there is a lack of literature on the mechanisms of change in DBT for other clinical presentations.

Boritz et al. (2017) proposed four mechanisms of change in DBT: greater attentional control, an increase in acceptance and awareness of ones emotions, improved emotion modulation, and increased skill use. The other three proposed mechanisms could occur via

increased skill use. Attentional control is discussed in relation to mindfulness, and acceptance and awareness of emotions is discussed as akin to experiential avoidance (Boritz et al., 2017). Emotion modulation and ER have been investigated as related constructs (Blair et al., 2007). Research on mechanisms of change in DBT is limited by overlapping and broad constructs and subsequent variations in how mechanisms of change are measured and operationalised (Boritz et al., 2017).

Mindfulness skills have been postulated as a mechanism of change by which DBT reduces symptomology (Chapman & Owens, 2020; Mochrie et al., 2019). The research by Mochrie et al. (2019) was undertaken in a partial hospital setting so may not generalise to other treatment settings. The intervention involved skills training in all four skills modules, but mindfulness was the only skill which was measured. Therefore, we cannot ascertain whether skill acquisition relating to the other modules was a potential mechanism of change. There is evidence that improvements in mindfulness and DT may lead to changes in outcomes, but a lack of a control intervention makes it unclear whether these are specific to DBT (Zeifman et al., 2020).

A systematic review investigating ER as a proposed mechanism of change concluded that research was limited by heterogeneity in DBT interventions, underpowered studies, high attrition rates, insufficient blinding, and a lack of clarity in defining the construct of ER (Harvey et al., 2019). ER and IE were shown to be significant predictors of change in depression and anxiety symptoms; this research was limited by a small adolescent sample which reduces the generalisability of the results (Lenz et al., 2016). Self-report measures are often used in DBT programmes which may limit conclusions by providing a measure of participant's perceptions of skill use rather than actual skill use (Harvey et al., 2019). Further research is needed determine whether overall or specific skill use is a mechanism of change in DBT.

Therapeutic alliance (TA) is proposed as mechanism of change across therapeutic modalities (Baier, 2020) and specifically in DBT (Mehlum, 2021; Rudge et al., 2020). Validation is a core feature of the TA in DBT (Linehan, 2015), and a further proposed mechanism of change (Lynch et al., 2006). Specific components of validation have been associated with change in client affect, via a decrease in emotion dysregulation (Carson- Wong, 2016). These mechanisms could be understood in the context of the biosocial theory of DBT (Linehan, 1993); the model proposes that BPD develops when individuals with a biological or emotional sensitivity are exposed to an invalidating environment, leading to difficulties with emotion regulation. Therefore the use of validation in the therapeutic relationship may lead to changes

in emotion regulation. Interpersonal difficulties are a key feature of BPD (Lazarus et al., 2014); potential interpersonal mechanisms of change may have a differential effect in individuals with BPD and therefore literature on such mechanisms may not generalise to other clinical populations.

### **1.1.4 Summary and Present Study**

The current review aims to add to our understanding of how and why DBT interventions lead to change. This is important given that DBT is a widely used, NICE (2009) recommended intervention, and can inform the implementation of DBT in services. DBT research is limited by heterogeneity in interventions (Harvey et al., 2019) and a focus on outcome data which demonstrates a correlational rather than a causal relationship and thus does not clearly identify mechanisms of change (Boritz et al., 2017). Existing literature has proposed potential mechanisms of change in DBT but is limited by not focusing on mediation analyses, and has called for this question to be explored further, using empirical research (Boritz et al., 2017; Chapman & Owens, 2020; Lynch et al., 2006; Mehlum., 2021; Rudge et al., 2020). This study will systematically review mediation studies; studies aiming to address the question of mechanisms of change should include this methodology (Kazdin, 2007).

Previous reviews are limited by a focus on BPD which may not generalise to other presentations (Lynch et al., 2006; Mehlum., 2021; Rudge et al., 2020). There is an evidence base to suggest that DBT may be an effective treatment for a range of clinical presentations (Jones et al., 2023; Lynch et al., 2003; Malivoire, 2020; Oppenauer et al., 2023; Safer et al., 2001; Safer & Jo, 2010) and populations (Brown et al., 2013; Moulden et al., 2020; Rathus & Miller, 2000), suggesting that it targets transdiagnostic processes. The current review aims to address a literature gap regarding the mechanisms of change across clinical presentations. A synthesis of mediation studies will allow for stronger and more cogent conclusions about how DBT may improve psychological outcomes in clinical populations.

### **1.1.5 Review Question**

What are the mechanisms of change in DBT interventions for clinical populations?

## **1.2 Methods**

The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) 2020 (Page et al., 2021) guidelines were followed. This systematic review was pre-registered on PROSPERO international prospective register of systematic reviews (ID:CRD42023423406), accessible at [crd.york.ac.uk/prospero/display\\_record.php?RecordID=423406](http://crd.york.ac.uk/prospero/display_record.php?RecordID=423406)

### **1.2.1 Search Strategy**

On 26<sup>th</sup> October 2023, the following databases were searched: PsycINFO, CINAHL Plus with Full Text, Web of Science Core Collection, PubMed, Cochrane library, and Scopus. See Appendices B – C for search details. Search terms A were to capture DBT, search terms B were to capture mechanisms of change, and search terms C were to capture mediation studies. Searches were from the earliest publication date available until the date of the search. The search was re-run in April 2024. Studies needed to meet the inclusion criteria outlined in Table 1. Studies regarding radically open DBT (RO-DBT) (Lynch, 2018) only were excluded as it targets different symptoms and skills and thus hypothesised different mechanisms of change.

**Table 1***Inclusion and Exclusion criteria*

Inclusion	Exclusion
Published in English.	Reported on Radically Open-Dialectical Behaviour Therapy (RO-DBT) only.
Participants aged 18 years or over. An empirical study design.	
Participants from a clinical population (defined as participants with either a mental health diagnosis or symptomology reported, or the intervention was delivered in a mental health setting).	
Included at least one direct DBT intervention (DBT skills group, or one to one DBT sessions, or DBT skills coaching).	
Reported on quantitative mental health based or quality of life outcomes.	
Reported on the processes behind changes in outcomes in relation to DBT (rather than just reporting efficacy or outcomes).	
Reported on mediation analysis.	

**1.2.2 Data Extraction and Synthesis**

The primary reviewer (R1) extracted data into a Microsoft Excel spreadsheet. Extracted data included study characteristics (title, author, publication date, journal, country, design, sample size, DBT intervention), participant characteristics (diagnosis/presentation, age, gender, ethnicity) and information regarding outcomes and mediation (independent variable, dependent variable, proposed mediator variable(s), type of mediation analysis, and findings). The key findings of the included studies were synthesised narratively. A meta-analysis was not considered to be suitable for this review given the heterogeneity of clinical presentations, DBT interventions, IVs, DVs, and mediator variables (Campbell et al., 2020b).

### **1.2.3 Quality Assessment**

Two separate tools were used to assess the quality of the included studies. Mansell et al.'s (2013) critical appraisal tool for mediation studies was used to assess the methodological quality of the studies, specifically in relation to mediation. The tool consists of twelve items answered as 'yes' or 'no'. The validity or reliability of the tool has not been reported. Downs and Black's (1998) checklist was utilised for a broader assessment of the methodological quality of the studies. The checklist consists of 27 questions, the first ten items are answered as 'yes' or 'no' and the remaining items have the additional response of 'unable to determine' (UTD). It has good interrater and test-retest reliability, and high internal consistency (Downs & Black, 1998). There is a risk of reducing quality assessment results into a single score (Higgins et al., 2023; Jüni et al., 1999) as this can omit key details and a potentially rich discussion about the different aspects of quality, some of which may be more important than others (Boland et al., 2017). A descriptive summary is given rather than a single score. Two independent reviewers (R1 and R2) used both tools to complete quality assessments on the included 18 studies. Prior to resolving disagreements, inter-rater reliability was analysed by calculating Cohen's Kappa coefficient (Cohen, 1968). Agreement on the Mansell et al. (2013) tool was 95% with an 'almost perfect' level of inter-rater reliability ( $\kappa = .89$ ). Agreement on the Downs and Black (1998) tool was 79% with a 'moderate' level of inter-rater reliability ( $\kappa = .56$ ). All disagreements were discussed with a supervisor (R4) which led to reviewing and resolving all disagreements. Final agreement was 100% for both tools. See results section for quality assessment summary.

## **1.3 Results**

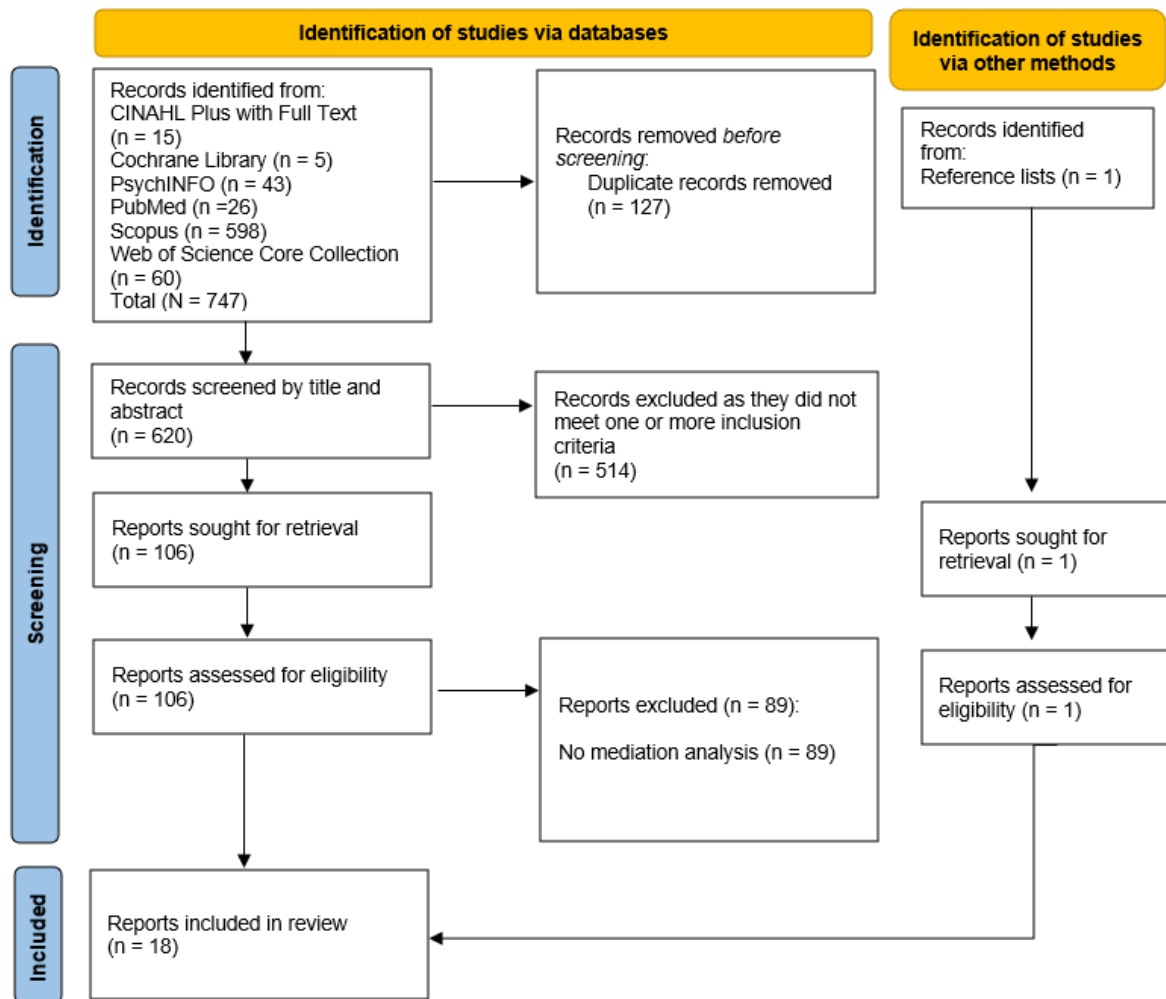
### **1.3.1 Search Results**

The database searches identified a total of 747 records, 127 of which were duplicates. All records were imported into an EndNote library. The reference lists of two core DBT publications were also searched: *Cognitive-behavioral treatment of borderline personality disorder* (Linehan, 1993) and *DBT skills training manual* (Linehan, 2015). This did not yield any further records. Figure 2 outlines the flow of reports through the selection process. R1 completed all screening independently other than four 'undecided' records which were discussed with R2, R3 and R4; it was unanimously agreed that they were not eligible. R1 searched the reference lists of 17 included studies and identified one additional report which was eligible for inclusion. A total of 18 reports were eligible for inclusion in the systematic review. R2 independently reviewed the

full-text of the 18 eligible records and 10% of those that R1 had categorised as not eligible. R2 agreed with the decisions on both counts. R3 independently reviewed the full text of four eligible records and agreed that they were eligible for inclusion.

**Figure 2**

*PRISMA flow diagram*



### 1.3.2 Sample and Study Characteristics

Extracted data is shown in Table 2. Studies included a range of clinical presentations: alcohol use disorder (AUD) or alcohol dependence ( $n = 5$ ) (Cavicchioli et al., 2019, 2020a, 2020b; Cavicchioli, Movalli & Maffei, 2019; Maffei et al., 2018), BPD ( $n = 6$ ) (Hood et al., 2024; Kramer, 2016; Krantz et al., 2018; Neacsiu et al., 2010a; Schmaling et al., 2021; Schmidt et al., 2021), depression or an anxiety disorder ( $n = 1$ ) (Neacsiu et al., 2018), depression or an anxiety disorder with high emotion dysregulation ( $n = 2$ ) (Wyatt et al., 2023), depression or an anxiety

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disorder with binge drinking ( $n = 1$ ) (Whiteside, 2011) an eating disorder (ED) diagnosis ( $n = 1$ ) (Karam et al., 2022), a body mass index (BMI) greater than 30 ( $n = 1$ ) (de Souza et al., 2019) and mixed psychopathology ( $n = 1$ ) (Seow et al., 2020). Sample sizes ranged from 21 to 454 participants with 2706 participants included across the 18 studies. Participant ages ranged from 18 to 75 years of age; four studies commented on the mean age of participants rather than the age range. Most studies ( $n = 16$ ) had both male and female participants; two had only female participants (Neacsiu et al., 2010a; Schmaling et al., 2021). Data regarding ethnicity was extracted but is not included in Table 2 as only eight of the 18 included studies provided information on this; in all eight studies the majority of the sample was white.

Eight studies were quasi-experimental studies, five were a randomised controlled trial (RCT), and five were a secondary analysis of an RCT. Two included studies (Neacsiu et al., 2018; Wyatt et al., 2023) both conducted secondary analysis on another of the included studies (Neacsiu et al., 2014). The two secondary analysis studies (Neacsiu et al., 2010a; Schmaling, 2021) both conducted secondary analysis on the same RCT (Linehan et al., 2006b), however, Neacsiu et al. (2010a) also included data from two other RCTs (Linehan et al., 1999; Linehan et al., 2002). One study (Cavicchioli et al., 2020a) also included secondary data from another included study (Maffei et al., 2018) with additional data from another sample. The other secondary analysis study (Hood et al., 2024) used data from studies not included in the review (McMain et al., 2018, 2022).

Of the eight quasi-experimental studies, one compared a DBT-ST outpatient program to a combined inpatient and outpatient DBT-ST programme (Cavicchioli et al., 2020a). In the other quasi-experimental studies, the interventions were DBT-ST ( $n = 5$ ) (Cavicchioli et al., 2019, 2020b, Cavicchioli, Movalli & Maffei, 2019; de Souza et al., 2019; Maffei et al., 2018), a standard DBT programme ( $n = 1$ ) (Karam et al., 2022) and a DBT-informed programme without a comparison group ( $n = 1$ ) (Seow et al., 2020). One RCT compared treatment as usual (TAU) to TAU plus DBT-ST (Kramer, 2016), one compared DBT-ST to a waitlist control group (Krantz et al., 2018), one compared DBT-ST to an activities-based support group (ASG) (Neacsiu et al., 2014), one compared DBT mindfulness skills training (DBT-M) to DBT interpersonal effectiveness skill training DBT-IE (Schmidt et al., 2021), and one compared a Brief Alcohol Screening and Intervention for College Students (BASICS) to a DBT-skills enhanced version of BASICS (DBT-BASICS) and a relaxation control condition (RCC) (Whiteside, 2011). In the secondary analysis studies, two compared DBT-ST to ASG (Neacsiu et al., 2018), one compared standard DBT to community treatment by experts (CTBE) (Schmaling et al., 2021), one compared six and twelve



months of standard DBT, and one combined data from three RCTs comparing an unspecified DBT condition to either CTBE, TAU or comprehensive validation therapy in conjunction with a 12 step program (Neacsiu et al., 2010a). The length of DBT intervention ranged from a one hour ( $n = 1$ ) (Whiteside, 2011) to one year ( $n = 3$ ) (Hood et al., 2024; Neacsiu et al., 2010a; Schmaling et al., 2021).

The mediation findings as evidence for potential mechanisms of change are synthesised narratively below.

### **1.3.3 DBT Skill use as a Mediator**

**Study Design.** Six studies evaluated DBT skill use as a mediator; one (Wyatt et al., 2023) was a secondary analysis of data from another included study; a pilot RCT (Neacsiu et al., 2014). Another conducted a secondary data analysis on data from three RCTs (Neacsiu et al., 2010a), the other three were a quasi-experimental design (Cavicchioli et al., 2019; Karam et al., 2022; Seow et al., 2020).

**Clinical presentation.** Two studies utilised the same data from participants with depression or an anxiety disorder with high emotion dysregulation (Neacsiu et al., 2014; Wyatt et al., 2023), other samples included adults with AUD ( $n = 1$ ) (Cavicchioli et al., 2019), eating disorders ( $n = 1$ ) (Karam et al., 2022), BPD ( $n = 1$ ) (Neacsiu et al., 2010a), and mixed psychopathology ( $n = 1$ ) (Seow et al., 2020).

**Analytic Strategy.** Four used simple mediation analyses and two used multiple mediation.

**Measures of mediators.** The majority used the DBT ways of coping checklist (DBT-WCCL; Neacsiu et al., 2010b) to measure skill use ( $n = 5$ ) (Cavicchioli et al., 2019; Karam et al., 2022; Neacsiu et al., 2010a, 2014; Wyatt et al., 2023). One study used an alternative DBT progress questionnaire, which was designed for the study (Seow et al., 2020). One study (Wyatt et al., 2023) also evaluated mindfulness and perceived control as mediators. Neacsiu et al. (2010a) also used the DBT-WCCL to measure non-DBT coping strategies use as a mediator.

**Measures of IVs.** The independent variables were treatment condition ( $n = 2$ ) (Neacsiu et al., 2014; Wyatt et al., 2023), emotion dysregulation or difficulties with ER ( $n = 2$ ) (Cavicchioli et al., 2019; Karam et al., 2022), time in treatment ( $n = 1$ ) (Neacsiu et al., 2010a), and pre-treatment psychological distress ( $n = 1$ ) (Seow et al., 2020).

**Measures of DVs.** Most of these six studies measured more than one outcome, including emotion dysregulation ( $n = 2$ ) (Neacsiu et al., 2014; Wyatt et al., 2023), depression ( $n = 2$ ) (Neacsiu et al., 2010a, 2014), abstinence maintenance and addictive behaviours ( $n = 1$ ) (Cavicchioli et al., 2019), anxiety ( $n = 1$ ) (Neacsiu et al., 2014), psychological distress ( $n = 1$ ) (Seow et al., 2020), anger ( $n = 1$ ) (Neacsiu et al., 2010a), eating disorder behaviours and pathology ( $n = 1$ ) (Karam et al., 2022), and suicide attempts and nonsuicidal self-injury (NSSI) ( $n = 1$ ) (Neacsiu et al., 2010a).

**Synthesis of Findings.** Of the six studies, all but one (Wyatt et al., 2023) found support for DBT skill use as a mediator on the relationship between ER and alcohol use (Cavicchioli et al., 2019), ER and eating disorder pathology (Karam et al., 2022), treatment condition and ER, anxiety and depression (Neacsiu et al., 2014), time in treatment and decrease in likelihood of suicide attempts, anger control, and depression (Neacsiu et al., 2010a), and between pre and post-treatment psychological distress (Seow et al., 2020). These studies provide overall support for skill use as a mediator across different clinical populations and DBT interventions, with most utilising the DBT-WCCL to measure skill use.

### 1.3.4 *Emotion Dysregulation as a Mediator*

The terms ‘emotion regulation’ and ‘emotion dysregulation’ are used interchangeably in the literature (D’Agostino et al., 2017). All studies which explored this as a mediator appear to be referring to the same concept as they used the same measure (Gratz & Roemer, 2004).

**Study Design.** Five studies evaluated emotion dysregulation as a mediator. Two were a quasi-experimental design (Cavicchioli et al., 2020a; Maffei et al., 2018). Cavicchioli et al., (2020a) included data from Maffei et al. (2018). One conducted a secondary data analysis (Neacsiu et al., 2018) of another included study (Neacsiu et al., 2014), another was also a secondary data analysis (Hood et al., 2024) and one was an RCT (Whiteside., 2011).

**Clinical Presentation.** Three of the studies were looking at presentations related to alcohol use; AUD (Cavicchioli et al., 2020a), alcohol dependence (Maffei et al., 2018), and depression or anxiety with binge drinking (Whiteside, 2011). The other two included participants with depression or an anxiety disorder (Neacsiu et al., 2018), or BPD (Hood et al., 2024).

**Analytic Strategy.** Two studies evaluated emotion dysregulation with simple mediation analyses (Neacsiu et al., 2018; Whiteside, 2011), one study used a multiple mediation analysis

(Maffei et al., 2018), one used a serial mediation analysis (Cavicchioli et al., 2020a), and another used structural equation models (Hood et al., 2024).

**Measures of Mediators.** All five studies used the DERS (Gratz & Roemer, 2004) as a measure of emotional dysregulation. In addition to measuring emotional dysregulation as a mediator, Cavicchioli et al (2020a) also measured pre to post changes in experiential avoidance, Whiteside (2011) measured drinking to cope and depression, and Hood et al. (2024) measured mindfulness.

**Measures of IVs.** Two studies had treatment attendance as the independent variable (Cavicchioli et al., 2020a; Maffei et al., 2018) and three had treatment condition or intervention (Hood et al., 2024; Neacsiu et al., 2018; Whiteside, 2011) as the independent variable.

**Measures of DVs.** Three studies had alcohol related outcomes; two of which measured abstinence maintenance via consecutive days of abstinence (CDA) and a toxicology screening (Cavicchioli et al., 2020a; Maffei et al., 2018), and one (Whiteside, 2011) used the Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989). Neacsiu et al. (2018) measured multiple outcomes; anger, shame, disgust, and distress. Hood et al (2024) measured BPD symptomology using the Borderline Symptom List-23 (BSL-23; Bohus et al., 2007).

**Synthesis of Findings.** Four studies found support for emotion dysregulation as a mediator on the relationship between treatment attendance and abstinence maintenance, and between attendance and changes in experiential avoidance (Cavicchioli et al., 2020a), between attendance and substance abstinence (Maffei et al., 2018), between condition and anger suppression, shame and distress (Neacsiu et al., 2018), and between condition and alcohol related problems (Whiteside, 2011). Hood et al. (2024) found support for ER mediating an inverse relationship between mindfulness and BPD symptoms; that is, without the mediating effect of ER, increased mindfulness was associated with increased BPD symptomology. Overall the studies provide particular support for emotion dysregulation as a mediator between treatment attendance or condition and alcohol use. All of the studies which found support for emotion dysregulation as a mediator utilised an intervention which focused on the skills component of DBT; three of which were at least three months in duration (Cavicchioli et al., 2020a; Maffei et al., 2018; Neacsiu et al., 2018). The intervention in the Whiteside (2011) study was limited by being only one hour in duration.

### **1.3.5 Experiential Avoidance as a Mediator**

Three studies evaluated experiential avoidance as a mediator; two studies use the term experiential avoidance, and one refers to emotional avoidance. Emotional avoidance is a more specific term for a facet of experiential avoidance (Hayes et al., 1996).

**Study Design.** Two were a quasi-experimental design, by the same lead author, published in the same year (Cavicchioli et al., 2020a, 2020b). The third was a secondary data analysis of an RCT (Schmaling et al., 2021).

**Clinical Presentation.** Two studies looked at individuals with AUD (Cavicchioli et al., 2020a, 2020b), and the third looked at individuals with BPD (Schmaling et al., 2021).

**Analytic Strategy.** One study conducted a simple mediation analysis (Schmaling et al., 2021), one conducted a serial mediation analysis (Cavicchioli et al., 2020a), and one conducted a multiple mediation analysis (Cavicchioli et al., 2020b).

**Measures of Mediators.** All three studies used different versions of the same measure for experiential avoidance; the Acceptance and Action Questionnaire (AAQ; Hayes et al., 2004) ( $n = 1$ ), and an updated Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011). Cavicchioli et al. (2020a) also looked at emotion dysregulation as a mediator.

**Measures of IVs.** Each of the three studies had a different IV; treatment attendance (Cavicchioli et al., 2020a), treatment condition (Schmaling et al., 2021), and improvements in ER (Cavicchioli et al., 2020b).

**Measures of DVs.** All three only had one DV; abstinence maintenance (Cavicchioli et al., 2020a), addictive behaviours (Cavicchioli et al., 2020b), and somatic symptoms (Schmaling et al., 2021).

**Synthesis of Findings.** Two of the studies found support for experiential avoidance as a mediator; it partially mediated the relationship between ER and compulsive shopping and fully mediated the relationship between ER and bingeing and starving (Cavicchioli et al., 2020b), and mediated the relationship between treatment condition and somatization (Schmaling et al., 2021). The third study did not find support for experiential avoidance as a mediator (Cavicchioli et al., 2020a). Support is therefore provided for experiential avoidance as a mediator in both AUD and BPD populations, with DBT skills only (Cavicchioli et al., 2020b) and full standard programme (Schmaling et al., 2021) interventions.

### 1.3.6 *Mindfulness as a Mediator*

**Study Design.** Four studies evaluated mindfulness as a mediator (Cavicchioli, Movalli & Maffei, 2019; de Souza et al., 2019; Hood et al., 2024; Wyatt et al., 2023), two had a quasi-experimental design, the other two utilised secondary data (Hood et al., 2024; Wyatt et al., 2023)

**Clinical Presentation.** Studies included participants with AUD (Cavicchioli, Movalli & Maffei, 2019), a body mass index (BMI) over 30 (de Souza et al., 2019), BPD (Hood et al., 2024), or depression or anxiety disorder with high emotion dysregulation (Wyatt et al., 2023).

**Analytic Strategy.** A simple mediation analysis (de Souza et al., 2019) multiple mediation analyses (Cavicchioli, Movalli & Maffei, 2019; Wyatt et al., 2023), and a structural equation model (Hood et al., 2024) were used.

**Measures of Mediators.** Different mindfulness measures were utilised; one study utilised the Mindful Attention Awareness Scale (MAAS) and the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2008), two utilised the Kentucky Inventory of Mindfulness Skills (KIMS; Baer et al., 2004), another study specifically investigated mindful eating using the Mindful Eating Questionnaire (MEQ; Framson et al., 2009).

**Measures of IVs.** In three studies the intervention was the independent variable (de Souza et al., 2019; Hood et al., 2024; Wyatt et al., 2023). In one, emotion dysregulation was the independent variable (Cavicchioli, Movalli & Maffei, 2019)

**Measures of DVs.** Cavicchioli, Movalli and Maffei (2019) measured addictive behaviours as the outcome, de Souza et al. (2019) measured problematic and adaptive eating outcomes, Hood et al. (2024) measured BPD symptoms and Wyatt et al. (2023) measured ER. Hood et al. (2024) also investigated the relationship between ER and mindfulness.

**Synthesis of Findings.** Two found support for mindfulness as a mediator on the relationship between ER and alcohol use (Cavicchioli, Movalli & Maffei, 2019) and between the DBT intervention and eating outcomes (de Souza et al., 2019). Hood et al. (2024) and Wyatt et al. (2023) did not find support for mindfulness as a mediator. Although only two of the four studies evidenced mindfulness as a mediator, this finding is strengthened by the fact that both utilised an experimental design, large sample and equivalent DBT- ST only interventions.

**1.3.7 Other Mediators**

A series of studies were the sole investigations to explore several concepts. These found support for assertive anger as a mediator between treatment group and symptom decrease (Kramer, 2016), acceptance without judgement as a mediator between DBT- ST and frequency of NSSI (Krantz et al., 2018), drinking to cope and depression as a mediator between the DBT intervention and a reduction in alcohol related problems (Whiteside, 2011), and decentering as a mediator between mindfulness skills and BPD symptomatology (Schmidt et al., 2021). Decentering is defined as the ability to know that ones thoughts and feelings are temporary and objective, rather than truth (Fresco et al., 2007). These results allow for future research to explore the evidenced concepts as potential mediators in DBT, in different clinical populations.

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**Table 2**

*Study Characteristics*

Author (year of publication)	Clinical presentation	Design/  Treatment intervention(s) (sample size)	Independent variable (IV) (measure)  Dependent variable(s) (DV) (measure)	Mediator variable(s) (measure)	Mediation analysis	Findings of mediation analysis
<b>Cavicchioli, Movali &amp; Maffei, (2019)</b>	Alcohol Use Disorder	Quasi-experimental/  DBT- ST (n = 244)  21-71 (47.14, 9.14)	<b>IV:</b> Difficulties with ER (DERS; Gratz & Roemer, 2004)  <b>DV:</b> Addictive behaviours (SPQ; Christo et al., 2003)	Mindfulness dimensions (Mindful Attention Awareness Scale, MAAS; Brown & Ryan, 2003; Five Facet Mindfulness Questionnaire, FFMQ; Baer et al., 2008)	Multiple mediation analysis, PROCESS tool for SPSS (Hayes 2017).	<ul style="list-style-type: none"> <li>Mindfulness dimensions significantly mediated the relationship between DERS and alcohol use.</li> </ul>
<b>Italy</b>		<b>Age of participants (M, SD)</b>				
<b>Cavicchioli et al. (2019)</b>	Alcohol Use Disorder	Quasi-experimental/  DBT-ST (n = 108)  24-75 (48.43, 9.61)	<b>IV:</b> Difficulties with ER (DERS; Gratz & Roemer, 2004).  <b>DV:</b> Abstinence maintenance measured by consecutive days of abstinence (CDA) (toxicology screening) Addictive behaviours (SPQ; Christo et al., 2003)	DBT Skills use (DSS) Dysfunctional non-DBT coping strategies use (DCS) (DBT ways of coping checklist, DBT-WCCL; Neacsiu, et al., 2010b)	Multiple mediation analysis, PROCESS tool for SPSS (Hayes 2017).	<ul style="list-style-type: none"> <li>DSS and DCS partially mediated the relationship between DERS and alcohol use.</li> <li>DCS partially mediated the relationship between DERS and prescription drug use.</li> </ul>
<b>Italy</b>						
<b>Cavicchioli et al. (2020a)</b>	Alcohol Use Disorder	Quasi-experimental/  DBT Skills Training (DBT-ST) outpatient program (n = 244) vs DBT-ST inpatient and outpatient (n = 171)  25-75 (47.92, 9.28)	<b>IV:</b> Treatment attendance (number of absences)  <b>DV:</b> Abstinence maintenance (consecutive days of abstinence; CDA, toxicology screening)	Emotional dysregulation (Difficulties in emotion regulation scale; DERS; Gratz & Roemer, 2004)  Pre to post changes in experiential (Acceptance and action Questionnaire-II, AAQ-II; Bond et al., 2011)	Serial mediation analysis, PROCESS tool for SPSS (Hayes 2017)	<ul style="list-style-type: none"> <li>The relationship between treatment attendance and abstinence maintenance was fully mediated by DERS changes.</li> <li>The relationship between attendance and changes in experiential avoidance was fully mediated by DERS changes.</li> </ul>
<b>Italy</b>						

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Author (year of publication)	Clinical presentation	Design/  Treatment intervention(s) (sample size)	Independent variable (IV) (measure)  Dependent variable(s) (DV) (measure)	Mediator variable(s) (measure)	Mediation analysis	Findings of mediation analysis
Country		Age of participants ( <i>M, SD</i> )				
<b>Cavicchioli et al. (2020b)</b>	Alcohol Use Disorder	Quasi-experimental/  DBT-ST ( <i>n</i> = 186)	<b>IV:</b> Improvements in ER (DERS; Gratz & Roemer, 2004)  <b>DV:</b> Addictive behaviours (Shorter PROMIS questionnaire, SPQ; Christo et al., 2003)	Pre to post changes in experiential avoidance (AAQ-II, Bond et al., 2011)	Multiple mediation analysis, PROCESS tool for SPSS (Hayes 2017).	<ul style="list-style-type: none"> <li>• Experiential avoidance partially mediated the relationship between DERS and compulsive shopping.</li> <li>• Experiential avoidance fully mediated the relationship between DERS and bingeing and DERS and starvation.</li> </ul>
<b>Italy</b>		21-75 ( <i>47.95, 9.43</i> )				
<b>de Souza et al. (2019)</b>	Body Max Index greater than 30	Quasi- experimental/  DBT-ST ( <i>n</i> = 121)	<b>IV:</b> DBT-based skills training group Intervention  <b>DV:</b> Problematic and adaptive eating outcomes (Emotional Eating Scale, EES; Arnow et al., 1995; Binge Eating Scale, BES; Gormally et al., 1982; Intuitive Eating Scale-2, IES-2; Tylka & Kroon Van Diest, 2013)	Mindful eating (Mindful Eating Questionnaire, MEQ; Framson et al., 2009)	Simple mediation. Path analysis using Jamovi software (Jamovi project, 2018).	<ul style="list-style-type: none"> <li>• An increase in mindful eating partially mediated the relationship between the intervention and problematic and adaptive eating outcomes.</li> </ul>
<b>Brazil</b>		18-59 ( <i>38.49, 10.54</i> )				
<b>Hood et al. (2024)</b>	BPD	Secondary data analysis of RCT/  Six vs twelve-month standard DBT ( <i>n</i> = 240)	<b>IV:</b> Intervention  <b>DV:</b> BPD symptoms (Borderline Symptom List-23; BSL-23; Bohus et al., 2007)	Mindfulness (Kentucky Inventory of Mindfulness Skills, KIMS; Baer et al., 2004)  ER (DERS; Gratz & Roemer, 2004)	Structural equation models using R's Lavaan package (Rosseel, 2012)	<ul style="list-style-type: none"> <li>• ER may mediate an inverse association between mindfulness and BPD symptoms.</li> </ul>
<b>Canada</b>		18 -59 ( <i>27.75, 8.62</i> )				



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Author (year of publication)	Clinical presentation	Design/  Treatment intervention(s) (sample size)	Independent variable (IV) (measure)  Dependent variable(s) (DV) (measure)	Mediator variable(s) (measure)	Mediation analysis	Findings of mediation analysis
Country	Age of participants ( <i>M, SD</i> )					
<b>Karam et al. (2022)</b>  <b>USA</b>	Eating disorder diagnosis (AN-R: anorexia nervosa: restricting subtype; AN-BP anorexia nervosa: binge-purge subtype; BN: bulimia nervosa; BED: binge eating disorder; ARFID: avoidant and restrictive food intake disorder; OSFED: other specified feeding and eating disorder)	Quasi-experimental /  Standard DBT ( <i>n</i> = 454)  Not stated ( <i>26.15, 9.14</i> )	<b>IV:</b> Emotion dysregulation  <b>DV:</b> Binge eating frequency, self-induced vomiting frequency, and global eating disorder psychopathology at discharge (Eating Disorder Examination Questionnaire, EDE-Q; Fairburn & Beglin, 2008)	DBT skill use (DBT-WCCL; Neacsiu, et al., 2010b)	Simple mediation model, PROCESS tool for SPSS (Hayes, 2017). Moderated-mediation models, PROCESS tool for SPSS (Hayes, 2017).	<ul style="list-style-type: none"> <li>The relationship between emotion dysregulation and global eating disorder (ED) psychopathology was mediated by an increase in DBT skills use.</li> <li>DBT skill use did not mediate the relationship between emotion dysregulation and change in binge eating, or change in self-induced vomiting.</li> <li>Mediation did not differ when type of ED was accounted for.</li> </ul>
<b>Kramer (2016)</b>  <b>Switzerland</b>	Borderline personality disorder (BPD)	Add-on RCT /  Treatment as usual (TAU) ( <i>n</i> = 20) vs TAU+DBT-ST ( <i>n</i> = 21)  Not stated (TAU: <i>33.60, 8.57</i> ; TAU+DBT-ST: <i>35.14, 9.67</i> )	<b>IV:</b> Treatment group assignment  <b>DV:</b> Symptom decrease at discharge: global score, symptomatic distress, interpersonal relationships, and social role (Outcome Questionnaire; Lambert et al., 1996)	Assertive anger (Classification of Affective Meaning States, CAMS; Pascual-Leone & Greenberg, 2005).	Simple mediation. Causal steps (Baron & Kenny, 1986). Sobel test.	<ul style="list-style-type: none"> <li>The relationship between treatment group and a decrease in problems in related to social role was mediated by changes in assertive anger.</li> </ul>
<b>Krantz et al. (2018)</b>  <b>Canada</b>	BPD	Two -arm RCT/  DBT-ST ( <i>n</i> = 42) vs waitlist control group ( <i>n</i> = 42)  18-60 ( <i>29.67, 8.62</i> )	<b>IV:</b> Treatment  <b>DV:</b> Frequency of nonsuicidal self-injury (NSSI) (Modified Suicide attempt and self-injury interview, SASII; Linehan et al., 2006b)	Accepting without judgement (Kentucky Inventory of Mindfulness Skills, KIMS; Baer et al., 2004)	Simple mediation. Contemporary mediation procedures using bootstrapping (Hayes & Rockwood, 2017; Hayes, 2017).	<ul style="list-style-type: none"> <li>The relationship between DBT skills training and change in frequency of NSSI was mediated by acceptance without judgment.</li> </ul>

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Author (year of publication)	Clinical presentation	Design/  Treatment intervention(s) (sample size)	Independent variable (IV) (measure)  Dependent variable(s) (DV) (measure)	Mediator variable(s) (measure)	Mediation analysis	Findings of mediation analysis
<b>Maffei et al. (2018)</b>  Italy	Alcohol dependent	Quasi-experimental/  DBT-ST ( <i>n</i> = 244)  21 – 71 ( <i>M</i> , <i>SD</i> )	<b>IV:</b> Treatment attendance (number of absences)  <b>DV:</b> Alcohol or substance use (consecutive days of abstinence; CDA, urine toxicology screening, measuring carbohydrate-deficient transferrin; CDT, as a biomarker of alcohol use)	Emotional dysregulation. Overall and specific aspects of DER (DERS; Gratz & Roemer, 2004)	Multiple mediation. Procedures outlined by Preacher and Hayes (2004).	<ul style="list-style-type: none"> <li>The relationship between treatment attendance and consecutive days of abstinence was partially mediated by overall improvements in emotional dysregulation, and the ability to accept and tolerate negative emotions.</li> </ul>
<b>Neacsiu et al. (2010a)</b>  USA	BPD	Secondary data from three RCTs/  DBT condition ( <i>n</i> = 54) vs control treatment ( <i>n</i> = 54)  Not stated ( <i>31.44</i> , <i>7.39</i> )	<b>IV:</b> Time in treatment.  <b>DV:</b> Suicide attempts and nonsuicidal self-injury (Suicide attempt and self- injury interview, SASII; Linehan et al., 2006b) Anger (State-trait anger expression inventory, STAXI; Spielberger, 1988). Depression (Hamilton rating scale for depression, HRSD; Hamilton, 1960)	DBT skill use (DBT-WCCL, skills subscale; Neacsiu, et al., 2010b)	Simple mediation. As outlined by Krull and MacKinnon (2001).	<ul style="list-style-type: none"> <li>DBT skill use fully mediated the relationship between time in treatment and decrease in likelihood of suicide attempts, increase in anger control, and improvements in depression.</li> <li>DBT skill use partially mediated the relationship between time in treatment and increase in likelihood of no NSSI.</li> </ul>
<b>Neacsiu et al. (2014)</b>  USA	Depression or anxiety disorder with high emotion dysregulation	Pilot RCT/  DBT-ST ( <i>n</i> = 22) vs activities-based support group (ASG) ( <i>n</i> = 22)  Not stated (DBT-ST: <i>32.27</i> , <i>10.50</i> ; ASG: <i>38.82</i> , <i>13.55</i> )	<b>IV:</b> Treatment condition  <b>DV:</b> Emotion dysregulation (DERS; Gratz & Roemer, 2004). Depression (Patient Health Questionnaire-9, PHQ-9; Kroenke et al., 2001) Anxiety (Overall Anxiety Severity and Impairment Scale, OASIS; Norman et al., 2006)	DBT skill use (DBT-WCCL, skills subscale; Neacsiu, et al., 2010b)	Simple mediation. As outlined by Krull and MacKinnon (2001).	<ul style="list-style-type: none"> <li>Skill use significantly mediated the relationship between treatment condition and improvements in ER, and the relationship between condition and change in depression symptoms.</li> <li>Skill use also mediated the relationship between condition and anxiety symptoms.</li> </ul>

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Author (year of publication)	Clinical presentation	Design/  Treatment intervention(s) (sample size)	Independent variable (IV) (measure)  Dependent variable(s) (DV) (measure)	Mediator variable(s) (measure)	Mediation analysis	Findings of mediation analysis
<b>Neacsiu et al. (2018)</b>  USA	Depression or anxiety disorder	Secondary data from pilot RCT/  DBT-ST ( <i>n</i> = 22) vs ASG ( <i>n</i> = 22)  19 - 70 ( <i>M</i> , <i>SD</i> ) <i>(35.55, 12.43)</i>	<b>IV:</b> Treatment condition  <b>DV:</b> Anger (STAXI; Spielberger, 1988). Shame (Experience of Shame Scale, ESS; Andrews et al., 2002). Disgust (Disgust Propensity and Sensitivity Scale—Revised, DPSS-R; Van Overveld et al., 2006). Distress (Outcome Questionnaire; Lambert et al., 1996)	Emotion dysregulation after 2 months of treatment (DERS; Gratz & Roemer, 2004)	Simple mediation. PROCESS tool for SPSS (Hayes, 2022).	<ul style="list-style-type: none"> <li>The relationship between treatment condition and anger suppression, shame and distress were mediated by changes in emotion dysregulation.</li> </ul>
<b>Schmaling et al. (2021)</b>  USA	BPD	Secondary data from RCT/  Standard DBT ( <i>n</i> = 52) vs community treatment by experts (CTBE) ( <i>n</i> = 49)  18-45 ( <i>M</i> , <i>SD</i> ) <i>(29.30, 7.54)</i>	<b>IV:</b> Treatment condition  <b>DV:</b> Somatic symptoms (Brief Symptom Inventory, BSI; Derogatis, 1993)	Emotional avoidance (Acceptance and Action Questionnaire, AAQ; Hayes et al., 2004)	Simple mediation. PROCESS tool for SPSS (Hayes, 2017).	<ul style="list-style-type: none"> <li>A reduction in emotional avoidance mediated the relationship between DBT and reduced somatization.</li> </ul>
<b>Schmidt et al. (2021)</b>  Spain	BPD	Single centre RCT/  DBT Mindfulness skill training (DBT-M) ( <i>n</i> = 50) vs DBT interpersonal effectiveness skill training (DBT-IE) ( <i>n</i> = 52)  18-50 (DBT-M: <i>M</i> , <i>SD</i> : 32.06, 8.00; DBT-IE: 32.56, 8.0)	<b>IV:</b> DBT intervention.  <b>DV:</b> BPD symptoms (The Borderline Symptom List -23, BSL-23; Bohus et al., 2007)	Decentering (Experiences Questionnaire, EQ; Fresco et al., 2007) and emotion dysregulation, (DERS; Gratz & Roemer, 2004)	Multiple mediation model using PROCESS tool for SPSS (Hayes, 2017).	<ul style="list-style-type: none"> <li>Decentering mediated the relationship between mindfulness-based DBT skills training (DBT-M) and reduced BPD symptomatology.</li> <li>Serial mediation showed that DBT-M reduced BPD symptomatology by increasing decentering, which led to improvements in emotion dysregulation.</li> </ul>

## Chapter 1

Author (year of publication)	Clinical presentation	Design/  Treatment intervention(s) (sample size)	Independent variable (IV) (measure)  Dependent variable(s) (DV) (measure)	Mediator variable(s) (measure)	Mediation analysis	Findings of mediation analysis
Country		Age of participants ( <i>M, SD</i> )				
<b>Seow et al. (2020)</b>  <b>Australia</b>	Mixed psychopathology (including BPD, mood disorders, anxiety disorders, substance use disorders, behavioural disorders, and schizophrenia)	Quasi-experimental/  12-week DBT programme ( <i>n</i> = 102)  18 - 68 ( <i>37.23, 13.02</i> )	<b>IV:</b> Pre-treatment psychological distress.  <b>DV:</b> Post-treatment psychological distress (Five Item Daily Index, DI-5; Dyer et al., 2014)	DBT skill use (DBT Progress Questionnaire, designed for this study).	Simple mediation using a series of regression analyses.	<ul style="list-style-type: none"> <li>There were improvements in psychological distress from pre to post DBT intervention; this was mediated by a self-reported increase in mindfulness, ER, distress tolerance and interpersonal effectiveness skills, and self-reported confidence in and perceived effectiveness of skill use.</li> </ul>
<b>Whiteside (2011)</b>  <b>USA</b>	Depression or anxiety presentation with binge drinking	RCT/  Brief Alcohol Screening and Intervention for College Students (BASICS) ( <i>n</i> = 49) vs DBT-skills enhanced version of BASICS (DBT-BASICS) ( <i>n</i> = 43) vs Relaxation Control Condition (RCC) ( <i>n</i> = 53)  17 – 26 ( <i>18.92, 1.22</i> )	<b>IV:</b> Treatment condition, baseline difficulties regulating emotions and baseline alcohol related problems.  <b>DV:</b> Alcohol related problems at the 3-month follow-up. (Rutgers Alcohol Problem Index, RAPI; White & Labouvie, 1989).	Emotional dysregulation (DERS; Gratz & Roemer, 2004), drinking to cope (Drinking Motives Questionnaire, DMQ; Cooper, 1994), depression (The Beck Depression Inventory-II, BDI; Beck et al., 1996).	Simple mediation. As outlined by Baron and Kenny (1986) and MacKinnon and Dwyer (1993).	<ul style="list-style-type: none"> <li>The relationship between the DBT intervention and a reduction in alcohol related problems was mediated by improvements in emotion dysregulation, depression and drinking to cope.</li> </ul>
<b>Wyatt et al. (2023)</b>  <b>USA</b>	Depression or anxiety disorder with high emotion dysregulation	Secondary data from pilot RCT/  DBT-ST ( <i>n</i> = 22) vs activities-based support group (ASG) ( <i>n</i> = 22)  19-70 ( <i>35.55, 12.43</i> )	<b>IV:</b> Treatment condition  <b>DV:</b> Emotion dysregulation (DERS; Gratz & Roemer, 2004).	DBT skill use (DBT-WCCL, skills subscale; Neacsu, et al., 2010b), mindfulness (KIMS; Baer et al., 2004), and perceived control (The Control Scale from the Dimensions of Stress Scale, DoSS; Vitaliano et al., 1993).	Multiple mediation. Multi-level mediation model.	<ul style="list-style-type: none"> <li>Skills use, mindfulness, and perceived control did not mediate the relationship between treatment condition and emotion dysregulation.</li> </ul>

### **1.3.8 Quality Assessment Results**

Quality assessment results using Mansell et al.'s (2013) critical appraisal tool are shown in Appendix D. Common limitations of studies were not reporting a power calculation (78%), not ascertaining temporal precedence (67%), and not identifying a correlation between change in the potential mediator and change in the outcome (89%). Common strengths were citing a theoretical framework (100%), reporting the psychometric characteristics of mediator (100%) and outcome variables (94%), and utilising appropriate methods of data analysis (100%). With regards to mediation analyses, all studies were deemed to be of medium to high quality, and thus appropriate for inclusion in the review.

Quality assessment results using Downs and Black's (1998) checklist are shown in Appendix E. Common limitations were not reporting on possible adverse events (0%), participants not being representative of the entire population from which they were recruited (94%), insufficient blinding of participants to intervention (0%), and compliance with the DBT intervention could not be determined (89%). Common strengths were clearly described aims, hypotheses, main outcomes to be measured (100%), main findings and patient characteristics (100%), providing estimates of the random variability in the data for the main outcomes (100%), and clarifying when results were based on data dredging (100%). Based on Downs and Black's (1998) checklist, all studies were deemed to be of medium to high quality, and thus appropriate for inclusion in this review.

## **1.4 Discussion**

This systematic review aimed to identify and synthesise the literature on potential mechanisms of change in DBT. To our knowledge, this is the first systematic review of mechanisms of change specific to DBT which includes a range of clinical populations and focuses on mediation studies.

### **1.4.1 Synthesis within the Theoretical and Empirical Literature**

Eighteen mediation studies were identified, with differing designs, outcome measures, mediation analyses, and DBT interventions, making the synthesis of findings challenging. Skills use was commonly supported as a mediator on a range of mental health and other psychological outcomes (Cavicchioli et al., 2019; Karam et al., 2022; Neacsiu et al., 2010a, 2014, Seow et al., 2020), as were emotional dysregulation (Cavicchioli et al., 2020a; Hood et al., 2024; Neacsiu et al., 2018; Maffei et al., 2018; Whiteside., 2011), experiential avoidance (Cavicchioli et al., 2020a, 2020b; Schmalig et al., 2021), and mindfulness (Cavicchioli, Movalli

& Maffei, 2019; de Souza et al., 2019). These findings are consistent with the theoretical basis of DBT (Linehan, 1993). There was single case support for assertive anger on symptomology (Kramer, 2016), acceptance without judgement on frequency of NSSI (Krantz et al., 2018), drinking to cope on a reduction in alcohol related problems (Whiteside, 2011), depression on a reduction in alcohol related problems (Whiteside, 2011), and decentering on BPD symptomatology (Schmidt et al., 2021) as mediators, however these need to be interpreted with caution due to limited investigations.

The finding of skill use as a mediator of the psychological benefits of DBT is in line with other commentaries on the mechanisms of change in DBT (Boritz et al., 2017; Chapman & Owens, 2020; Mehlum, 2021; Rudge et al., 2020) and the stipulation of this as a necessary element of a DBT intervention (Linehan, 1993). The term 'skill use' encompasses the four skills modules; ER, DT, mindfulness and IE. However, identifying "skill use" as a mediator does not clarify whether each skill module acts as an individual mechanism of change, or whether the modules are collectively a mechanism of change. Little is known about whether different skills elicit distinct levels of change, or the intercorrelations of DBT skills.

Other identified mediators could be considered as skills in themselves, thus subsumed within "skills use". For example, multiple studies evaluated ER and mindfulness as mediators. ER and mindfulness are two of the four skills modules. Experiential avoidance and mindfulness have been posed as ER strategies (Schut & Boelen, 2017), all of which could arguably come under "skill use". Rudge et al. (2020) viewed ER as a separate mechanism of change to skill use, postulating that deficits in ER are improved with skill use via the therapeutic alliance. There may be a chain effect in that skills use targets ER which then targets symptomology; however this warrants further investigation.

In the current review, studies which evidenced ER as a mediator support the biosocial theory of DBT, and previous discussions on the mechanisms of change in DBT (Chapman & Owens, 2020; Lynch et al., 2006; Mattei & Sposato, 2020; Mehlum, 2021; Rudge et al., 2020). Research has evidenced a relationship between DBT and improved ER (Goodman et al., 2014), and ER and symptom reduction (Lenz et al., 2006); although the latter study was with an adolescent population. However, research into the efficacy of DBT in improving ER is inconclusive (Harvey et al., 2019) and limited, despite it being a core part of the theoretical underpinning of this modality.

Linehan (1993) referred to 'core' mindfulness and discussed mindfulness as central to DBT. Mindfulness skills are thought to support and underpin the other three skills domains (Linehan, 2015); further raising the question of whether the modules should be evaluated as mechanisms of change individually or collectively. Two of the included studies found evidence for the role of mindfulness as a mediator (Cavicchioli, Movalli & Maffei, 2019; de Souza et al.,

2019). This supports previous literature on mindfulness as a mechanism of change (Chapman & Owens, 2020) and research specifically investigating the mindfulness component of DBT which found that acquisition of mindfulness skills led to symptom reduction (Mochrie et al., 2019; Zeifman et al., 2020). Krantz et al. (2018) found support for acceptance without judgement as a mediator between DBT skills training and NSSI. Acceptance without judgment can be seen as a facet of mindfulness (Baer et al., 2004). Mindfulness is a core component of DBT but is not unique to this therapeutic modality (Johanson & Dapa, 2006) and may be a mechanism of change in other interventions (Bajaj et al., 2016; Dehghan et al., 2020; Keng et al., 2020; van den Hurk, 2011), rather than a mechanism of change specific to DBT.

One study looked at the relationship between ER and mindfulness and BPD symptomology, finding that ER inversed the relationship between mindfulness and BPD symptoms (Hood et al., 2024). That is, increased mindfulness was associated with increased BPD symptoms, but when ER was introduced as a mediator, increased mindfulness was associated with reduced BPD symptomology. This suggests an interaction between different potential mediators. They also found that more people experienced changes in ER prior to changes in mindfulness, suggesting that the effect of potential mediators may differ at different time points during the intervention. Further research is needed to investigate whether this is replicated in other samples and across clinical presentations.

Experiential avoidance (EA) is defined as “*the phenomenon that occurs when a person is unwilling to remain in contact with particular private experiences (e.g., bodily sensations, emotions, thoughts, memories, behavioral predispositions) and takes steps to alter the form or frequency of these events*” (Hayes et al., 1996, p. 4). EA was supported as a mediator between ER and compulsive shopping, binging, and starving (Cavicchioli et al., 2020b), and between the DBT treatment and somatization (Schmaling et al., 2021). EA is a construct that is more often discussed in Acceptance and Commitment Therapy (ACT), with the AAQ and AAQ-II measures designed based on the theory underpinning ACT (Bond et al., 2011; Hayes et al., 2004). Although experiential avoidance is not specifically named in DBT, it does relate to DBT theory and the skills modules. For example, the ‘opposite action’ skill within the ER module encourages patients to do the opposite action of avoidance behaviours. Mindfulness involves being present in an experience (as opposed to avoiding it). To tolerate distress (DT), one needs to be in contact with the distressing experience (Linehan, 2015). Using the above definition of EA, this finding is in line with Boritz et al.’s (2017) discussion of increased acceptance and awareness of emotions as a mechanism of change in DBT. There is limited research specifically focused on the role of experiential avoidance in DBT, one study found an association between changes in EA and changes in depression in a DBT programme (Berking et al., 2009). There is evidence for EA as a

mechanism of change in CBT (Eustis et al., 2020) and acceptance-based therapy (Eustis et al., 2016) which suggests that it may not be a mechanism of change which is specific to DBT.

Overall, the results broadly support theoretical and empirical investigations, however clarity on the specificity of mechanisms and component parts of DBT, and replication of results, are still needed.

#### **1.4.2 Critique of Included Studies**

A key limitation is the large conceptual overlap between all mediators investigated. The concept of ER has multiple definitions (Bennetts, 2022; Harvey et al., 2017) despite commonalities across definitions of ER having been identified (Tull & Aldao, 2015). Conflicting theories all mention some aspect of awareness, acceptance, action, and coping (Bennetts, 2022). Based on this definition, arguably all mediators investigated could be considered as ER. This is in line with ER being proposed as a transdiagnostic mechanism or construct (Sloan et al., 2017). Across the studies, ER was set as an IV (Cavicchioli et al., 2019; 2020b; Cavicchioli, Movalli & Maffei, 2019; Karam et al., 2022), a DV (Neacsiu et al., 2014; Wyatt et al., 2023), and a mediator (Cavicchioli et al., 2020a; Maffei et al., 2018; Neacsiu et al., 2018; Whiteside, 2011), which leads to difficulties in drawing conclusions about the role of ER in DBT.

Findings are compromised by diverse DBT interventions and data analyses in the included studies, therefore more consistent and robust studies are needed to explore specificity of DBT components, mediators, and outcomes. Only two studies (Hood et al., 2024; Krantz et al., 2018) commented on treatment fidelity, making it difficult to determine how closely interventions adhered to DBT protocol which reduces the validity, reliability, and generalisability of the research. Most included studies did not establish temporal precedence, and therefore cannot demonstrate whether the change in the mediating variable preceded change in the outcome variable. A strength of Hood et al.'s (2024) paper was that they considered the temporal ordering of changes in potential mediators.

There was some consistency in the measures used across studies; particularly the DERS (Gratz & Roemer, 2004) to measure ER and the DBT-WCCL (Neacsiu et al., 2010b) to measure skill use. The DERS is a commonly used measure of ER in DBT (Harvey et al., 2017). The use of self-report measures in the research is a limitation as they capture self-perceptions of behaviour which may be subject to bias (Boritz et al., 2017; Harvey et al., 2017). Thus future research should attempt to gather objective measures or reports of behaviours, such as occurrences of utilising certain types of coping strategies.

There is a potential conflict of interest and bias in findings given that Marsha Linehan, who developed DBT, was co-author of two of the included studies (Neacsiu et al., 2010a; Schmalzing



et al., 2021). Other aspects of the literature pose a risk of bias; four studies conducted a secondary analysis, either using the same data as each other or data from other included studies. Secondary data analysis can optimise the utility of previous research but can lead to confirmation bias and distortion of the evidence base (Baldwin et al., 2022); results should be interpreted with caution as there is a risk that mediation analyses were only conducted because there was preliminary evidence of mediation in the original studies.

Study samples were predominantly white participants, or studies did not report on ethnicity, race or cultural background. Some core concepts within DBT are from eastern philosophy (Linehan, 1993), and in there is emerging evidence on cultural adaptations of DBT (Haft et al., 2022). It would be helpful to further our understanding of whether the mechanisms of change in DBT differ depending on ethnicity, race, or cultural background, as discussed by Haft et al. (2022). It should be standard practice for research to report on this demographic information as it informs discussions about the generalisability of results to different populations. This could be encouraged by including this in future versions of the PRISMA guidelines.

There may be a gender bias in the included studies; two studies had a female only sample. DBT is only NICE (2009) recommended for females with BPD, and there is a gender bias towards women in DBT literature (Holah et al., 2023). Further research is needed to ascertain if the mechanisms of change in DBT differ between genders.

### **1.4.3 Critique of Current Review**

There is a risk of publication bias given that the review did not include grey literature, and therefore may not have identified other literature suitable for inclusion. The primary author and supervisors are trained in DBT which introduces a risk of bias when selecting papers and interpreting the results. A further limitation of the current review is that mediation analysis was an inclusion criterion on the basis that investigation of mediators is often the first step in understanding mechanisms of change (Kazdin, 2007); this did not capture studies which discuss mechanisms of change without a mediation analysis. Removing this criterion would widen the scope of this review, although may make the synthesis of data more challenging. Limitations of the quality assessment tools were evident from the initial discrepancy between reviewer ratings; some questions were ambiguous and subjective in nature which resulted in discussions between researchers to clarify the concepts that certain questions were addressing.

#### **1.4.4 Future Research**

When linking the evidenced mediators to the theoretical basis of DBT, it is important to note that DBT was developed for BPD, with the biosocial theory outlining the development of that clinical presentation only. Future research could explore how other clinical presentations can be understood in terms of the biosocial theory which could further our understanding of the mechanisms of change in DBT interventions for different clinical populations. Given the broad conceptual overlaps between identified mediators and in DBT literature (Boritz et al., 2017) it would be beneficial for future DBT research to clearly define and operationalise these concepts.

Future studies should strive to overcome the limitations of the literature reviewed through consistent use of mediation analysis to explore mechanisms, consistency in study designs and measurements, and exploration of the specificity of DBT components on effecting mediators. Studies would be further improved by using multiple time points to establish temporal precedence. Such research could ascertain whether changes in a particular skill use, temporally precede changes in the related outcomes. Research could establish if each mediator variable has a differential effect depending on when during treatment it is delivered (Kendall et al., 2017).

Our findings suggest that there may be some similarities between mechanisms of change in DBT and other therapeutic modalities; future studies could compare mediators in DBT and other interventions, for example DBT mindfulness compared to Mindfulness Based Cognitive Therapy.

Finally, for increased ecological validity, it could be beneficial to have qualitative feedback on patient experiences to elicit if proposed mechanisms of change align with any changes individuals notice from the intervention.

#### **1.4.5 Clinical Implications**

Findings suggest the transdiagnostic benefits of skill use, therefore it may be beneficial for clinicians and services to emphasise and enhance this element of DBT by focusing sessions and groups on this and integrating skill use into the ethos of the service. There is evidence of potential interactions between different skills modules, such as ER and mindfulness. Services may therefore need to be cautious about delivering skills modules in isolation. The support for the role of ER as a mediator suggests that clinicians may wish to prioritise this set of skills. Evidence for emotional avoidance as a mediator suggests that it may be beneficial for clinicians to explicitly explain this construct to clients in the same way as the four skills module constructs.

The delivery of any intervention has cost implications; understanding the mechanisms of change in DBT could allow for a more cost-effective delivery of DBT interventions. Additionally, it could inform clinicians and research with regards to how to focus on or enhance those mechanisms to improve the efficacy and outcomes of the intervention. Research into the mechanisms of change in DBT can set a precedent for the development and research of other modalities in that we should be ascertaining the process of change, rather than merely accepting that change occurs. Furthermore, understanding the mechanisms of change in DBT could allow research to then explore whether they differ depending on the clinical presentation.

### **1.4.6 Conclusions**

The current review aimed to synthesise mediation studies to address the question of what the mechanisms of change are in DBT, that is, how DBT may improve psychological outcomes in clinical populations. This was the first systematic review of mediation studies to address this question, and include studies with a range of clinical populations rather than focusing on BPD. Synthesis was limited by overlapping and poorly defined constructs and the inclusion of heterogeneous studies. However, results broadly supported the theoretical basis of DBT (Linehan, 1993) and previous literature on the mechanisms of change in DBT (Boritz et al., 2017; Chapman & Owens, 2020; Lynch et al., 2006; Mehlum., 2021; Rudge et al., 2020). Results strengthen the discussion around mechanisms of change by focusing on appropriate mediation analyses. The most commonly supported mediators were skill use, emotional dysregulation, experiential avoidance, and mindfulness. Further research should seek to clarify the distinct contribution of each proposed mediator and the interaction between these as potential mechanisms of change. Clarity in the definition of these constructs could improve future DBT research and interventions. Research into the mechanisms of change in DBT in clinical populations could improve the delivery and efficacy of DBT interventions in mental health services, by informing whether certain components of the treatment should be enhanced or prioritised. It may also allow for individualisation of treatment based on service user preferences and presentation.

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## Chapter 1

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## Chapter 2 Empirical Paper

**Title:** Yoga and DBT: A cross sectional study exploring the relationship between yoga practice, the four skills modules of DBT, and mental wellbeing.

**Journal specification:** This review has been prepared for submission to the following journal: Complementary Therapies in Clinical Practice. No word limit is provided. See Appendix F for author guidelines.

Word count: 9546 (excluding abstract, figures, tables and references)

### Abstract

**Background and Purpose:** Research supports the potential efficacy of yoga in improving psychological outcomes in a range of clinical populations. DBT interventions have been implemented for various clinical presentations which suggests that it targets transdiagnostic processes. The potential shared transdiagnostic psychological processes between yoga and DBT were investigated. This study explored the differences between yoga practisers (YPs) and non-yoga practisers (NYPs) on outcomes measures relating to each of the four DBT skills modules, and a measure of mental wellbeing. This research addresses a literature gap by analysing intercorrelations between the DBT outcome measures. **Materials and Method:** In this cross-sectional study a non-clinical sample of YPs and NYPs ( $N = 433$ ) completed an online survey. Self-report measures of emotion regulation, distress tolerance, mindfulness, interpersonal relationships, and mental wellbeing were used. YPs completed a measure regarding the inclusion of the eight limbs in their yoga practice. **Results:** On all five outcome measures there was a statistically significant difference between YPs and NYPs. YPs reported greater levels of emotion regulation, distress tolerance, mindfulness, interpersonal satisfaction and mental wellbeing. Each of the eight limbs of yoga correlated with at least one outcome measure. Certain limbs predicted scores on each measure; yama was the most consistent predictor. There was a statistically significant strong correlation between the four DBT measures. **Conclusion:** Results support an association between yoga and psychological outcomes, and potential shared transdiagnostic processes between yoga and DBT. Clinical implications and the need for future research are discussed.

### Keywords

Yoga, Dialectical Behaviour Therapy, mental wellbeing

## 2.1 Introduction

Suffering and distress is a part of being human; be that psychologically, spiritually, or physically. It can be an individual experience, or one which effects entire communities and countries, such a wars and pandemics (Malpas & Lickiss, 2012). This has an impact on individuals' mental health and wellbeing. A reported 970 million people were living with a mental disorder globally in 2019; most commonly anxiety and depression, with a significant impact on all aspects of life (World Health Organization, 2024). Given the shared human experience of distress and the current prevalence of mental disorders it is pertinent to explore common mechanisms of coping strategies or interventions which may be utilised when experiencing such distress.

Cultural differences in coping styles and psychological health have been discussed; highlighting the contrast between western individualistic values and eastern collectivist values (O'Connor & Shimizu, 2002). Yoga is derived from eastern culture; it is thought to have originated in South Asia (Thompson-Ochoa, 2019). 'Yoga' meaning 'to unite', consists of mental and physical practices focusing on achieving harmony between the body, mind and spirit (Basavaraddi, 2015; Thompson-Ochoa, 2019). The introduction of yoga into western societies dates to 1893, with an increase in popularity in the 1960s due the perceived benefits for psychological and physical wellbeing (Askegaard & Eckhardt, 2012). The popularity of yoga has further increased in western countries since the nineties (Ding & Stamatakis, 2014; Zhang et al., 2021).

### 2.1.1 *Yoga and Mental Health*

The Covid-19 pandemic had an impact on individuals' mental health. In Great Britain, rates of depression increased; with 21% of adults experiencing some form of depression in January 2021, double compared to before the pandemic (Office for National Statistics; ONS, 2021). Google search trends showed a significant increase in 'yoga' search queries during the pandemic; this significantly correlated with 'depression' and 'anxiety' search queries (Jindal et al., 2021). Covid -19 restrictions led to an increase in online yoga classes, which have remained popular (Brinsley, 2021). Yoga practice may have improved psychological wellbeing during the pandemic (Kulkarni et al., 2022; Puyat et al., 2020) and subsequently it may benefit those experiencing symptoms of long-Covid (Santos et al., 2023).

Studies have indicated the potential benefits of yoga for a range of mental health difficulties (Balasubramaniam et al., 2013), including depression (Brinsley, 2021; Duan-Porter et al., 2016), anxiety (Cramer et al., 2018a), bipolar disorder (Jean et al., 2022), PTSD (Cramer et

al., 2018b), eating disorders (Borden & Cook-Cottone, 2020), and schizophrenia (Vancampfort et al., 2012). Yoga can improve wellbeing (Sahni, 2021) and reduce stress (Riley & Park, 2015). This evidence base is limited by a lack of randomised controlled trials comparing yoga to other psychological interventions (Balasubramaniam et al., 2013), small sample sizes (Duan-Porter et al., 2016) and insufficient blinding in studies (Cramer et al., 2018a; Jean et al., 2022). A limitation of yoga research is variation across types and style of practices, and poorly defined yoga interventions (Brinsley, 2021), making it difficult to conclude which components of yoga are associated with psychological benefits. A further challenge within research into the psychological benefits of yoga is a lack of clarity in distinguishing between yoga ‘therapy’ and the ‘therapeutic’ benefits of yoga (Bennetts, 2022). Yoga therapy is defined as personalising yoga techniques to an individual to improve quality of life, and physical or emotional wellbeing (British Wheel of Yoga, 2024); arguably yoga practice may yield similar benefits. Ethical concerns regarding the cultural appropriation of yoga have been discussed, arguing that western adaptation has negated the important spiritual eastern origins (Thompson-Ochoa, 2019). Research in the UK and USA has found yoga practisers are more likely to be white, female, and degree educated (Cartwright et al., 2020; Ding & Stamatakis, 2014; Ross et al., 2013). It may be that such yoga practisers are more likely to participate in yoga research resulting in a sampling bias. In the UK, yoga classes often focus on the physical poses (asana), with less time on meditation (dhyana), breathing exercises (pranayama) and other aspects of yoga (Nalbant et al., 2022). This may support concerns about the cultural appropriation of yoga (Thompson-Ochoa, 2019), if practice in the UK is negating some of the philosophical basis. There is a need to standardise how yoga interventions are researched and reported; the CLARIFY guidelines have been developed to improve the usefulness and transparency of yoga research (Moonaz et al., 2021).

Despite heterogeneity among yoga practices, many focus on the eight limbs of yoga as outlined in *Patanjali's Yoga Sutras* (Satchidananda, 2020); a core text on yogic practice. There are eight limbs: yama, niyama, asana, pranayama, pratyahara, dharana, dhyana, samadhi. Yama and niyama are further subdivided into five limbs each, with a total of 16 different concepts. Definitions of the limbs are provided in Table 3. Whilst studies have explored the link between yoga and psychological outcomes, few have specifically focused on how the limbs relate to psychological processes (Bennetts, 2022). Research which does not consider the ethical underpinnings of yoga could reinforce concerns about the cultural appropriation of yoga. Gard et al. (2014) present a model outlining self-regulatory processes in yoga which may lead to psychological benefits. The model groups the eight limbs into four features of yoga; ethics, postures, breath regulation, and meditation. Kishida et al. (2019) utilised the same four categories in a model which focuses on inter and intra personal factors leading to health and

wellbeing outcomes. Although each model discusses certain limbs, the specific contribution of each limb is not discussed. Bennetts' (2022) model proposes that yoga targets specific transdiagnostic processes via each limb, leading to improved wellbeing, reduced distress and psychological change. Initial evidence has supported this model, finding a positive association between distinct yoga practices and psychological outcomes, specifically between ahimsa and compassion, ahimsa and wellbeing, and between pranayama and compassion (Pick et al., in prep). Furthermore, the extent of ahimsa within yoga practice was the sole predictor of psychological wellbeing, self-compassion, and compassion from others, supporting specificity of individual yoga limbs, and specifically the yamas and niyamas, in the predicting psychological wellbeing. Pick et al.'s (in prep) research was limited by focusing on only three of the limbs.

**Table 3***The Eight Limbs of Yoga*

Limb	Meaning
Yama	Abstinence, regulation
Ahimsa	Non violence
Satya	Truthfulness
Asteya	Non- stealing
Brahmacharya	Continence, moderation
Aparigraha	Non-greed
Niyama	Observance
Saucha	Purity
Santosha	Contentment
Tapas	Spiritual austerity
Svadhyaaya	Self-enquiry or spiritual study
Isvara pranidhana	Worship of God or self-surrender
Asana	Pose
Pranayama	Breathwork
Pratyahara	Withdrawal of the senses
Dharana	Concentration
Dhyana	Meditation
Samadhi	Contemplation, absorption

Note. Definitions from Desikachar (1999) pp 238-242 and Satchidananda (2020) pp 225-235.

**2.1.2 Dialectical Behaviour Therapy**

Dialectical behaviour therapy (DBT) is a NICE recommended (National Institute for Health and Care Excellence; NICE, 2009) treatment intervention in NHS mental health services.

DBT dropout rates are high; data from a London service showed 58% of patients dropped out of DBT before completion (Gaglia, 2013). Further research is needed into patient attitudes towards DBT and why dropout rates are high (Kuckertz et al., 2020). DBT is a time intensive intervention which could impact on cost, and patient and clinician experience. DBT was developed as a treatment for Borderline Personality Disorder (BPD); there is stigma associated with this diagnosis (Ring & Lawn, 2019) which may negatively impact on patient engagement when being offered DBT.

### **2.1.3 Yoga and DBT**

Yoga is grounded in eastern philosophy; Linehan referred to the influence of eastern philosophy and meditation practices in the development of DBT (Linehan 1993, 2015). In Bennetts' (2022) model, the transdiagnostic processes are hypothesised as mechanisms of change in yoga, and discussed in relation to third wave therapies, including DBT. The model specifically focuses on the 'eight limbs' of yoga. Bennetts (2022) argued yoga and DBT target the same transdiagnostic processes and therefore may lead to an equivalent change in symptomology; in yoga via rehearsal of the eight limbs and in DBT via skills practice, both resulting in therapeutic benefits. A postulated mechanism of change in DBT is 'skill use' (Mehlum, 2021; Rudge et al., 2020). DBT skills are divided into four modules: emotion regulation (ER), distress tolerance (DT), mindfulness and interpersonal effectiveness (IE). Research is needed into how the skills modules relate as mechanisms of change (see Chapter One).

Linehan (2015) defines ER as the ability to inhibit maladaptive behaviours which result from strong emotional experiences, engage in self-soothing techniques, and change ones focus of attention, to work towards a goal which is not mood dependent. Emotion dysregulation is the inability to regulate emotional responses and expressions (Linehan, 2015). Yoga has been associated with improved ER (Drapkin, 2019; Menezes, 2015) and reduced emotion dysregulation (Parkinson & Smith, 2023). The impact of yoga on ER subsequently impacts on levels of anxiety and depression (Rasoulzadeh, 2019). This evidence is limited by small samples (Drapkin, 2019; Menezes, 2015), a lack of a control group (Drapkin, 2019; Menezes, 2015) and a cross-sectional design which does not infer causality (Parkinson & Smith, 2023; Rasoulzadeh, 2019). Furthermore, Bennetts (2022) discussed ER as a transdiagnostic process which could be associated with many of the eight limbs; satya, asteya, brahmacharya, aparigraha, saucha, santosha, svadhyaya, isvara pranidhana, pranayama, pratyahara, dharana, dhyana, samadhi.

DT refers to an ability to accept and tolerate distress; trying to change, control, or stop ones emotions, thoughts, or behaviours (Linehan, 2015). The 'TIPP' DT skill in DBT refers to using paced breathing, similarly, pranayama focuses on changing breathing pace in yoga. This

suggests breathwork may be a common mechanism of change in DBT and yoga (Bennetts, 2022). Yoga has been shown to increase DT (Medina et al., 2015), although this research is limited by small and underpowered samples, high attrition rates, and a lack of an active control condition comparing the effect of yoga to other psychological interventions.

In DBT, mindfulness is the conscious act of becoming aware of the present moment without attachment or judgement (Linehan, 2015). Mindfulness is proposed to underpin the other skills modules (Linehan, 2015). Yoga is associated with increased mindfulness and lower psychiatric symptoms (Gaiswinkler & Unterrainer, 2016). Mindfulness has been found to mediate the relationship between yoga and quality of life (Gard et al., 2012), and between yoga and wellbeing (Tihanyi et al., 2016). Research identified a significant association between facets of mindfulness and yoga practice, finding that the non-judgement facet of mindfulness mediated the relationship between yoga and anxiety (Boni et al., 2018). Four of the eight limbs (pratyahara, dharana, dhyana, and samadhi) fall under the category of 'meditation' (Gard et al., 2014). There is a risk that in using the terms meditation and mindfulness interchangeably, each construct will not be clearly defined. There has been an increase in research into 'mindfulness meditation' which aims to increase mindfulness (Eberth & Sedlmeier, 2012), suggesting an overlap in these constructs.

Three aspects of interpersonal effectiveness are covered in DBT; maintaining relationships with self-respect whilst communicating ones needs, developing and maintaining healthy relationships and ending unhelpful relationships, and maintaining a balance between change and acceptance in relationships. There is a lack of research exploring the association between yoga and interpersonal effectiveness skills, however, Kishida et al. (2019) found individuals can experience relational benefits from yoga. There was a significant relationship between yoga practice and greater social connectedness which was mediated by greater mindfulness. This is in line with Linehan's (1993) proposal that mindfulness underpins other skills modules. Bennetts (2022) discussed how satya relates to the interpersonal skills in DBT; with truthfulness with oneself and others being required in order to communicate ones needs whilst maintaining self-respect. There is an interpersonal element to asteya and ahimsa, which refer to 'not stealing' the physical belongings, emotional experiences, or resources of others (asteya), and non-violence towards self and others (ahimsa) (Bennetts, 2022). Therefore one might expect an impact on interpersonal relationships if these limbs are part of an individual's practice.



### **2.1.4 Rationale**

The potential overlap in the psychological mechanisms and benefits of yoga and DBT has not been well researched; aside from Bennetts' (2022) model. Existing literature has evidenced a link between yoga and the four separate constructs of the DBT skills modules, however, the potential shared mechanisms between all of the skills modules and specific components of yoga has not been fully explored. Previous research is limited by not clearly defining or exploring specific components of yoga. Specifically, there is a lack of research which considers the ethical underpinnings of yoga, namely the eight limbs, with regards to transdiagnostic psychological processes.

This study aims to explore shared transdiagnostic psychological processes and potential mechanisms of change between DBT and yoga, focusing on the four skills modules of DBT. The study also aims to explore the relationship between the four DBT skills modules, given the lack of research in this area.

Research into yoga as a viable treatment alternative to third wave therapies could lead to a more holistic approach to the interventions offered in the NHS. This could improve patient choice, patient experience, and reduce the current stigma associated with accessing mental health services. The current research could lead to intervention studies which directly compare the efficacy of yoga versus third wave interventions including DBT.

## **2.2 Hypotheses**

- 1) Yoga practisers will have greater emotion regulation, distress tolerance, mindfulness, interpersonal effectiveness skills and mental wellbeing compared to non-yoga practisers. It is anticipated that this study will replicate Pick et al.'s (in prep) findings that yoga practisers have significantly higher wellbeing than non-yoga practisers.
- 2) Participant scores on the DBT skills measures will correlate with each other.
- 3) Yoga practisers' scores on emotion regulation, distress tolerance, mindfulness, interpersonal effectiveness, and wellbeing measures will positively correlate with the eight limbs of yoga. Each of the four DBT outcomes will correlate with at least one of the eight limbs. It is anticipated that the correlations between the emotion regulation measure and the eight limbs will be in line with the model presented by Bennetts (2022).
- 4) At least one of the limbs of yoga will predict scores on the four DBT skills measures and a wellbeing measure.

## **2.3 Method**

### **2.3.1 Design**

A cross sectional design was used. For the first hypothesis, there were two levels to the between-subjects independent variable ('Yoga practiser'; YP, vs 'Non-Yoga practiser'; NYP). Data from both YP and NYP participants was included for hypothesis two. The third and fourth hypotheses relate only to YP participants. The study used a joint recruitment process as part of a wider research project also exploring yoga and acceptance and commitment therapy (ACT) (Fox et al., 2024).

### **2.3.2 Ethics**

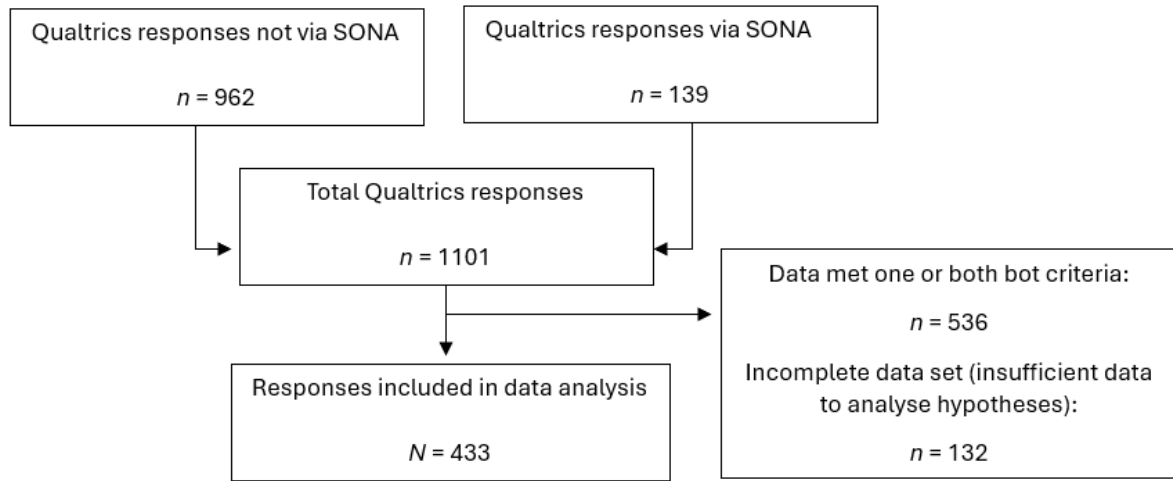
This study received ethical approval via the University of Southampton Ethics and Research Governance Online (ERGO) system (ID: 81567) (Appendix G).

### **2.3.3 Power**

A priori power analyses were conducted using G\*Power (version 3.1.9.2; Faul et al., 2013), utilising effect sizes from another cross sectional study (Pick et al., in prep). A minimum of 218 participants (109 per group) was required for a multiple regression with eight predictors, assuming a medium effect size and power of 0.80.

### **2.3.4 Participants**

Participants had to be aged over 18 years and fluent in English. Participants were a YP if they reported to practice yoga a minimum of twice per month, this is consistent with previous research (Pick et al., in prep). During recruitment it became apparent that some responses were from 'bots' rather than human participants. There is a limited amount of research on 'bot' responses to online surveys and how these can be identified. A 'bot' exclusion criteria was agreed by the research team based on previous research (Goodrich et al., 2023; Lawrence et al., 2023) and recommendations on Qualtrics; see Appendix H. A total of 433 responses were included (YP  $n = 204$ , NYP  $n = 229$ ). See Figure 3.

**Figure 3***Consort Diagram of Included and Excluded Data*

Note. SONA is the University of Southampton online experiment management system.

### 2.3.5 Materials

#### 2.3.5.1 Demographic Information

All participants completed a demographic questionnaire (Appendix I) including questions about age, gender, ethnicity, mental health difficulties, current treatment for mental health difficulties, previous engagement in DBT or ACT, and type and frequency of exercise. All participants were asked if they practice yoga and, if yes, how frequently. YPs completed additional demographic questions about type of yoga practiced, number of years practicing, location of practice, and whether they were a yoga teacher or therapist. YP's completed an additional questionnaire about features of their yoga practice, this is discussed below.

#### 2.3.5.2 Outcome measures

The following outcome measures were completed by all participants. See Appendix J.

**Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004).** The DERS is a 36 item self-report questionnaire designed to measure ER. It consists of six subscales; nonacceptance of emotional responses, difficulties engaging in goal-directed behaviour, impulse control difficulties, lack of emotional awareness, limited access to ER strategies, and lack of emotional clarity. Responses are on a five point Likert scale from 1 (almost never) to 5 (almost always), indicating how often each item is applicable to the respondent. A higher score indicates greater difficulties with ER. It was shown to be a valid measure with high internal

consistency ( $\alpha = .93$ ) and good test–retest reliability (Gratz & Roemer, 2004; Dan-Glauser & Scherer, 2012). In the current study, the DERS had a Cronbach’s alpha of .96.

**The Distress Tolerance Scale (DTS; Simons & Gaher, 2005)**. This is a 15 item self-report measure of emotional DT, consisting of four subscales; tolerance, appraisal, absorption, and regulation. Respondents rate their agreement with each item on a five point Likert scale from 5 (strongly disagree) to 1 (strongly agree). A higher score indicates a greater ability to tolerate emotional distress. Research has shown the scale to have good validity, internal consistency ( $\alpha = 0.89$ ) (Simons et al., 2018; Simons & Gaher, 2005), and test-retest reliability (Simons et al., 2018). In the current study, the DTS had a Cronbach’s alpha of .93.

**Five-Facet Mindfulness Questionnaire (FFMQ-15; Baer et al., 2012)**. The 15-item version of this self-report questionnaire has five subscales, each measuring a different facet of mindfulness; describing, observing, awareness, non-judgment, and non-reactivity. This abbreviated version of the 39 item FFMQ (Baer et al., 2006) was administered to reduce participant burden. Respondents indicate how applicable each statement is on a five point Likert scale from 1 (never or very rarely true) to 5 (very often or always true). A higher score indicates greater trait mindfulness. It has been shown to be a reliable and valid measure (Gu et al., 2016) with adequate internal consistency ( $\alpha = .80$  to  $.85$ ; Baer et al., 2012). In the current study, the FFMQ-15 had a Cronbach’s alpha of .83.

**The Functional Idiographic Assessment Template-Questionnaire-Short Form (FIAT-Q-SF; Darrow et al., 2014)**. This is a 32 item self-report questionnaire measuring difficulties with interpersonal relationships and consisting of six subscales: avoidance of interpersonal intimacy, argumentativeness or disagreement, connection and reciprocity, conflict aversion, emotional experience and expression, and excessive expressivity. Respondents indicate their agreement with each item on a six point Likert scale from 1 (strongly disagree) to 6 (strongly agree). A higher score indicates greater distress and lower satisfaction. It was shown to have moderate internal consistency ( $\alpha = .72$  to  $.82$ ) and test-retest reliability (Darrow et al., 2014). This version was administered rather than the full 117 item version (FIAT-Q; Darrow et al., 2014) to reduce participant burden. In the current study, the FIAT-Q-SF had a Cronbach’s alpha of .92.

**The Short Warwick–Edinburgh Mental Wellbeing Scale (SWEMWBS; Stewart-Brown et al., 2009)**. This measure of mental wellbeing is a shortened version of the Warwick–Edinburgh Mental Well-being Scale (WEMWBS). Responses are given on a five point Likert scale from 1 (none of the time) to 5 (all of the time), with a higher score indicating greater mental wellbeing. The scale has good internal consistency ( $\alpha = 0.84$ ; Ng Fat et al., 2017), high test-rest reliability (Tennant et al., 2007) and is sensitive to change (Shah et al., 2021). In the current study the SWEMWBS had a Cronbach’s alpha of .85.

**Eight limbs of yoga questionnaire.** This measure was completed by YPs only. There is not currently a tool available which measures to what extent each of the eight limbs is included in an individual's yoga practice; such a measure was needed for the analyses of hypotheses three and four. The Essential Properties of Yoga Questionnaire (EPYQ) was designed to measure components of yoga practice (Park et al., 2018). This was considered as an outcome measure in the present study but was deemed unsuitable because it is an observation measure and does not capture all the limbs. The Ashtanga Yoga Hindi Scale (Raina & Singh, 2018) is theoretically based on the eight limbs but has not been translated into English or validated as such.

The present eight limbs questionnaire was developed jointly with two other research teams (Fox et al., 2024; Wing et al., 2024). As part of patient and public involvement (PPI), development of the questionnaire was discussed in a focus group of YPs, and discussed individually with three YPs who have training in yoga. Feedback was gathered on the wording of questions and potential participant burden.

The questionnaire consists of 48 items; there are three items relating to each of the 16 limb concepts. Responses are given on a seven point Likert scale from 1 (never) to 7 (always). The first 30 items were designed to capture the yamas and niyamas, which are guiding principles. The latter 18 questions were designed to capture the remaining limbs relating to specific aspects of an individual's practice, such as physical postures and breathwork. There is an additional final item: 'To what extent are you familiar with the eight limbs of yoga?'. Responses are given on a seven point Likert scale, from 1 (completely unfamiliar) to 7 (very much familiar). Questionnaire items and the corresponding yoga limb can be found in Appendix K.

In the current study, the overall questionnaire had a Cronbach's alpha of .96. The yama subscale had a Cronbach's alpha of .90. The niyama subscale had a Cronbach's alpha of .92. Cronbach's alphas for each limb ranged from .45 - .92 (Appendix L).

### **2.3.6 Procedure**

A recruitment poster (Appendix M) was shared via email, Facebook, Instagram, and special interest groups. Emails were sent to yoga teachers asking them to share the recruitment poster via their social media. University of Southampton undergraduate students were recruited via an online experiment management system (SONA).

The study was accessed via a link to an online Qualtrics survey. Participants were presented with an information sheet (Appendix N) followed by a consent statement. Participants could only progress to the next part of the survey when the consent statement was ticked. At the point of being concerned about potential 'bot' responses, a reCAPTCHA tick box

was added into the survey after the consent statement (Appendix N). All participants completed the demographic questionnaire. YPs completed four additional questions about their yoga practice. Both YPs and NYPs completed the DERS, DTS, FFMQ-15, FIAT-Q-SF, SWEMWBS and the MPFI-24. YPs also completed the eight limbs questionnaire. Measures were presented in a randomised order. Participants were shown a debrief statement (Appendix O) and invited to follow a link to a prize draw. Those who opted in to the prize draw were directed to a separate Qualtrics survey to enter their email address; responses were not connected to their anonymised responses on the previous survey. University of Southampton students who completed the survey via SONA were offered credits, rather than prize draw entry. The survey was open to participants from 28<sup>th</sup> July to 27<sup>th</sup> October 2023. The survey was available on SONA from 29<sup>th</sup> September to 25<sup>th</sup> October 2023.

### **2.3.7 Data Analytic Procedure**

SPSS version 28.1.1.0 (IBM Corporation, 2021) was used for data analysis. Items in the DERS, DTS, FFMQ-15 and FIAT-Q-SF were reverse scored where applicable. Total scores were calculated for the following variables: DERS, DTS, FFMQ-15, FIAT-Q-SF and SWEMWBS. Total scores were calculated for each of the 16 limbs, a total score was also calculated for the yama and niyama subscales. Relevant assumptions were checked prior to analysis for each hypothesis (Field, 2009). To ascertain if there were significant differences between YPs and NYPs with regards to demographic variables, the chi-squared test was used. Gender and exercise frequency did not meet the assumption of expected frequency to run the chi-squared test. For gender, 50% cells had an expected count less than 5 due to the inclusion of ‘non-binary’ and ‘prefer not to say’ as responses. It was deemed inappropriate to collapse categories for gender, therefore the chi-squared test for gender was run with caution. For exercise frequency, 12.5% cells had an expected count less than 5. McHugh (2013) advises that 80% of cells should have expected values of at least 5; therefore a chi-squared test was run for exercise frequency. The group differences which correlated with the dependent variables were considered as covariates, however, they did not meet the necessary assumptions (Field, 2009) to be included as covariates in the analysis. Guidance advises that inclusion of covariates should be considered a priori (European Medicines Agency, 2015); this was a further reason why demographic variables were not set as covariates.

For hypothesis one, a between subjects MANOVA was conducted. For hypotheses two and three, a Pearson correlation was conducted. For the correlation matrices in hypotheses two and three, Cohen’s (1988) guidelines were utilised to determine the strength of the correlation, where correlations  $<.3$  = small,  $>.3$  and  $<.5$  = moderate, and  $>.5$  = strong. For hypothesis four, a series of multiple linear regressions were conducted. The correlation analysis was run prior to

the regression analysis as there is no previous research exploring the correlations between the DBT measures and all of the eight limbs; data from the correlation analysis can inform future research.

## **2.4 Results**

### **2.4.1 Demographic Data**

Participant demographics are displayed in Table 4. Most participants were female (NYPs, 77.3%; YPs, 90.7%), and self-reported having experienced previous mental health difficulties (NYPs, 54.1%; YPs, 66.2%); no specific data was gathered with regards to the nature and severity of individuals' mental health difficulties. 21% of NYPs and 29.4% of YPs reported to be currently engaging in treatment for mental health difficulties. Most participants had not previously engaged in DBT (NYPs = 86.9%, YPs = 85.8%). With regards to exercise frequency, 79.8% of NYPs exercise at least once per week, 91% of YPs exercise at least once per week. The majority of YPs were not yoga therapists or teachers (75%). 42.5% of YPs were somewhat, quite, or very much familiar with the eight limbs. Details of participant's yoga practice and exercise are shown in Appendices P-Q. Group differences were significant for age,  $X^2(6, N = 433) = 57.43, p < .001$ , gender,  $X^2(3, N = 433) = 15.02, p = .002$ , previous mental health,  $X^2(1, N = 433) = 6.49, p = .011$ , and current treatment for mental health,  $X^2(1, N = 433) = 4.11, p = .042$ . The relationship between group differences and each of the dependent variables was explored. Gender significantly correlated with the FIAT-Q-SF only. All other group differences (frequency of exercise, age, previous mental health, and current therapy) correlated significantly with each of the dependent variables.

**Table 4***Participant Demographics (N = 433)*

Demographic	Non -Yoga practisers <i>n</i> (%)	Yoga Practisers <i>n</i> (%)	<i>p</i>
Total	229 (52.9)	204 (47.1)	
Age			<.001
18 – 21	97 (42.4)	32 (15.7)	
21 – 24	9 (3.9)	10 (4.9)	
25 – 34	70 (30.6)	51 (25)	
35 – 44	25 (10.9)	38 (18.6)	
45 – 54	10 (4.4)	26 (12.7)	
55 – 64	14 (6.1)	34 (16.7)	
65 and over	4 (1.7)	13 (6.4)	
Gender			.002
Female	177 (77.3)	185 (90.7)	
Male	49 (21.4)	19 (9.3)	
Non-binary	2 (0.9)	0	
Prefer not to say	1 (0.4)	0	
Ethnicity			.546
White	178 (77.7)	165 (80.9)	
Asian or Asian British	24 (10.5)	19 (9.3)	
Black or Black British	13 (5.7)	8 (3.9)	
Mixed heritage background	10 (4.4)	6 (2.9)	
Arab	1 (0.4)	2 (1)	
Other	3 (1.3)	4 (2)	
Previous mental health difficulties			.011
Yes	124 (54.1)	135 (66.2)	
No	105 (45.9)	69 (33.8)	
Current treatment for mental health			.042
Yes	48 (21)	60 (29.4)	
No	181 (79)	144 (70.6)	
Previous engagement in DBT			.736
Yes	30 (13.1)	29 (14.2)	
No	199 (86.9)	175 (85.8)	



### 2.4.2 Hypothesis One

Hypothesis one: Yoga practisers will have greater emotion regulation, distress tolerance, mindfulness, interpersonal effectiveness skills and mental wellbeing compared to non-yoga practisers.

A one way multivariate analysis of variance (MANOVA) was run; the independent variable being yoga practiser (YP) or non-yoga practiser (NYP). The dependent variables were total scores on the relevant outcomes measures: DERS, DTS, FFMQ-15, FIAT-Q-SF and SWEMWBS.

Normality of distribution and outliers were assessed by inspection of histograms, boxplots, Q-Q plot (Field, 2009). Data was normally distributed. Three outliers were identified; they did not affect the analysis so they were not removed. Multicollinearity was assessed with Pearson correlation; the dependent variables did not correlate very highly (Field, 2009), correlations ranged from  $r(431) = .56, p < .001$  to  $r(431) = -.789, p < .001$ . Scatterplots showed linear relationships. Box's M was significant ( $p = .008$ ); Box's M can be disregarded if sample sizes are equal (Field, 2009) and Hahs-Vaughn (2016) recommend using a significance level of .001 in larger samples. It was therefore assumed that the assumption of homogeneity of variance-covariance matrices was met. Levene's test showed there was homogeneity of variances ( $p > .05$ )

Using Wilks' statistic, there was a statistically significant difference between YPs and NYPs on the combined dependent variables,  $F(5, 427) = 8.49, p < .0001$ ; Wilks'  $\Lambda = .910$ ; partial  $\eta^2 = .090$ .

Follow up univariate ANOVAs were conducted. As there were multiple dependent variables, a Bonferroni correction was made. Results are shown in Table 5.

**Table 5***Follow Up Univariate ANOVA Results*

Measure	YPs		NYPs		<i>F</i> (1, 431)	$\eta^2$
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
DERS	75.01	23.84	87.77	24.44	30.099***	.065
DTS	55.01	11.43	48.56	12.69	30.586***	.066
FFMQ-15	52.83	8.2	48.18	7.80	36.557***	.078
FIAT-Q-SF	78.11	22.14	86.60	21.99	15.986***	.036
SWEMWBS	25.50	4.14	23.78	4.52	17.001***	.038

\*\*\*  $p < .001$ **2.4.3 Hypothesis Two**

Hypothesis two: Participant scores on the DBT skills measures will correlate with each other.

Histograms and scatterplots showed linear relationships between variables and normal distribution. There were no significant outliers. There was a statistically significant strong negative correlation between the DERS and the DTS, the DERS and the FFMQ-15, the DTS and the FIAT-Q-SF, and between the FFMQ-15 and the FIAT-Q-SF. There was a statistically significant strong positive correlation between the DERS and the FIAT-Q-SF, and between the DTS and the FFMQ-15. The correlations are displayed in Table 6.

**Table 6***Bivariate Correlations Between Outcome Measures*

	Emotion regulation (DERS)	Distress tolerance (DTS)	Mindfulness (FFMQ- 15)
Distress tolerance (DTS)	-.788***		
Mindfulness (FFMQ- 15)	-.758***	.628***	
Interpersonal effectiveness (FIAT-Q-SF)	.744***	-.617***	-.640***

\*\*\*  $p < .001$

#### 2.4.4 Hypothesis Three

**Hypothesis three:** Yoga practisers' scores on emotion regulation, distress tolerance, mindfulness, interpersonal effectiveness, and wellbeing measures will correlate with the eight limbs of yoga. Each of the four DBT outcomes will correlate with at least one of the eight limbs.

Inspection of scatterplots and histograms showed linear relationships between variables and normal distribution, respectively. There were no significant outliers. A Bonferroni correction was considered to account for the number of variables, however, this was not applied as the majority of correlations were significant at  $p < .001$ . There was a statistically significant correlation between each of the eight limbs and at least one of the ER, DT, mindfulness, interpersonal effectiveness, and wellbeing outcome measures. This is shown in Table 7.

**Emotion regulation.** There was a statistically significant moderate negative correlation between the DERS and nine of the limbs; ahimsa,  $r(199) = -.484, p < .001$ , satya,  $r(199) = -.406, p < .001$ , brahmacharya,  $r(199) = -.341, p < .001$ , aparigraha,  $r(199) = -.391, p < .001$ , santosha,  $r(199) = -.440, p < .001$ , tapas,  $r(199) = -.306, p < .001$ , asana,  $r(199) = -.431, p < .001$ , pranayama,  $r(199) = -.300, p < .001$ , pratyahara,  $r(199) = -.323, p < .001$ . There was a statistically significant small negative correlation between the DERS and four of the limbs; asteya,  $r(199) = -.281, p < .001$ , saucha,  $r(199) = -.262, p < .001$ , svadhyaya,  $r(199) = -.190, p = .007$ , and dharana,  $r(199) = -.177, p = .012$ . The DERS did not significantly correlate with three of the limbs: isvara pranidhana, dhyana, and samadhi. Collectively, there was a statistically significant moderate negative correlation between the yamas and the DERS,  $r(199) = -.441, p$

< .001. There was a statistically significant moderate negative correlation between the combined niyamas and the DERS  $r(199) = -.300, p < .001$ .

**Distress tolerance.** There was a statistically significant moderate positive correlation between the DTS and two of the limbs: ahimsa,  $r(199) = .300, p < .001$ , and santosha,  $r(199) = .311, p < .001$ . There was a statistically significant small positive correlation between the DTS and eight of the limbs: satya,  $r(199) = .213, p = .002$ , asteya,  $r(199) = .145, p = .04$ , brahmacharya,  $r(199) = .182, p = .01$ , aparigraha,  $r(199) = .229, p = .001$ , tapas,  $r(199) = .164, p = .02$ , asana,  $r(199) = .269, p < .001$ , pranayama,  $r(199) = .206, p = .003$ , and pratyahara,  $r(199) = .203, p = .004$ . The DTS did not significantly correlate with six of the limbs: saucha, svadhyaya, isvara pranidhana, dharana, dhyana, and samadhi. When the yamas were combined, there was a statistically significant small positive correlation between the yamas and the DTS  $r(199) = .248, p < .001$ . Collectively, the niyamas did not significantly correlate with the DTS  $r(199) = -.14, p = .054$ .

**Mindfulness.** There was a statistically significant correlation between the FFMQ-15 and each of the each limbs. There was a statistically significant moderate positive correlation between the FFMQ-15 and nine of the limbs: ahimsa,  $r(199) = .469, p < .001$ , satya,  $r(199) = .417, p < .001$ , asteya,  $r(199) = .301, p < .001$ , brahmacharya,  $r(199) = .389, p < .001$ , aparigraha,  $r(199) = .378, p < .001$ , santosha,  $r(199) = .436, p < .001$ , and asana  $r(199) = .369, p < .001$ . There was a statistically significant small positive correlation between the FFMQ-15 and seven of the limbs: saucha,  $r(199) = .261, p < .001$ , tapas,  $r(199) = .279, p < .001$ , svadhyaya,  $r(199) = .266, p < .001$ , isvara pranidhana,  $r(199) = .163, p = .02$ , dharana,  $r(199) = .224, p < .001$ , dhyana,  $r(199) = .182, p = .01$ , samadhi,  $r(199) = .232, p < .001$ . There was a statistically significant moderate positive correlation between the combined yamas and the FFMQ-15  $r(199) = .453, p < .001$ . There was a statistically significant moderate positive correlation between the combined niyamas and the FFMQ  $r(199) = .324, p < .001$ .

**Interpersonal effectiveness.** There was a statistically significant moderate negative correlation between the FIAT-Q-SF and eight of the limbs: ahimsa,  $r(199) = -.498, p < .001$ , satya  $r(199) = -.409, p < .001$ , brahmacharya  $r(199) = -.322, p < .001$ , aparigraha,  $r(199) = -.359, p < .001$ , santosha,  $r(199) = -.452, p < .001$ , asana,  $r(199) = -.464, p < .001$ , pranayama,  $r(199) = -.317, p < .001$ , pratyahara  $r(199) = -.353, p < .001$ . There was a statistically significant small negative correlation between the FIAT-Q-SF and five of the limbs: asteya,  $r(199) = -.282, p < .001$ , saucha,  $r(199) = -.220, p = .002$ , tapas,  $r(199) = -.249, p < .001$ , svadhyaya,  $r(199) = -.191, p = .007$ , and dharana  $r(199) = -.200, p = .004$ . The FIAT-Q-SF did not significantly correlate three of the limbs; isvara pranidhana, dhyana, and samadhi. There was a statistically significant moderate negative correlation between the combined yamas and the FIAT-Q-SF  $r(199) = -.45, p$

< .001. There was a statistically significant small negative correlation between the combined niyamas and the FIAT-Q-SF  $r(199) = -.280, p < .001$ .

**Mental Wellbeing.** There was a statistically significant moderate positive correlation between the SWEMWBS and eight of the limbs: ahimsa,  $r(199) = .469, p < .001$ , satya,  $r(199) = .358, p < .001$ , aparigraha,  $r(199) = .328, p < .001$ , santosha,  $r(199) = .480, p < .001$ , tapas,  $r(199) = .322, p < .001$ , asana,  $r(199) = .444, p < .001$ , pranayama,  $r(199) = .301, p < .001$ , pratyahara,  $r(199) = .378, p < .001$ . There was a statistically significant small positive correlation between the SWEMWBS and seven of the limbs: asteya,  $r(199) = .280, p < .001$ , brahmacharya,  $r(199) = .295, p < .001$ , saucha,  $r(199) = .261, p < .001$ , svadhyaya,  $r(199) = .191, p = .007$ , dharana,  $r(199) = .216, p = .002$ , dhyana,  $r(199) = .200, p = .004$ , samadhi,  $r(199) = .143, p = .043$ . There was a statistically significant moderate positive correlation between the combined yamas and the SWEMWBS  $r(199) = .403, p < .001$ . There was also a statistically significant moderate positive correlation between the combined niyamas and the SWEMWBS  $r(199) = .307, p < .001$ . The SWEMWBS did not correlate with isvara pranidhana.

**Table 7***Bivariate Correlations between Variables*

	Outcome measure				
	Emotion regulation (DERS)	Distress tolerance (DTS)	Mindfulness (FFMQ-15)	Interpersonal effectiveness (FIAT-Q-SF)	Mental Wellbeing (SWEMWBS)
Yamas	-.441***	.248***	.453***	-.435**	.403***
Ahimsa	-.484***	.300***	.469***	-.498***	.469***
Satya	-.406***	.213**	.417***	-.409***	.358***
Asteya	-.281***	.145*	.301***	-.282***	.280**
Brahmacharya	-.341***	.182**	.389***	-.322***	.295**
Aparigraha	-.391***	.229***	.378***	-.359***	.328***
Niyamas	-.300***	.136	.324***	-.280***	.307***
Saucha	-.262***	.096	.261***	-.220**	.261***
Santosha	-.440***	.311***	.436***	-.452***	.480***
Tapas	-.306***	.164*	.279***	-.249***	.322***
Svadyaya	-.190**	.049	.266***	-.191**	.191**
Isvara pranidhana	-.118	.001	.163*	-.117	.101
Asana	-.431***	.269***	.369***	-.464***	.444***
Pranayama	-.300***	.206**	.314***	-.317***	.301***
Pratyahara	-.323***	.203**	.335***	-.353***	.378***
Dharana	-.177*	.073	.224**	-.200**	.216**
Dhyana	-.125	.002	.182**	-.116	.200**
Samadhi	-.103	-.024	.232***	-.058	.143*

\*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

**2.4.5 Hypothesis Four**

Hypothesis four: At least one of the limbs of yoga will predict scores on the four DBT skills measures and a wellbeing measure.

Assumptions were met for all multiple regression models. The Durbin-Watson statistic indicated independence of residuals. Linearity and homoscedasticity were assessed with scatterplots. Inspection of tolerance and VIF values showed no multicollinearity. Outliers were found in two of the regression models; one in the wellbeing model and two in the ER model. Across models there were no highly influential points or high leverage points, therefore all outliers were kept in. The assumption of normality was assessed by inspection of histograms and P-P plots.

**Predicting emotion regulation.** A multiple regression was run to ascertain whether the inclusion of the eight limbs of yoga (yama, niyama, asana, pranayama, pratyahara, dharana, dhyana and samadhi) predicted scores on the ER measure; the DERS. The multiple regression model was statistically significant  $F(8, 191) = 10.5, p < .001$ . The inclusion of yama, asana and dhyana in an individual's yoga practice significantly predicted scores on the DERS. Inclusion of the other five limbs in an individual's yoga practice (niyama, pranayama, pratyahara, dharana, and samadhi) did not significantly predict scores on the DERS. Results are shown in Table 8.

**Table 8***Multiple Regression Results for Emotion Regulation*

	95% CI for B				$\beta$	$R^2$	$\Delta R^2$
	B	LL	UL	SE B			
Model						.31	.28***
Constant	137.390	120.13	154.66	8.75			
Yama	-.818	-1.26	-.38	.22	-.54***		
Niyama	.301	-.12	.72	.21	.21		
Asana	-1.590	-2.71	-.47	.57	-.23**		
Pranyama	-.915	-2.00	.17	.55	-.14		
Pratyahara	-.655	-2.13	.82	.75	-.10		
Dharana	.223	-1.02	1.47	.63	.04		
Dhyana	1.533	.25	2.82	.65	.23*		
Samadhi	.220	-.77	1.21	.50	.04		

*Note.* Model = "Enter" method in SPSS statistics; B = unstandardized regression coefficient; CI = confidence interval; LL = lower limit; UL = upper limit; SE B = standard error of the coefficient;  $\beta$  = standardized coefficient;  $R^2$  = coefficient of determination;  $\Delta R^2$  = adjusted  $R^2$ .

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$



**Predicting distress tolerance.** A multiple regression was run to ascertain whether the inclusion of the eight limbs of yoga predicted scores on the DT measure; the DTS. The multiple regression model was statistically significant  $F(8, 191) = 4.66, p < .001$ . Inclusion of yama and dhyana in an individual's yoga practice significantly predicted scores on the DTS. Inclusion of the other six limbs in an individual's yoga practice (niyama, asana, pranayama, pratyahara, dharana and samadhi) did not significantly predict scores on the DTS.  $R^2$  for the overall model was 16.3% with an adjusted  $R^2$  of 12.8%, a medium effect size (Cohen, 1988). Results are shown in Table 9.

**Table 9***Multiple Regression Results for Distress Tolerance*

	95% CI for B				$\beta$	$R^2$	$\Delta R^2$
	B	LL	UL	SE B			
Model						.16	.13***
Constant	37.645	28.41	61.59	4.68			
Yama	.264	.03	.50	.12	.36*		
Niyama	.103	-.33	.12	.11	-.15		
Asana	.386	-.21	.98	.30	.11		
Pranyama	.521	-.06	1.10	.29	.16		
Pratyahara	.532	-.26	1.32	.40	.16		
Dharana	-.125	-.79	.54	.34	-.04		
Dhyana	-.865	-1.55	-.18	.35	-.27*		
Samadhi	-.302	-.83	.23	.27	-.10		

*Note.* Model = "Enter" method in SPSS statistics;  $B$  = unstandardized regression coefficient; CI = confidence interval;  $LL$  = lower limit;  $UL$  = upper limit;  $SE B$  = standard error of the coefficient;  $\beta$  = standardized coefficient;  $R^2$  = coefficient of determination;  $\Delta R^2$  = adjusted  $R^2$ .

\*  $p < 0.5$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

**Predicting mindfulness.** A multiple regression was run to ascertain whether the inclusion of the eight limbs of yoga (yama, niyama, asana, pranayama, pratyahara, dharana, dhyana and samadhi) predicted scores on the mindfulness measure; the FFMQ-15. The multiple regression model was statistically significant  $F(8, 191) = 9.02, p < .001$ . Inclusion of yama and niyama in an individual's yoga practice significantly predicted scores on the FFMQ-15. Inclusion of the other six limbs in an individual's yoga practice (asana, pranayama, pratyahara, dharana, dhyana and samadhi) did not significantly predict scores on the FFMQ-15.  $R^2$  for the overall model was 27.4% with an adjusted  $R^2$  of 24.4%, a large effect size (Cohen, 1988). Results are shown in Table 10.

**Table 10***Multiple Regression Results for Mindfulness*

	95% CI for B			SE B	$\beta$	$R^2$	$\Delta R^2$
	B	LL	UL				
Model						.27	.24***
Constant	31.846	25.83	37.86	3.05			
Yama	.305	.15	.46	.08	.59***		
Niyama	-.154	-.30	-.01	.07	-.31*		
Asana	.345	-.04	.73	.20	.14		
Pranyama	.277	-.10	.66	.19	.12		
Pratyahara	.172	-.34	.69	.26	.08		
Dharana	-.015	-.45	.41	.22	-.01		
Dhyana	-.449	-.90	-.001	.23	-.20		
Samadhi	.264	-.08	.61	.18	.13		

*Note.* Model = "Enter" method in SPSS statistics;  $B$  = unstandardized regression coefficient; CI = confidence interval;  $LL$  = lower limit;  $UL$  = upper limit;  $SE B$  = standard error of the coefficient;  $\beta$  = standardized coefficient;  $R^2$  = coefficient of determination;  $\Delta R^2$  = adjusted  $R^2$ .

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

**Predicting interpersonal effectiveness.** A multiple regression was run to ascertain whether the inclusion of the eight limbs of yoga predicted scores on the interpersonal effectiveness measure; the FIAT–Q-SF. The multiple regression model was statistically significant  $F(8, 191) = 12.53, p < .001$ . Inclusion of yama, asana and dhyana in an individual’s yoga practice significantly predicted scores on the FIAT–Q-SF. Inclusion of the other five limbs in an individual’s yoga practice (niyama, pranayama, pratyahara, dharana and samadhi) did not significantly predict scores on the FIAT–Q-SF.  $R^2$  for the overall model was 34.4% with an adjusted  $R^2$  of 31.7%, a large effect size (Cohen, 1988). Results are shown in Table 11.

**Table 11***Multiple Regression Results for Interpersonal Effectiveness*

	95% CI for B				$\beta$	$R^2$	$\Delta R^2$
	B	LL	UL	SE B			
Model						.34	.32***
Constant	138.014	122.35	153.68	7.94			
Yama	-.759	-1.16	-.36	.20	-.54***		
Niyama	.292	-.09	.67	.19	.21		
Asana	-1.581	-2.59	-.57	.51	-.24**		
Pranyama	-.892	-1.88	.09	.50	-.14		
Pratyahara	-.918	-2.26	.42	.68	-.15		
Dharana	-.054	-1.19	1.08	.57	-.01		
Dhyana	1.690	.52	2.86	.59	.27**		
Samadhi	.570	-.33	1.47	.46	.10		

*Note.* Model = “Enter” method in SPSS statistics; B = unstandardized regression coefficient; CI = confidence interval; LL = lower limit; UL = upper limit; SE B = standard error of the coefficient;  $\beta$  = standardized coefficient;  $R^2$  = coefficient of determination;  $\Delta R^2$  = adjusted  $R^2$ .

\*\*  $p < .01$ , \*\*\*  $p < .001$

**Predicting Wellbeing.** A multiple regression was run to ascertain whether the inclusion of the eight limbs of yoga predicted scores on the mental wellbeing measure; the SWEMWBS (Stewart-Brown et al., 2009). The multiple regression model was statistically significant  $F(8, 191) = 8.46, p < .001$ . Inclusion of asana in an individual's yoga practice, significantly predicted scores on the mental wellbeing measure. Inclusion of the other seven limbs in an individual's yoga practice (niyama, asana, pranayama, pratyahara, dharana, dhyana and samadhi) did not significantly predict scores on the mental wellbeing measure.  $R^2$  for the overall model was 26.2% with an adjusted  $R^2$  of 23.1%, a large effect size (Cohen, 1988). Results are shown in Table 12.

**Table 12***Multiple Regression Results for Mental Wellbeing*

	95% CI for B				$\beta$	$R^2$	$\Delta R^2$
	B	LL	UL	SE B			
Model						.26	.23***
Constant	14.290	11.19	17.39	1.57			
Yama	.069	-.01	.15	.04	.26		
Niyama	-.010	-.09	.07	.04	-.04		
Asana	.318	.12	.52	.10	.26**		
Pranyama	.109	-.09	.30	.10	.09		
Pratyahara	.232	-.03	.50	.13	.20		
Dharana	-.103	-.33	.12	.11	-.10		
Dhyana	-.142	-.37	.09	.12	-.12		
Samadhi	-.021	-.20	.16	.09	-.02		

*Note.* Model = "Enter" method in SPSS statistics; B = unstandardized regression coefficient; CI = confidence interval; LL = lower limit; UL = upper limit; SE B = standard error of the coefficient;  $\beta$  = standardized coefficient;  $R^2$  = coefficient of determination;  $\Delta R^2$  = adjusted  $R^2$ .

\*\*  $p < .01$ , \*\*\*  $p < .001$

## 2.5 Discussion

The present study aimed to explore whether yoga and DBT target shared transdiagnostic psychological processes, as proposed by Bennetts (2022). The study specifically focused on the four skills modules of DBT; four outcome measures relating to each of the modules were utilised, alongside a mental wellbeing measure.

NYPs scored significantly higher on the DERS than YPs, suggesting NYPs have greater difficulties with regulating their emotions. This may support previous research which associates yoga practice with reduced emotion dysregulation (Parkinson & Smith, 2023) and greater ER (Drapkin, 2019; Menezes, 2015). YPs scored significantly higher on the DTS than NYPs, suggesting YPs are more able to tolerate emotional distress. This is in line with previous research which proposed yoga increases DT (Medina et al., 2015). YPs scored significantly higher than NYPs on the FFMQ-15, replicating Pick et al.'s (in prep) findings and supporting previous research showing increased mindfulness as a result of yoga practice (Boni et al., 2018; Gaiswinkler & Unterrainer, 2016), and mindfulness as a potential mechanism of change in yoga (Boni et al., 2018; Gard et al., 2012; Tihanyi et al., 2016). YPs scored significantly lower on the FIAT-Q-SF which indicates YPS are less distressed and more satisfied with regards to their interpersonal relationships. This supports previous research into the potential interpersonal benefits of yoga (Kishida et al., 2019; Ross et al., 2014). Results also replicated Pick et al.'s (in prep) findings that YPs have greater mental wellbeing than NYPs; further supporting previous research suggesting yoga is associated with greater mental wellbeing (Rasania, 2021). This study is novel in simultaneously evaluating the relationship between yoga and ER, DT, mindfulness, interpersonal effectiveness, and wellbeing measures in the same sample. This allows for further analysis of the correlation between these outcomes.

There was a statistically significant strong negative correlation between the DERS and the FFMQ-15; indicating that as trait mindfulness increased, difficulties with ER reduced. There was a statistically significant strong negative correlation between the FFMQ-15 and the FIAT-Q-SF; indicating that as trait mindfulness increased, levels of distress and satisfaction associated with interpersonal relationships improved. The DTS was positively correlated with the FFMQ-15; this indicates that as mindfulness increased, the ability to tolerate emotional distress also increased. This supports previous findings that increased mindfulness is associated with increased DT (Lotan et al., 2013). The theoretical basis of DBT suggests that improvements in mindfulness lead to improvements in the other three skills modules (Linehan, 2015). The current result offer tentative support for this, however, further research is needed to determine a causal relationship between mindfulness and the other modules.

The DERS and FIAT-Q-SF were positively correlated; this indicates that as difficulties with ER increased, there was greater distress and lower satisfaction with interpersonal relationships. Research has shown a relationship between interpersonal functioning and ER processes (Gross & John, 2003). The biosocial theory of DBT theory postulates that interpersonal instability contributes to the development of emotion dysregulation, and subsequent difficulties with regulating emotions result in less effective interpersonal relations (Linehan, 1993). The current results offer support for an association between ER and interpersonal relationships.

The DTS was negatively correlated with the DERS; this indicates that as difficulties with ER decreased, the ability to tolerate emotional distress increased. Research has supported an association between ER and DT (Jeffries et al., 2015), with ER indicated as mediating the relationship between DT and mental health outcomes (Brandt et al., 2012). McHugh et al. (2013) found that DT and ER strategies were distinctly and independently associated with experiential avoidance. Further research is needed to better understand the relationship between ER and DT, and constructs which may mediate or moderate this relationship.

The DTS was negatively correlated with the FIAT-Q-SF; this indicates that as the ability to tolerate emotional distress increased, difficulties in interpersonal relationships decreased. The role of DT in resolving interpersonal issues has been discussed (Choudhary & Thapa, 2012), particularly how acceptance skills can reduce jealousy in relationships, and increase tolerance of uncertainty in relationships. That discussion is limited by focusing on such specific facets of interpersonal relationships. There is need for empirical research exploring the link between DT and interpersonal relationships more fully.

This study differs from previous research in exploring the specific components of yoga which may correlate with each outcome. YP scores on ER, DT, mindfulness, interpersonal effectiveness, and wellbeing measures correlated with certain limbs. All five outcomes measures significantly correlated with ten of the eight limbs: ahimsa, satya, asteya, brahmacharya, aparigraha, santosha, tapas, asana, pranayama, and pratyahara. These findings are in line with previous research which has shown an association between certain yoga limbs, psychological constructs, and wellbeing (Pick et al., in prep). This supports theoretical models proposing a link between the psychological mechanisms in yoga and changes in psychological outcomes (Bennetts, 2022; Gard et al., 2014). The current study was unique in exploring specificity in the yamas and niyamas; the model presented by Gard et al. (2014) collapses them under 'ethics'.

The DERS was significantly negatively correlated with thirteen of the limbs: ahimsa, satya, asteya, brahmacharya, aparigraha, saucha, santosha, tapas, svadhyaya, asana,

pranayama, pratyahara, and dharana. Collectively, the yamas and niyamas also correlated with the DERS. This suggests that as inclusion of these limbs in an individual's practice increased, their scores on the DERS decreased, indicating fewer difficulties with ER. This is in line with Bennetts' (2022) model which draws comparisons between each of the eight limbs and the transdiagnostic process of ER. The DERS was not significantly correlated with isvara pranidhana, dhyana, and samadhi; this contradicts Bennetts (2022) proposal that each of these limbs is also associated with ER. However, Bennetts (2022) looked at the combined processes of the 'meditation' limbs (pratyahara, dharana, dhyana). There may be a correlation with the ER measure if measures of pratyahara, dharana, and dhyana were combined; the current study did not investigate this and only supported an association between ER and the pratyahara and dharana facets of meditation. Future research could explore the individual facets of the 'meditation' limbs (pratyahara, dharana, dhyana) to better understand their role in ER.

There was a significant positive correlation between the DTS and ten of the limbs: ahimsa, satya, asteya, brahmacharya, aparigraha, santosha, tapas, asana, pranayama, and pratyahara. This indicates that as inclusion of these ten limbs in an individual's practice increased, their DT also increased. This supports previous research which has indicated that yoga practice leads to greater increases in DT (Medina et al., 2015). There was no significant correlation between the DTS and six of the limbs: saucha, svadhyaya, isvara pranidhana, dharana, dhyana, and samadi. Collectively, the yamas were correlated with the DTS but the niyamas were not, suggesting that the yamas are more relevant to the construct of DT.

With regards to mindfulness, the FFMQ-15, was significantly positively correlated with each of the limbs, and the combined yamas and niyamas. The correlation was moderate for the following nine limbs: ahimsa, satya, asteya, brahmacharya, aparigraha, santosha, asana, pranayama, and pratyahara. The correlation was small for the following seven limbs: isvara pranidhana, svadhyaya, saucha, tapas, dharana, dhyana, and samadhi. This suggests that as inclusion of each of the limbs in an individual's practice increased, their levels of trait mindfulness also increased. This supports previous findings that yoga is associated with greater levels of mindfulness (Pick et al., in prep; Shelov et al., 2009), however that research did not specifically evaluate the individual contribution of each limb. Correlational analyses cannot infer causality. Whilst research suggests that yoga increases levels of mindfulness, individual's with greater trait mindfulness may be more likely to practice yoga, therefore causality needs further investigation.

The FIAT-Q-SF was significantly negatively correlated with thirteen of the limbs: ahimsa, satya, asteya, brahmacharya, aparigraha, saucha, santosha, tapas, svadhyaya, asana, pranayama, pratyahara, and dhrana. As inclusion of these limbs increased, levels of distress

and satisfaction with interpersonal relationships improved. This is in line with findings that yoga can lead to positive interpersonal changes (Kishida et al., 2019; Ross et al., 2014). There appears to be no other empirical research which has evaluated interpersonal outcomes in relation to the specific inclusion of the eight limbs. The FIAT-Q-SF did not correlate with three of the limbs: isvara pranidhana, dhyana, and samadhi. This may be because these limbs relate to spirituality (isvara pranidhana), meditation (dhyana), and contemplation (samadhi) which are arguably more intrapersonal than interpersonal processes.

The SWEMWBS was significantly positively correlated with all the limbs apart from isvara pranidhana. This supports and extends Pick et al.'s (in prep) findings that ahimsa predicts positive wellbeing; as inclusion of all the limbs aside from isvara pranidhana, individual's self-rated mental wellbeing also increased.

Collectively, these results support Bennetts (2022) model which outlines how distinct limbs of yoga, and specifically the inclusion of the individual yamas and niyamas, may correlate with psychological wellbeing and transdiagnostic processes. The findings in line with Gard et al.'s (2014) model which presents how the limbs impact on self-regulation. Isvara pranidhana significantly correlated with only one of the outcome measures, the FFMQ-15; this correlation was small. This does not support Bennetts' (2022) proposal that isvara pranidha may target the transdiagnostic process of ER. Isvara pranidha is concerned with spirituality, the 'worship of God' or a higher power, or self-surrender (Satchidananda, 2020). Yoga classes in the UK are more likely to focus on the physical poses (asana) than the spiritual elements (Nalbant et al., 2022). It may be that western yoga practices are less spiritual and include less of this limb which as a result is less involved in transdiagnostic processes in western populations. It could also be that the sample in the current study was particularly non-spiritual.

Yama, asana, and dhyana significantly predicted scores on the DERS. Yama and dhyana significantly predicted scores on the DTS. Yama and niyama predicted scores on the FFMQ-15. Yama, asana and dhyana significantly predicted scores on the FIAT-Q-SF. Yama as a predictors on the DERS, DTS, FFMQ-15, and FIAT-Q-SF, support the proposal that yamas are particularly relevant to psychological change (Bennetts, 2022). Inclusion of asana in an individual's yoga practice significantly predicted scores on the mental wellbeing measure. This particular finding contrasts Pick et al.'s (in prep) results that ahimsa, a component of yama, was the strongest predictor of wellbeing. However, that study only looked at the inclusion of ahimsa, pranayama, and dharana, as opposed to the other limbs.

Bennetts' model (2022) emphasises the role of the yamas and niyamas in eliciting psychological improvements and processes. Findings support the importance of including yama to yield benefits, as this was the only common significant predictor for all of outcome



measures, apart from wellbeing measure. It may be that the yamas relate more than niyamas to the constructs being measured by the four DBT outcomes. It may also be that the yamas are more frequently included in western practice than niyamas.

### **2.5.1 Strengths and Limitations**

This is the first empirical study to evaluate the relationship between yoga practice and outcomes on DBT skills measures. This novel research provides support for the model proposed by Bennetts (2022). This research is also unique in utilising a separate outcome measure for each of the four DBT skills modules and investigating a correlational relationship between them.

The research team have added to yoga research more broadly in the development of a self-report eight limbs measure. A strength was the PPI involvement in the development of the measure. The overall Cronbach's alpha (.96) indicates excellent internal consistency, although the Cronbach's alpha of certain individual subscales (asteya, brahmacharya) indicate poor internal consistency. The utility of the measure was limited by the lack of another measure for cross validation. Further research can explore the properties of the questionnaire, with the potential that it can be used in future studies measuring the inclusion of the eight limbs in yoga practice.

A cross sectional design presents strengths and limitations (Wang & Cheng, 2020). This design established preliminary support for hypotheses which can be explored further in future studies. The cross sectional design cannot determine causal inference, that is, whether yoga practice has led to differences between YP and NYP scores on the outcome measures. Future research could utilise baseline outcome measures prior to commencing yoga practice and at follow up points, to more clearly ascertain the causal relationship between yoga and psychological outcomes.

Recruitment methods included a convenience sample and a student population. Group differences were significant; YPs were older, more likely to be female, more likely to have had mental health difficulties and more likely to be currently in treatment for mental health than NYPs. Assumptions were not met to include these as covariates (Field, 2009). This limits the results for hypothesis one as these differences may have impacted on the relationship between the independent and dependent variables. Most participants were white and female which limits the generalisability of findings. Concerns about the cultural appropriation of yoga have been discussed (Thompson-Ochoa, 2019); the current study was conducted in a western population by a white female research team. The discussion and understanding of the eight limbs in this paper is from a western perspective and may maintain or contribute to concerns about the cultural appropriation of yoga. There is a gender bias towards females in yoga

(Cartwright et al., 2020; Ding & Stamatakis, 2014; Ross et al., 2013) and DBT literature (Holah et al., 2023); the current paper is limited in not addressing that bias. Other features of participant's yoga practice such as immersion, type of practice and years of practice were not factored into analyses which is a further limitation of the study.

An online survey aided recruitment but led to a large number of 'bot' responses. Criteria was applied based on previous research to prevent the inclusion of bot data in the analyses (Goodrich et al., 2023; Lawrence et al., 2023) (Appendix H), however, this raises concerns about the validity and integrity of the data (Lawrence et al., 2023).

The study is limited by reliance on self-report measures and the use of global scores on each measure. Self-report measures create bias in that they capture perceived ability of skill use rather than actual ability (Harvey et al., 2019). The psychological constructs in DBT are broad and overlapping (Boritz et al., 2017). The four DBT outcome measures which were used map on to the four DBT skills modules in that they measure similar constructs but they are not DBT specific measures. The outcomes provide measures of ER, DT, trait mindfulness and interpersonal satisfaction. It could be argued that they do not measure skill use in each area, which limits the conclusions that can be drawn from the scores in relation to the DBT skills modules. The subscales of the FIAT- Q- SF appear have positively and negatively valenced subscales (e.g. connection and intimacy versus avoidance), therefore the use of global scores may skew the results and subscales may correlate differently, or more intuitively, if analysis had utilised the subscale rather than global scores.

### **2.5.2 Clinical Implications**

This research warrants further consideration of yoga as a potential alternative or adjunct to third wave therapies in clinical settings, in highlighting an association between yoga and psychological outcomes. This could inform the development of yoga interventions for clinical populations, which could be designed to include the limbs which target particular outcomes. It suggests that yoga practices which incorporate specific limbs may improve ER, DT, mindfulness, interpersonal effectiveness, and mental wellbeing. This supports the importance of considering the ethical underpinnings of yoga when considering the benefits, and allows for a more culturally sensitive understanding of yoga. The yamas warrant specific investigation as a predictor of four of the five outcome measures, thus holding potential for clinical interventions with presentations struggling with ER, DT, mindfulness, and interpersonal dissatisfaction. The current research could lead to intervention studies which evaluate the efficacy of offering yoga as an alternative or an adjunct intervention to DBT or other third wave therapies for clinical populations. If yoga interventions are found to be a viable alternative to third wave interventions,

this could increase patient choice and may improve clinical outcomes. A correlation between the skills modules has implications for the delivery of DBT programmes, for example, allowing an individualised approach focusing on certain modules depending on presentation. Modules could be targeted based on service user preference, which may still lead to changes in outcomes related to other modules, however, causal investigations are required.

### **2.5.3 Research Implications**

Further research into the psychological benefits of yoga would benefit from greater consideration of the ethical basis and inclusion of the eight limbs. Given the eastern origins of yoga, there is a rationale to conduct a cross cultural study to ascertain if there are cultural differences in the inclusion of the eight limbs in practice, and if so, differences in subsequent transdiagnostic processes and psychological outcomes.

Future research should replicate the current study in a clinical sample. A further study could utilise a randomised controlled trial design, assigning a clinical population to a yoga intervention, a DBT intervention, or a control. Outcome measures should be administered prior to the intervention and at regular follow up points to further explore possible shared transdiagnostic processes between yoga and DBT, and causal mechanisms. It would be helpful for future research to utilise a Yoga Immersion Scale (Gaiswinkler & Unterrainer, 2016) and an observational measure of the eight limbs in a yoga intervention, to further validate the assessment of the extent to which each limb is included, and to understand the relationship between an individual's yoga practice and psychological outcomes. Future studies could utilise a matched pairs design to control for the group differences which limit the current research.

Data on the frequency and length of yoga practice was collected; such data could be analysed in more depth to ascertain whether the frequency and length of an individual's practice is associated with differences in the inclusion of the eight limbs in their practice, and on outcome measures. The current findings and previous research (Kishida et al., 2019) suggest the potential relevance of the interpersonal nature of yoga, but this is under researched. Future studies could explore whether the setting or delivery of the yoga intervention leads to differential results, for example, if practice takes place individually or in a group.

There is a lack of research investigating intercorrelations between measures relating to all four of the skills modules; future research could explore this in clinical populations engaging in DBT programmes to inform how the modules relate in certain populations or when particular symptoms are present.

#### **2.5.4 Conclusions**

This study adds to the growing body of evidence suggesting an association between yoga and psychological outcomes; it offers a unique contribution in focusing on constructs specifically relevant to DBT. The study provides important evidence regarding differences between YPs and NYPs on outcomes measures of ER, DT, mindfulness, interpersonal relationships, and mental wellbeing. This study offers support to the theoretical basis of DBT as the results provide evidence that scores on outcomes relating to the four skills modules correlate with each other. The study provides results regarding correlations between the eight limbs and each of the outcomes measures. Furthermore, certain limbs were predictors of ER, DT, mindfulness, interpersonal satisfaction, and mental wellbeing. Of note, the yamas, were the most consistent predictor across psychological processes. The research provides a basis for further research on the potential shared features and transdiagnostic processes of DBT, with potential clinical implications with regards to more holistic treatment interventions being offered by the NHS.

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## Chapter 2

Zhang, Y., Lauche, R., Cramer, H., Munk, N., & Dennis, J. A. (2021). Increasing trend of yoga practice among US adults from 2002 to 2017. *The journal of alternative and complementary medicine*, 27(9), 778-785. <https://doi.org/10.1089/acm.2020.0506>

# Appendix A Author Guidelines for Systematic Review

## 1. SUBMISSION

Authors should kindly note that submission implies that the content has not been published or submitted for publication elsewhere except as a brief abstract in the proceedings of a meeting or symposium.

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This is a journal for those who want to inform and be informed about the challenging field of clinical psychology and psychotherapy.

Submissions which fall outside of Aims and Scope, are not clinically relevant and/or are based on studies of student populations will not be considered for publication and will be returned to the author.

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Before you submit, you will need:

- Your manuscript: this should be an editable file including text, figures, and tables, or separate files – whichever you prefer. All required sections should be contained in your manuscript, including abstract (which does need to be correctly styled), introduction, methods, results, and conclusions. Figures and tables should have legends. Figures should be uploaded in the highest resolution possible. [OPTIONAL TEXT, if the journal is running image checks: If the figures are not of sufficiently high quality your manuscript may be delayed.] References may be submitted in any style or format, as long as it is consistent throughout the manuscript. Supporting information should be submitted in separate files. If the manuscript, figures or tables are difficult for you to read, they will also be difficult for the editors and reviewers, and the editorial office will send it back to you for revision. Your manuscript may also be sent back to you for revision if the quality of English language is poor.
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The text file should be presented in the following order:

1. A short informative title containing the major key words. The title should not contain abbreviations (see Wiley's [best practice SEO tips](#));
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5. Conflict of Interest statement;
6. Acknowledgments;
7. Data Availability Statement
8. Abstract, Key Practitioner Message and 5-6 keywords;



9. Main text;
10. References;
11. Tables (each table complete with title and footnotes);
12. Figure legends;

Figures and appendices and other supporting information should be supplied as separate files.

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Contributions from anyone who does not meet the criteria for authorship should be listed, with permission from the contributor, in an Acknowledgments section. Financial and material support should also be mentioned, including the name(s) of any sponsor(s) of the research contained in the paper, along with grant number(s). Thanks to anonymous reviewers are not appropriate.

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Authors will be asked to provide a conflict of interest statement during the submission process. For details on what to include in this section, see the [Conflict of Interest](#) section in the Editorial Policies and Ethical Considerations section below. Submitting authors should ensure they liaise with all co-authors to confirm agreement with the final statement.

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Enter an abstract of no more than 250 words containing the major keywords. An abstract is a concise summary of the whole paper, not just the conclusions, and is understandable without reference to the rest of the paper. It should contain no citation to other published work.

### **Key Practitioner Message**

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For more information about APA referencing style, please refer to the [APA FAQ](#).

Reference examples follow:

#### *Journal article*

Beers, S. R. , & De Bellis, M. D. (2002). Neuropsychological function in children with maltreatment-related posttraumatic stress disorder. *The American Journal of Psychiatry*, 159, 483–486. doi: [10.1176/appi.ajp.159.3.483](https://doi.org/10.1176/appi.ajp.159.3.483)

#### *Book*

Bradley-Johnson, S. (1994). *Psychoeducational assessment of students who are visually impaired or blind: Infancy through high school* (2nd ed.). Austin, TX: Pro-ed.

#### *Internet Document*

Norton, R. (2006, November 4). How to train a cat to operate a light switch [Video file]. Retrieved from <http://www.youtube.com/watch?v=Vja83KLQXZs>

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Endnotes should be placed as a list at the end of the paper only, not at the foot of each page. They should be numbered in the list and referred to in the text with consecutive, superscript Arabic numerals. Keep endnotes brief; they should contain only short comments tangential to the main argument of the paper.

#### **Tables**

Tables should be self-contained and complement, not duplicate, information contained in the text. They should be supplied as editable files, not pasted as images. Legends should be concise but comprehensive – the table, legend, and footnotes must be understandable without reference to the text. All abbreviations must be defined in footnotes. Footnote symbols: †, ‡, §, ¶, should be used (in that order) and \*, \*\*, \*\*\* should be reserved for P-values. Statistical measures such as SD or SEM should be identified in the headings.

#### **Figure Legends**

Legends should be concise but comprehensive – the figure and its legend must be understandable without reference to the text. Include definitions of any symbols used and define/explain all abbreviations and units of measurement.

#### **Figures**

Although authors are encouraged to send the highest-quality figures possible, for peer-review purposes, a wide variety of formats, sizes, and resolutions are accepted. Click [here](#) for the basic figure requirements for figures submitted with manuscripts for initial peer review, as well as the more detailed post-acceptance figure requirements.

**Figures submitted in color** may be reproduced in color online free of charge. Please note, however, that it is preferable that line figures (e.g. graphs and charts) are supplied in black and white so that they are legible if printed by a reader in black and white. The cost of printing color illustrations in the journal will be charged to the author. The cost is £150 for

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### **Additional Files**

#### ***Appendices***

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2. **Units of measurement:** Measurements should be given in SI or SI-derived units. Visit the [Bureau International des Poids et Mesures \(BIPM\) website](#) for more information about SI units.
3. **Numbers:** numbers under 10 are spelled out, except for: measurements with a unit (8mmol/l); age (6 weeks old), or lists with other numbers (11 dogs, 9 cats, 4 gerbils).
4. **Trade Names:** Chemical substances should be referred to by the generic name only. Trade names should not be used. Drugs should be referred to by their generic names. If proprietary drugs have been used in the study, refer to these by their generic name, mentioning the proprietary name and the name and location of the manufacturer in parentheses.

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The journal requires that all authors disclose any potential sources of conflict of interest. Any interest or relationship, financial or otherwise that might be perceived as influencing an author's objectivity is considered a potential source of conflict of interest. These must be disclosed when directly relevant or directly related to the work that the authors describe in their manuscript. Potential sources of conflict of interest include, but are not limited to: patent or stock ownership, membership of a company board of directors, membership of an advisory board or committee for a company, and consultancy for or receipt of speaker's fees

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## Appendix B Search Terms

Search term	Field	Search syntax
A	Title or abstract only	("Dialectical Behavior* Therapy" OR "Dialectical Behaviour* Therapy" OR "DBT")
B	Title or abstract only	AND ("mechanism* change" OR "outcome*" OR "therapeutic change" OR "change" OR "emotion* regulation" OR "mindfulness" OR "distress tolerance" OR "interpersonal effective*" OR "skill")
C	Full text	("mediat*")

## Appendix C Search Strategy for each Database

Database	Search syntax	Filters	Articles retrieved
PsycINFO (via EBSCOhost)	<p>“Dialectical Behavior* Therapy” OR  “Dialectical Behaviour* Therapy” OR “DBT”  (Abstract)  AND  “mechanism* change” OR “outcome*” OR  “therapeutic change” OR “change” OR  “emotion* regulation” OR “mindfulness” OR  “distress tolerance” OR “interpersonal  effective*” OR “skill” (Abstract)  AND  “mediat*” (All Text)</p>	<p>Language: English  Age: Adulthood</p>	43
CINAHL Plus with Full Text (via EBSCOhost)	<p>“Dialectical Behavior* Therapy” OR  “Dialectical Behaviour* Therapy” OR “DBT”  (Abstract)  AND  “mechanism* change” OR “outcome*” OR  “therapeutic change” OR “change” OR  “emotion* regulation” OR “mindfulness” OR  “distress tolerance” OR “interpersonal  effective*” OR “skill” (Abstract)  AND  “mediat*” (All Text)</p>	<p>Language: English  Age: Adulthood</p>	15
Web of Science Core Collection	<p>“Dialectical Behavior* Therapy” OR  “Dialectical Behaviour* Therapy” OR “DBT”  (Abstract)  AND  “mechanism* change” OR “outcome*” OR  “therapeutic change” OR “change” OR  “emotion* regulation” OR “mindfulness” OR  “distress tolerance” OR “interpersonal  effective*” OR “skill” (Abstract)  AND  “mediat*” (All fields)</p>	<p>Language: English</p>	60
PubMed	<p>“Dialectical Behavior* Therapy” OR  “Dialectical Behaviour* Therapy” OR “DBT”  (Abstract)  AND  “mechanism* change” OR “outcome*” OR  “therapeutic change” OR “change” OR  “emotion* regulation” OR “mindfulness” OR  “distress tolerance” OR “interpersonal  effective*” OR “skill” (Abstract)  AND  “mediat*” (All fields)</p>	<p>Language: English  Age: Adult  Species: Human</p>	26
Cochrane Library	<p>“Dialectical Behavior* Therapy” OR  “Dialectical Behaviour* Therapy” OR “DBT”  (Title/Abstract/Keyword)</p>	<p>No filters added</p>	5

Appendix C

	<p>AND  “mechanism* change” OR “outcome*” OR  “therapeutic change” OR “change” OR  “emotion* regulation” OR “mindfulness” OR  “distress tolerance” OR “interpersonal  effective*” OR “skill” (Title/Abstract/Keyword)  AND  “mediat*” (All Text)</p>		
Scopus	<p>“Dialectical Behavior* Therapy” OR  “Dialectical Behaviour* Therapy” OR “DBT”  (Article title/Abstract/Keyword)  AND  “mechanism* change” OR “outcome*” OR  “therapeutic change” OR “change” OR  “emotion* regulation” OR “mindfulness” OR  “distress tolerance” OR “interpersonal  effective*” OR “skill” (Article  title/Abstract/Keyword)  AND  “mediat*” (All fields)</p>	<p>Exclude:  Adolescents, Non-  human, Animal,  Animal Experiment</p> <p>Include: Journal</p>	598

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## Appendix D Mansell et al. (2013) Quality Assessment Ratings

	Wyatt et al. (2023)	Whiteside (2011)	Seow et al. (2020)	Schmidt et al. (2021)	Schmaling et al. (2021)	Neacsiu et al. (2018)	Neacsiu et al. (2018)	Neacsiu et al. (2014)	Maffei et al. (2018)	Krantz et al. (2018)	Kramer (2016)	Karam et al. (2022)	Hood et al. (2024)	de Souza et al. (2019)	Cavicchioli et al. (2020b)	Cavicchioli et al. (2020a)	Cavicchioli et al. (2019)	Cavicchioli, Movalli & Maffei (2019)
<b>Did the study cite a theoretical framework?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Were the study measures/procedures designed to influence mediating variables?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Were pilot studies conducted/reported to test the effect of the intervention on mediators?</b>	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
<b>Were the psychometric characteristics of mediator variables reported and were they within accepted ranges (Cronbach's alpha and test retest reliability &gt;.60)?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Did the study report a power calculation and was the study adequately powered to detect mediation?</b>	No	No	No	No	No	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No

Appendix D

	Wyatt et al. (2023)	Whiteside (2011)	Seow et al. (2020)	Schmidt et al. (2021)	Schmaling et al. (2021)	Neacsu et al. (2018)	Neacsu et al. (2018)	Neacsu et al. (2014)	Maffei et al. (2018)	Krantz et al. (2018)	Kramer (2016)	Karam et al. (2022)	Hood et al. (2024)	de Souza et al. (2019)	Cavicchioli et al. (2020b)	Cavicchioli et al. (2020a)	Cavicchioli et al. (2019)	Cavicchioli, Movalli & Maffei (2019)
<b>Did the study use an experimental design?</b>	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Were the psychometric characteristics of the outcome measure reported, and were they within acceptable ranges (i.e., test-retest or Cronbach's alpha &gt; .60)?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Were statistically appropriate/acceptable methods of data analysis used?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Did the study ascertain whether changes in the mediating variables preceded changes in the outcome variables?</b>	Yes	No	No	No	No	Yes	No	No	No	No	No	Yes	Yes	No	No	Yes	No	Yes
<b>Did the study report a change between baseline and follow-up for each mediator tested/reported?</b>	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No
<b>Was the change in the potential mediator correlated with change in outcome?</b>	No	No	No	No	No	Yes	No	No	No	No	No	No	Yes	Yes	No	No	No	No

Appendix D

Wyatt et al. (2023)	No
Whiteside (2011)	Yes
Seow et al. (2020)	No
Schmidt et al. (2021)	Yes
Schmaling et al. (2021)	No
Neacsiu et al. (2018)	Yes
Neacsiu et al. (2014)	Yes
Neacsiu et al. (2010a)	Yes
Maffei et al. (2018)	No
Krantz et al. (2018)	Yes
Kramer (2016)	No
Karam et al. (2022)	Yes
Hood et al. (2024)	No
de Souza et al. (2019)	No
Cavicchioli et al. (2020b)	Yes
Cavicchioli et al. (2020a)	Yes
Cavicchioli et al. (2019)	Yes
Cavicchioli, Movalli & Maffei (2019)	Yes
<b>Did the study control for possible confounding factors, e.g., baseline values?</b>	

## Appendix E Downs and Black (1998) Quality Assessment Ratings

	Cavicchioli, Movalli & Maffei (2019)	Cavicchioli et al. (2019)	Cavicchioli et al. (2020a)	Cavicchioli et al. (2020b)	de Souza et al. (2019)	Hood et al. (2024)	Karam et al. (2022)	Kramer (2016)	Krantz et al. (2018)	Maffei et al. (2018)	Neacsu et al. (2010a)	Neacsu et al. (2014)	Neacsu et al. (2018)	Schmaling et al. (2021)	Schmidt et al. (2021)	Seow et al. (2020)	Whiteside (2011)	Wyatt et al. (2023)
<b>1. Is the hypothesis/aim/objective of the study clearly described?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>2. Are the main outcomes to be measured clearly described in the introduction or methods section?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>3. Are the characteristics of the patients included in the study clearly described ?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>4. Are the interventions of interest clearly described?</b>	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
<b>5. Are the distributions of principal confounders in each group of subjects to be compared clearly described?</b>	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No
<b>6. Are the main findings of the study clearly described?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix E

	Wyatt et al. (2023)	Whiteside (2011)	Seow et al. (2020)	Schmidt et al. (2021)	Schmaling et al. (2021)	Neacsu et al. (2018)	Neacsu et al. (2018)	Neacsu et al. (2014)	Neacsu et al. (2010a)	Maffei et al. (2018)	Krantz et al. (2018)	Kramer (2016)	Karam et al. (2022)	Hood et al. (2024)	de Souza et al. (2019)	Cavicchioli et al. (2020b)	Cavicchioli et al. (2020a)	Cavicchioli et al. (2019)	Cavicchioli, Movalli & Maffei (2019)
<b>7. Does the study provide estimates of the random variability in the data for the main outcomes?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>8. Have all important adverse events that may be a consequence of the intervention been reported?</b>	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
<b>9. Have the characteristics of patients lost to follow-up been described?</b>	No	Yes	Yes	Yes	No	No	Yes	No	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes
<b>10. Have actual probability values been reported (e.g. 0.035 rather than &lt;0.05) for the main outcomes except where the probability value is less than 0.001?</b>	No	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes
<b>11. Were the subjects asked to participate in the study representative of the entire population from which they were recruited?</b>	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	UTD	UTD	UTD	No	UTD
<b>12. Were those subjects who were prepared to participate representative of the entire</b>	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	UTD	UTD	UTD	No	UTD



Appendix E

	Wyatt et al. (2023)	Whiteside (2011)	Seow et al. (2020)	Schmidt et al. (2021)	Schmaling et al. (2021)	Neacsu et al. (2018)	Neacsu et al. (2018)	Neacsu et al. (2014)	Neacsu et al. (2010a)	Maffei et al. (2018)	Krantz et al. (2018)	Kramer (2016)	Karam et al. (2022)	Hood et al. (2024)	de Souza et al. (2019)	Cavicchioli et al. (2020b)	Cavicchioli et al. (2020a)	Cavicchioli et al. (2019)	Cavicchioli, Movalli & Maffei (2019)
population from which they were recruited?																			
13. Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive?	Yes	No	Yes	Yes	UTD	No	No	Yes	UTD	No	Yes	Yes	Yes	Yes	UTD	Yes	Yes	Yes	Yes
14. Was an attempt made to blind study subjects to the intervention they have received ?	UTD	UTD	No	UTD	UTD	UTD	UTD	UTD	UTD	No	No	Yes	No	No	No	No	No	No	No
15. Was an attempt made to blind those measuring the main outcomes of the intervention?	UTD	UTD	No	UTD	UTD	Yes	Yes	Yes	Yes	No	No	No	No	Yes	No	No	No	No	No
16. If any of the results of the study were based on “data dredging”, was this made clear?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
17. In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case-control studies, is the time period between the intervention	UTD	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix E

	Wyatt et al. (2023)	Whiteside (2011)	Seow et al. (2020)	Schmidt et al. (2021)	Schmalzing et al. (2021)	Neacsu et al. (2018)	Neacsu et al. (2018)	Neacsu et al. (2014)	Neacsu et al. (2010a)	Maffei et al. (2018)	Krantz et al. (2018)	Kramer (2016)	Karam et al. (2022)	Hood et al. (2024)	de Souza et al. (2019)	Cavicchioli et al. (2020b)	Cavicchioli et al. (2020a)	Cavicchioli et al. (2019)	Cavicchioli, Movalli & Maffei (2019)
<b>and outcome the same for cases and controls ?</b>																			
<b>18. Were the statistical tests used to assess the main outcomes appropriate?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>19. Was compliance with the intervention/s reliable?</b>	UTD	UTD	UTD	UTD	UTD	Yes	UTD	UTD	UTD	UTD	UTD	UTD	UTD	UTD	UTD	UTD	UTD	UTD	UTD
<b>20. Were the main outcome measures used accurate (valid and reliable)?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>21. Were the patients in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population?</b>	N/A	N/A	Yes	N/A	N/A	Yes	N/A	Yes	Yes	N/A	No	Yes	Yes	No	Yes	N/A	Yes	Yes	UTD
<b>22. Were study subjects in different intervention groups or were the cases and controls recruited over the same period of time?</b>	N/A	N/A	No	N/A	N/A	Yes	N/A	Yes	UTD	N/A	No	UTD	UTD	No	No	N/A	No	No	UTD

## Appendix E

	Wyatt et al. (2023)	Whiteside (2011)	Seow et al. (2020)	Schmidt et al. (2021)	Schmaling et al. (2021)	Neacsu et al. (2018)	Neacsu et al. (2018)	Neacsu et al. (2014)	Neacsu et al. (2010a)	Maffei et al. (2018)	Krantz et al. (2018)	Kramer (2016)	Karam et al. (2022)	Hood et al. (2024)	de Souza et al. (2019)	Cavicchioli et al. (2020b)	Cavicchioli et al. (2020a)	Cavicchioli et al. (2019)	Cavicchioli, Movalli & Maffei (2019)
<b>23. Were study subjects randomised to intervention groups?</b>	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No	No	No	No	No
<b>24. Was the randomised intervention assignment concealed from both patients and health care staff until recruitment was complete and irrevocable?</b>	Yes	No	No	UTD	UTD	UTD	UTD	No	UTD	No	No	No	No	No	No	No	No	No	No
<b>25. Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?</b>	UTD	Yes	No	Yes	UTD	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes
<b>26. Were losses of patients to follow-up taken into account?</b>	Yes	Yes	Yes	UTD	UTD	Yes	Yes	Yes	UTD	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No
<b>27. Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%?</b>	No	No	No	No	Yes	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No

## Appendix F Author Guidelines for Empirical Project

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Submission to this journal proceeds totally online and you will be guided stepwise through the creation and uploading of your files. The system automatically converts your files to a single PDF file, which is used in the peer-review process.

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Divide the article into clearly defined sections.

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# Appendix G Ethics Approval

The screenshot displays the ERGO II interface. At the top left, it says 'ERGO II Ethics and Research Governance Online'. At the top right is the University of Southampton logo. Below the header is a navigation bar with 'Home' and 'Submissions'. The main content area shows the submission title '81567.A4 - Yoga, talking therapies and psychological wellbeing: Exploring shared mechanisms (Amendment 4)'. Below the title are four tabs: 'Submission Overview' (selected), 'Submission Questionnaire', 'Attachments', and 'History'. Under the 'Submission Overview' tab, there is a 'Details' section with the following information:

<b>Status</b>	Approved
<b>Category</b>	Category 6
<b>Submitter's Faculty</b>	Faculty of Environmental and Life Sciences (FELS)

## **Appendix H 'Bot' criteria**

Criteria for exclusion of data as a 'bot':

1. reCAPTCHA score of under .5 (recommend by Qualtrics)
2. Three or more responses started at the same time (within 60 seconds) and ended at the same time (within 60 seconds)

## Appendix I Demographic Questionnaire

How old are you?

18-21	
21-24	
25-34	
35-44	
45-54	
55-64	
65 and over	

What gender do you best identify with?

Female	
Male	
Non-binary	
Transgender	
Prefer not to say	
Other (Please state)	

How would you describe your ethnicity?

White: White British, White Irish, Any other white background	
Asian or Asian British: Indian, Pakistani, Bangladeshi, Chinese, Any other Asian background	
Black or Black British: African, Caribbean, Any other Black background	
Mixed heritage background	
Arab	
Prefer not to say	



Appendix I

Other (please specify)	
------------------------	--

Do you consider yourself to have ever had any mental health difficulties?

No	
Yes	

Are you currently receiving any treatment for mental health issues or having private therapy?

No	
Yes	

Have you ever engaged in Dialectical Behaviour Therapy (DBT)?

No	
Yes	

Have you ever engaged in Acceptance and Commitment Therapy (ACT)?

No	
Yes	

Which of the following forms of exercise do you participate in?

Brisk walking	
Cycling	
Dancing	
Football	
Gymnastics	
HIIT (high intensity) workouts	
Other cardio	

Appendix I

Pilates	
Running	
Tennis	
Water sports	
Weight training	
Other (please state)	
None of the above	

How many times per week do you exercise?

Less than once per month	
Once per month	
Twice per month	
Three times per month	
Once a week	
Twice per week	
Three to five times per week	
Daily	

Do you practise yoga?

Yes	
No	

What type/s of yoga do you practise?

Ashtanga Yoga	
Bikram Yoga	
Chair Yoga	
Hatha Yoga	

Appendix I

Integral Yoga	
Iyengar Yoga	
Jivamukti Yoga	
Kundalini Yoga	
Laughter Yoga	
Power Yoga	
Partner Yoga	
Restorative Yoga	
Sivananda Yoga	
Tantric Yoga	
Tibetan Yoga	
Vinyasa	
Yin Yoga	
Yoga Nidra	
Yogic Breathing	
Other	
Don't know	

On average, how much do you practise yoga?

Less than once per month	
Once per month	
Twice per month	
Three times per month	
Once a week	
Twice per week	
Three to five times per week	

Appendix I

Daily	
-------	--

How many years have you been practising yoga?

Less than 1 year	
1-3 years	
3-5 years	
5-10 years	
10-20 years	
20-30 years	
30+ years	

Where do you practice yoga (please select all that apply)?

Yoga studio	
Gym	
With a private instructor	
At home (self-directed)	
At home (online class)	
Outdoors	
Other (please specify)	

Are you a yoga teacher or yoga therapist?

No	
Yes, a yoga teacher	
Yes, a yoga therapist	

## Appendix J Self-report outcome measures

### Difficulties in Emotion Regulation Scale (DERS)

Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside each item.

1-----2-----3-----4-----5

almost never sometimes about half the time most of the time almost always

(0-10%) (11-35%) (36-65%) (66-90%) (91-100%)

- \_\_\_\_\_ 1) I am clear about my feelings.  
 \_\_\_\_\_ 2) I pay attention to how I feel.  
 \_\_\_\_\_ 3) I experience my emotions as overwhelming and out of control.  
 \_\_\_\_\_ 4) I have no idea how I am feeling.  
 \_\_\_\_\_ 5) I have difficulty making sense out of my feelings.  
 \_\_\_\_\_ 6) I am attentive to my feelings.  
 \_\_\_\_\_ 7) I know exactly how I am feeling.  
 \_\_\_\_\_ 8) I care about what I am feeling.  
 \_\_\_\_\_ 9) I am confused about how I feel.  
 \_\_\_\_\_ 10) When I'm upset, I acknowledge my emotions.  
 \_\_\_\_\_ 11) When I'm upset, I become angry with myself for feeling that way.  
 \_\_\_\_\_ 12) When I'm upset, I become embarrassed for feeling that way.  
 \_\_\_\_\_ 13) When I'm upset, I have difficulty getting work done.  
 \_\_\_\_\_ 14) When I'm upset, I become out of control.  
 \_\_\_\_\_ 15) When I'm upset, I believe that I will remain that way for a long time.  
 \_\_\_\_\_ 16) When I'm upset, I believe that I will end up feeling very depressed.  
 \_\_\_\_\_ 17) When I'm upset, I believe that my feelings are valid and important.  
 \_\_\_\_\_ 18) When I'm upset, I have difficulty focusing on other things.  
 \_\_\_\_\_ 19) When I'm upset, I feel out of control.  
 \_\_\_\_\_ 20) When I'm upset, I can still get things done.  
 \_\_\_\_\_ 21) When I'm upset, I feel ashamed at myself for feeling that way.  
 \_\_\_\_\_ 22) When I'm upset, I know that I can find a way to eventually feel better.  
 \_\_\_\_\_ 23) When I'm upset, I feel like I am weak.  
 \_\_\_\_\_ 24) When I'm upset, I feel like I can remain in control of my behaviors.  
 \_\_\_\_\_ 25) When I'm upset, I feel guilty for feeling that way.  
 \_\_\_\_\_ 26) When I'm upset, I have difficulty concentrating.  
 \_\_\_\_\_ 27) When I'm upset, I have difficulty controlling my behaviors.  
 \_\_\_\_\_ 28) When I'm upset, I believe there is nothing I can do to make myself feel better.  
 \_\_\_\_\_ 29) When I'm upset, I become irritated at myself for feeling that way.  
 \_\_\_\_\_ 30) When I'm upset, I start to feel very bad about myself.  
 \_\_\_\_\_ 31) When I'm upset, I believe that wallowing in it is all I can do.  
 \_\_\_\_\_ 32) When I'm upset, I lose control over my behavior.  
 \_\_\_\_\_ 33) When I'm upset, I have difficulty thinking about anything else.  
 \_\_\_\_\_ 34) When I'm upset I take time to figure out what I'm really feeling.  
 \_\_\_\_\_ 35) When I'm upset, it takes me a long time to feel better.  
 \_\_\_\_\_ 36) When I'm upset, my emotions feel overwhelming.

Reverse-scored items (place a subtraction sign in front of them) are numbered 1, 2, 6, 7, 8, 10, 17, 20, 22, 24 and 34.

**Calculate total score by adding everything up.** Higher scores suggest greater problems with emotion regulation.

**SUBSCALE SCORING\*\*:** The measure yields a total score (SUM) as well as scores on six sub-scales:

1. Nonacceptance of emotional responses (NONACCEPT): 11, 12, 21, 23, 25, 29
2. Difficulty engaging in Goal-directed behavior (GOALS): 13, 18, 20R, 26, 33
3. Impulse control difficulties (IMPULSE): 3, 14, 19, 24R, 27, 32
4. Lack of emotional awareness (AWARENESS): 2R, 6R, 8R, 10R, 17R, 34R
5. Limited access to emotion regulation strategies (STRATEGIES): 15, 16, 22R, 28, 30, 31, 35, 36
6. Lack of emotional clarity (CLARITY): 1R, 4, 5, 7R, 9

Total score: sum of all subscales

\*\*"R" indicates reverse scored item

### Distress Tolerance Scale

Think of times that you feel distressed or upset. Circle the item that best describes your beliefs about feeling distressed or upset. Please answer regarding your feelings of distress 'in general', that is, on the average.

Strongly Disagree	Mildly Disagree	Agree and Disagree Equally	Mildly Agree	Strongly Agree	
1	2	3	4	5	1. Feeling distressed or upset is unbearable to me.
1	2	3	4	5	2. When I feel distressed or upset, all I can think about is how bad I feel.
1	2	3	4	5	3. I can't handle feeling distressed or upset.
1	2	3	4	5	4. My feelings of distress are so intense that they completely take over.
1	2	3	4	5	5. There's nothing worse than feeling distressed or upset.
1	2	3	4	5	6. I can tolerate being distressed or upset as well as most people.
1	2	3	4	5	7. My feelings of distress or being upset are not acceptable
1	2	3	4	5	8. I'll do anything to avoid feeling distressed or upset.
1	2	3	4	5	9. Other people seem to be able to tolerate feeling distressed or upset better than I can.
1	2	3	4	5	10. Being distressed or upset is always a major ordeal for me.
1	2	3	4	5	11. I am ashamed of myself when I feel distressed or upset.
1	2	3	4	5	12. My feelings of distress or being upset scare me.
1	2	3	4	5	13. I'll do anything to stop feeling distressed or upset.
1	2	3	4	5	14. When I feel distressed or upset, I must do something about it immediately.
1	2	3	4	5	15. When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually feels.
Strongly Disagree	Mildly Disagree	Agree and Disagree Equally	Mildly Agree	Strongly Agree	

**FFMQ-15: 15-item Five-Facet Mindfulness Questionnaire****Instructions**

Please use the 1 (never or very rarely true) to 5 (very often or always true) scale provided to indicate how true the below statements are of you. Circle the number in the box to the right of each statement which represents your own opinion of what is generally true for you. For example, if you think that a statement is often true of you, circle '4' and if you think a statement is sometimes true of you, circle '3'.

	Never or very rarely true	Rarely true	Some- times true	Often true	Very often or always true
1. When I take a shower or a bath, I stay alert to the sensations of water on my body.	1	2	3	4	5
2. I'm good at finding words to describe my feelings.	1	2	3	4	5
3. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.	1	2	3	4	5
4. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.	1	2	3	4	5
5. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.	1	2	3	4	5
6. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.	1	2	3	4	5
7. I have trouble thinking of the right words to express how I feel about things.	1	2	3	4	5
8. I do jobs or tasks automatically without being aware of what I'm doing.	1	2	3	4	5
9. I think some of my emotions are bad or inappropriate and I shouldn't feel them.	1	2	3	4	5
10. When I have distressing thoughts or images I am able just to notice them without reacting.	1	2	3	4	5
11. I pay attention to sensations, such as the wind in my hair or sun on my face.	1	2	3	4	5
12. Even when I'm feeling terribly upset I can find a way to put it into words.	1	2	3	4	5
13. I find myself doing things without paying attention.	1	2	3	4	5
14. I tell myself I shouldn't be feeling the way I'm feeling.	1	2	3	4	5
15. When I have distressing thoughts or images I just notice them and let them go.	1	2	3	4	5

**FIAT – Q - SF**  
**Interpersonal Relationships Questionnaire – Short Form**

	Disagree			Agree		
	Strongly	Moderately	Mildly	Mildly	Moderately	Strongly
This questionnaire will ask you to respond to a number of statements. You are asked to read each statement carefully, and then think about whether the statement applies to you or does not apply to you. Then circle the number that best describes how much you agree with the statement.						
1. I do not want to share things about myself with others.	1	2	3	4	5	6
2. I intentionally hide my feelings.	1	2	3	4	5	6
3. I start to talk about what I am going through, and then decide it is better to keep my feelings to myself.	1	2	3	4	5	6
4. When friends ask me about how I am doing, I choose not to tell them.	1	2	3	4	5	6
5. I feel the need to keep secrets from people who are close to me.	1	2	3	4	5	6
6. I have problems being close with others.	1	2	3	4	5	6
7. I have difficulty making conversation with people.	1	2	3	4	5	6
8. I avoid asking people for help in meeting my needs.	1	2	3	4	5	6
9. I deliberately upset the other person during an argument.	1	2	3	4	5	6
10. When I am arguing with someone, the argument goes on for a long time.	1	2	3	4	5	6
11. People say I am not willing to compromise when there is a conflict.	1	2	3	4	5	6
12. When I am arguing with someone, the argument becomes more intense as time goes on.	1	2	3	4	5	6
13. When I have a disagreement with another person, I explain repeatedly why I think I am right.	1	2	3	4	5	6
14. If someone gives me feedback that I don't like, I do the opposite of what the person wants.	1	2	3	4	5	6
15. When people give me unfavorable feedback, I argue with them.	1	2	3	4	5	6
16. Close relationships are important to me.	6	5	4	3	2	1
17. I feel that there are times when it is beneficial to express disagreement in a relationship.	6	5	4	3	2	1
18. I listen to others and offer them support.	6	5	4	3	2	1
19. I ask other people to tell me about their feelings and their experiences.	6	5	4	3	2	1
20. I withdraw in the face of conflict, regardless of the circumstances.	1	2	3	4	5	6
21. I avoid conflict at all costs.	1	2	3	4	5	6



## Appendix J

	Strongly	Moderately	Mildly	Mildly	Moderately	Strongly
22. In order to avoid conflict, I try to anticipate what the other person wants me to do.	1	2	3	4	5	6
23. My emotional responses make sense to me when I consider the circumstances.	6	5	4	3	2	1
24. I have problems with my emotions.	1	2	3	4	5	6
25. I can tell the difference between one emotion and another.	6	5	4	3	2	1
26. I have problems identifying what I am feeling.	1	2	3	4	5	6
27. I express my emotions at appropriate times and places.	6	5	4	3	2	1
28. People tell me that when I talk about my own experience, I share information that is too personal.	1	2	3	4	5	6
29. People say that I talk about my feelings too much.	1	2	3	4	5	6
30. I am told that I talk too much about myself.	1	2	3	4	5	6
31. People are annoyed by the way that I express my emotions.	1	2	3	4	5	6
32. I express my emotions in an overly intense manner.	1	2	3	4	5	6



*The Short Warwick–Edinburgh  
Mental Well-being Scale (SWEMWBS)*

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 dealing with problems well	1	2	3	4	5
I've been thinking clearly	1	2	3	4	5
I've been feeling close to other people	1	2	3	4	5
I've been able to make up my own mind about things	1	2	3	4	5

## Appendix K Eight Limbs of Yoga Questionnaire

### Responses:

1. Never - 0% of the time
2. Rarely - about 10% of the time
3. Occasionally - about 30% of the time
4. Sometimes - about 50% of the time
5. Frequently - about 70% of the time
6. Usually - about 90% of the time
7. Always - about 100% of the time

**Please think about your current yoga practice when answering the following questions.**

**How much does your current yoga practice encourage the following principles?**

*Note. Subscale items in brackets are for reference only and are not be included in the items as they appear to participants online*

(Yama: general ethical principles which can guide your behaviour in daily life)

Kindness, compassion and non-harming towards others (Ahimsa)

Being kind and compassionate towards your body and in the way you respond to yourself, regardless of your internal and external experiences (Ahimsa)

Being non-judgemental and kind towards your body (Ahimsa)

Being truthful to yourself and others (Satya)

Acting in line with your true values and intentions (Satya)

Listening to what your body needs in the moment and taking rest or variations accordingly (Satya)

Not taking the belongings of others without permission (Asteya)

Respecting your own and other's resources, including time, energy, emotions, and ideas (Asteya)

Connecting with your internal experiences as they occur (Asteya)

Balancing energy; ensuring you are not exerting too much or not doing enough (Brahmacharya)

Restraint or moderation; for some people this could include sexual restraint or not drinking alcohol to excess (Brahmacharya)

Balancing strengthening with stretching, or speed with slowness (Brahmacharya)

Only taking and giving what is necessary and not excessive (Aparigraha)

Detaching yourself and 'letting go' of things, including objects, situations, thoughts and feelings (Aparigraha)

Letting go of the idea of a 'perfect' posture and moving in a way that is right for your individual body (Aparigraha)

(Niyama: self-discipline which can be strengthened over time through yoga practice, and guide your behaviour in daily life)

## Appendix K

Working towards a clean and calm body (Saucha)

Doing what you can to keep your surrounding environment clean and uncluttered (whether this is your home, yoga studio or the natural world etc.) (Saucha)

Making steps towards a pure and calm state of mind (Saucha)

Accepting and being content with life as it is (Santosha)

Letting go of the desire for things that we don't have, whilst accepting what you do have (Santosha)

Recognising that your practice may feel different on different days and that being okay (Santosha)

Practising self-discipline (Tapas)

Having motivation, willingness, and dedication in all that you do (Tapas)

Approaching challenges with courage (Tapas)

Studying yourself and reflecting on your thoughts, emotions, habits and intentions (Svadyaya)

Working to understand yourself better (this could include learning from books, scriptures or other sources) (Svadyaya)

Reflecting on your actions and what they mean about you as a person (Svadyaya)

The principle of completely surrendering or devoting yourself to a higher power (this may be any spiritual belief or any religion, but does not have to be) (Isvara Pranidhana)

Believing in a power that is bigger or greater than yourself (Isvara Pranidhana)

Acting in a way that is for the greater good rather than for selfish means (Isvara Pranidhana)

### **How much does your current yoga practice include the following?**

Practising the physical postures of yoga to increase flexibility, practice balance, or strengthen your body (Asana)

Practising the postures of yoga to encourage calmness and stillness (Asana)

Moving in your body into certain postures (Asana)

Focusing on your breath (Pranayama)

Engaging in breathing exercises (Pranayama)

Changing the ratio of your inhale, exhale or the pause between breaths (Pranayama)

Directing your attention inwards (Pratyahara)

Withdrawing from the senses and reducing external stimuli (e.g. sitting in silence, closing eyes etc.) (Pratyahara)

Becoming focused on the present moment and not distracted by sounds, sights, sensations, smells or taste (Pratyahara)

Bringing your attention to focus on one thing (Dharana)

Concentrating on one thing without distraction (Dharana)

## Appendix K

Focusing your attention solely on a mantra, mental image or the breath (Dharana)

Experiencing a sense of connection with the focus of our attention (Dhyana)

Maintaining your focus on one thing (e.g. breath, mantra) for a prolonged period of time (Dhyana)

Becoming entirely absorbed with the focus of your meditation (Dhyana)

A feeling of 'bliss' or 'enlightenment' which comes from an awareness of the connection between your mind, body and spirit (Samadhi)

Being connected to a higher power or something more than yourself (Samadhi)

Experiencing life exactly as it is, without seeing it through the lens of our likes, dislikes, biases or sensations (Samadhi)

### **To what extent are you familiar with the eight limbs of yoga?**

#### **Responses:**

1. Completely unfamiliar
2. Quite unfamiliar
3. Somewhat unfamiliar
4. Neutral
5. Somewhat familiar
6. Quite familiar
7. Very much familiar

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## Appendix L Cronbach's Alphas for Eight Limbs Questionnaire Subscales

	Cronbach's alpha
Yamas	.90
Ahimsa	.78
Satya	.73
Asteya	.45
Brahmacharya	.49
Aparigraha	.60
Niyamas	.92
Saucha	.67
Santosha	.69
Tapas	.77
Svadyaya	.78
Isvara pranidhana	.79
Asana	.76
Pranayama	.77
Pratyahara	.71
Dharana	.79
Dhyana	.67
Samadhi	.65

## Appendix M Recruitment Poster



**WE WANT TO BETTER UNDERSTAND THE PSYCHOLOGICAL BENEFITS OF YOGA**


**QUESTIONS?**

PLEASE FEEL FREE TO CONTACT THE RESEARCH TEAM:

**NADINE**  
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**HALINA**  
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**DR ALISON BENNETTS**  
(PRIMARY SUPERVISOR)  
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# YOGA AND PSYCHOLOGICAL WELLBEING

## WHETHER YOU PRACTICE YOGA OR NOT, WE NEED YOU!

### WHAT DOES IT INVOLVE?

**AN ONLINE SURVEY WHICH TAKES APPROXIMATELY 30 MINUTES TO COMPLETE**

### PRIZE DRAW

**WIN ONE OF TEN £25 VOUCHERS**

UNIVERSITY OF SOUTHAMPTON STUDENTS CAN PARTICIPATE VIA SONA TO RECEIVE CREDITS IF PREFERRED

**YOU CAN TAKE PART IF YOU ARE AGED 18+ AND SPEAK ENGLISH**

**IF YOU WOULD LIKE TO PARTICIPATE, PLEASE FOLLOW THIS LINK OR SCAN THE QR CODE :**

**(INSERT LINK AND QR CODE)**



This study has been approved by The University of Southampton Research Ethics Committee (ERGO Number 81567). Version 1 27.04.23

# Appendix N Online Participant Information and Consent

**Study Title:** Yoga, talking therapies and psychological wellbeing: Exploring shared mechanisms

**Researcher(s):** Halina Willis (nee Gleeson), Nadine Fox, Dr Ali Bennetts, Dr Andrew Merwood and Joanne Williams

**University email:** hsdg1n21@soton.ac.uk, njm1v16@soton.ac.uk

**Ethics/ERGO no:** 81567

**Version and date:** Version 3 [21/06/23]

You have been invited to participate in the above research study. To help you decide whether you would like to take part or not, the information below will help you understand why the research is being done and what it will involve. Please read the information below carefully. Please don't hesitate to email us with any questions if anything is unclear or you would like more information before you decide to take part in this research. If you are happy to participate you will be asked for your consent online.

## What is the research about?

The research is being conducted as part of a three-year doctoral qualification in Clinical Psychology at the University of Southampton. This is a research study about yoga and whether there are any differences between those who do regularly practice yoga and those who do not. For those who practice yoga, there will be additional questions about what yoga you practice and the different elements you include in your practice to consider if these elements might yield psychological benefit.

This study was approved by the Faculty Research Ethics Committee (FREC) at the University of Southampton (Ethics/ERGO Number: 81567).

## What will happen to me if I take part?

If you decide to take part then you will be asked to complete an online survey. The survey takes approximately 30 minutes to complete. You will be asked to complete an online survey which will ask about your demographic information (age etc), physical activity and a number of psychological constructs. Once you have completed all of the questionnaires then you will be shown a debrief statement and given the option to follow a link to enter a prize draw for one of ten available £25 gift vouchers. You will not be given the option to enter the prize draw if you are participating via SONA and receiving university credits.

## Why have I been asked to participate?

Anyone who is over the age of 18 and fluent in English can participate in this study, unless they have been involved in the development of the study.



**What information will be collected?**

You will be asked to complete an online survey which will ask about your demographic information (age etc), if you have had any previous contact with mental health services, physical activity and a number of psychological constructs. Data will be collected and stored in a way that is consistent with the Data Protection Act 2018 and the GDPR. The survey is anonymous so your data and questionnaire responses cannot be connected to you. This data will be handled carefully during collection and analysis. It will be stored electronically encrypted and password protected.

You have the right to change your mind and withdraw at any time without giving a reason and without your participant rights being affected. You can withdraw at any point by exiting the survey. If you withdraw from the study, we cannot remove the data you have already provided as we will not be able to identify it as belonging to you.

The prize draw will be a separate survey so if you do 'opt-in' to the draw then your contact details will not be connected to your demographic information and questionnaire responses. We will delete this data after the prize draw is completed.

**What are the possible benefits of taking part?**

By completing this research you would be helping the researchers gain a better understanding of the potential benefits of yoga which could lead to future research about the use of yoga as a possible treatment intervention. You will be given the option to provide your email address to be entered into a prize draw where you could win one of ten £25 vouchers as a token of appreciation.

**Are there any risks involved?**

There should not be any risks to you taking part. You will be asked to complete some questionnaires about yourself; it is hoped that these are not too sensitive and are unlikely to cause any distress however if you do experience any distress then please visit the following websites and resources for information and support:

Mind – the mental health charity: <http://www.mind.org.uk>

The Samaritans – emergency helpline: <http://www.samaritans.org>

NHS Improving Access to Psychological Therapies <http://www.nhs.uk/mental-health/talking-therapies-medicine-treatments/talking-therapies-and-counselling/nhs-talking-therapies/>

You will find the contact details of the researchers at the top of this sheet and again at the end of the survey. You can contact them after you have taken part if you have any concerns or questions.

**What will happen to the information collected?**

All information collected for this study will be stored securely on a password protected computer and backed up on a secure server. In addition, all data will be pooled and only compiled into data

## Appendix N

summaries or summary reports. Only the researcher and their supervisor will have access to this information.

The data from the study will be analyzed and written up as part of a doctoral thesis where it is hoped that this will be disseminated at conferences and submitted for publication in a peer-reviewed journal. Research findings made available in any reports or publications will not include information that can directly identify you. Only members of the research team will have access to the data whilst the study is underway. As all data will be anonymous, any research findings that are used for reports or published will not be linked to you.

The University of Southampton conducts research to the highest standards of ethics and research integrity. In accordance with our Research Data Management Policy, data will be held for 10 years after the study has finished when it will be securely destroyed. As a publicly funded organisation, the University has to ensure that it is in the public interest when we use personally-identifiable information about people who have agreed to take part in research. This means that when you agree to take part in a research study, we will use information about you in the ways needed, and for the purposes specified, to conduct and complete the research project. Under data protection law, 'Personal data' means any information that relates to and is capable of identifying a living individual. The University's data protection policy governing the use of personal data by the University can be found on its website: <http://www.southampton.ac.uk/legalservices/what-we-do/data-protection-and-foi.page> .

Once the study is finished, the anonymous data will be deposited and made publicly available in the University of Southampton's institutional repository. Research findings made available in any reports or publications will not include information that can directly identify you without your specific consent. Your anonymous data will be uploaded to the university repository (see Welcome to ePrints Soton - ePrints Soton for full details) where it will be stored for 10 years and may be accessed for future research studies, subject to suitable ethical approval.

### **Will my participation be confidential?**

Your participation and the information we collect will be kept strictly anonymous. All data will be encrypted and stored in a password-protected database only accessible to the research team. Only members of the research team and responsible members of the University of Southampton may be given access to data about you for monitoring purposes and/or to carry out an audit of the study to ensure that the research is complying with applicable regulations. Individuals from regulatory authorities (people who check that we are carrying out the study correctly) may require access to your data. All of these people have a duty to keep your information, as a research participant, strictly confidential.

If you choose to enter the prize draw at the end of the study, you will need to provide your name and email address. This will be kept separate from your survey responses. This data will also be encrypted

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and stored in a password-protected database accessible only to the research team, and deleted after the prize draw has taken place.

### What happens if there is a problem?

If you are unhappy about any aspect of this study and would like to make a formal complaint, you can contact the Head of Research Integrity and Governance, University of Southampton, on the following contact details: Email: [ergoinfo@soton.ac.uk](mailto:ergoinfo@soton.ac.uk), phone: + 44 2380 595058.

Please quote the Ethics/ERGO number above. Please note that by making a complaint you might be no longer anonymous.

More information on your rights as a study participant is available via this link:  
<https://www.southampton.ac.uk/about/governance/participant-information.page>

### Where can I get more information?

If you have any more queries or would like to know more about this study, please do not hesitate to get in touch , details of the research team are provided below:

Chief Investigators: Nadine Fox ([njm1v16@soton.ac.uk](mailto:njm1v16@soton.ac.uk)) and Halina Willis (nee Gleeson) ([hsdg1n21@soton.ac.uk](mailto:hsdg1n21@soton.ac.uk))

Research supervisor: Dr Alison Bennetts ([a.bennetts@soton.ac.uk](mailto:a.bennetts@soton.ac.uk))

### Thank you for reading this information sheet and considering taking part in this research.


#### Consent

Please check this box to indicate that you have read and understood information on this form, are aged 18 or over and agree to take part in this study.

I consent to participating the study

#### Robot?

Please tick the below box to confirm you are not a robot

I'm not a robot   
reCAPTCHA  
Privacy - Terms

## Appendix O Debrief Statement

**Study Title:** Yoga, talking therapies and psychological wellbeing: Exploring shared mechanisms

**Ethics/ERGO number:** 81567

**Researcher(s):** Halina Willis (nee Gleeson), Nadine Fox, Dr Ali Bennetts, Dr Andrew Merwood and Joanne Williams

**University email(s):** hsdg1n21@soton.ac.uk, njm1v16@soton.ac.uk

**Version and date:** Version 1 [24/02/23]

Thank you for taking part in our research project. Your contribution is very valuable and greatly appreciated.

### **Purpose of the study**

The aim of this research is to explore whether there are any differences in the wellbeing of those who practice yoga and those who do not. Additionally we are looking at, whether there are any elements of a person's yoga practice which relate to psychological benefit. The data is being collected for two separate thesis projects which will be analysed and written up as two separate papers.

### **Study one**

This study will be exploring the relationship between yoga practice, wellbeing and psychological flexibility. Psychological flexibility involves acceptance and willingness to experience unwanted private events in order to pursue one's values and goals (Hayes, 2006).

It is expected that the researchers will find:

- Those who practice yoga will have higher levels of wellbeing and psychological flexibility than those who do not practice yoga.

- We are also looking at the different elements included in participants yoga practice and predict that inclusion of certain limbs of yoga practice will predict scores of psychological flexibility and wellbeing.

### **Study two**

This study is exploring the relationship between yoga practice, the four skills modules of DBT, and mental wellbeing. Dialectical Behaviour Therapy (DBT) is an evidence based mental health intervention. In the survey there were questions looking at the four skills areas that are taught in DBT. These are emotion regulation, mindfulness, distress tolerance and interpersonal effectiveness. There was also a questionnaire about wellbeing.

Based on previous research the follow outcomes are predicted:

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- Yoga practisers will have greater emotion regulation, core mindfulness, distress tolerance, interpersonal effectiveness skills and mental wellbeing compared to non-yoga practisers.
- Yoga practisers' scores on emotion regulation, core mindfulness, distress tolerance, interpersonal effectiveness, and wellbeing measures will positively correlate with the eight limbs of yoga. Each of the four DBT outcomes will correlate with at least one of the eight limbs.
- The inclusion of certain limbs of yoga in someone's yoga practice will predict their scores on the four DBT skills measures and a wellbeing measure.
- Participant's scores on the DBT skills measures correlate with each other.

Your data will help our understanding of yoga as an intervention, which may lead to further research into whether yoga could be offered as a treatment intervention for common mental health difficulties.

### **Confidentiality**

Results of this study will not include your name or any other identifying characteristics.

### **Study results**

If you would like to receive a copy of the thesis when it is completed, please let us know by using the contact details provided on this form. Please note, by doing this, you will be self-identifying as having participated in the project, however we will still not be able to identify your individual responses to questions.

### **Further support**

If taking part in this study has caused you discomfort or distress, you can contact the following organisations for support:

Mind – the mental health charity: <http://www.mind.org.uk>

The Samaritans – emergency helpline: <http://www.samaritans.org>

NHS Improving Access to Psychological Therapies <http://www.nhs.uk/mental-health/talking-therapies-medicine-treatments/talking-therapies-and-counselling/nhs-talking-therapies/>

### **Further reading**

If you would like to learn more about this area of research, you can refer to the following resources:

Bennetts, A. (2022). How does yoga practice and therapy yield psychological benefits? A review and model of transdiagnostic processes. *Complementary Therapies in Clinical Practice*.

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Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., and Lillis, J. (2006). Acceptance and commitment therapy: model, processes and outcomes. *Behav. Res. Ther.* 44, 1–25. doi: 10.1016/j.brat.2005.06.006

Linehan, M. (2015). *DBT Skills training manual*. Guilford Publications.

Linehan, M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*. Guilford Press.

### **Further information**

If you have any concerns or questions about this study, please contact Halina Willis (nee Gleeson) [hsdg1n21@soton.ac.uk](mailto:hsdg1n21@soton.ac.uk) or Nadine Fox at [njm1v16@soton.ac.uk](mailto:njm1v16@soton.ac.uk) who will do their best to help.

If you remain unhappy or would like to make a formal complaint, please contact the Head of Research Integrity and Governance, University of Southampton, by emailing: [rgoinfo@soton.ac.uk](mailto:rgoinfo@soton.ac.uk), or calling: +44 2380 595058. Please quote the Ethics/ERGO number which can be found at the top of this form. Please note that if you participated in an anonymous survey, by making a complaint, you might be no longer anonymous.

**Thank you again for your participation in this research.**

## Appendix P Characteristics of Participant's Exercise

	Non -Yoga practisers <i>n</i> (%)	Yoga Practisers <i>n</i> (%)
Total	229 (52.9)	204 (47.1)
Frequency of exercise		
Less than once per month	19 (8.3)	3 (1.5)
Once per month	5 (2.2)	4 (2)
Twice per month	13 (5.7)	6 (2.9)
Three times per month	9 (3.9)	5 (2.5)
Once per week	33 (14.4)	17 (8.3)
Twice per week	53 (23.1)	46 (22.5)
Three to five times per week	66 (28.8)	77 (37.7)
Daily	31 (13.5)	46 (22.5)
Type of exercise		
Brisk walking	142 (62)	137 (67.2)
Cycling	36 (15.7)	28 (13.7)
Dancing	25 (10.9)	31 (15.2)
Football	18 (7.9)	9 (4.4)
Gymnastics	8 (3.5)	10 (4.9)
HIIT (high intensity) workouts	35 (15.3)	42 (20.6)
Other cardio	49 (21.4)	49 (24)
Pilates	24 (10.5)	46 (22.5)
Running	67 (29.3)	62 (30.4)
Tennis	9 (3.9)	11 (5.4)
Water sports	22 (9.6)	16 (7.8)
Weight training	63 (27.5)	63 (30.9)
Other	32 (14)	82 (40.2)

Note. participants could provide multiple responses 'type of exercise' question.

## Appendix Q Characteristics of Yoga Practisers

Demographic	<i>n</i> (%)
<b>Type of yoga practice</b>	
Ashtanga Yoga	27 (13.2)
Bikram Yoga	4 (2)
Chair Yoga	12 (5.9)
Hatha Yoga	59 (28.9)
Integral Yoga	1 (0.5)
Iyengar Yoga	10 (4.9)
Jivamukti Yoga	2 (1)
Kundalini Yoga	7 (3.4)
Laughter Yoga	3 (1.5)
Power Yoga	18 (8.8)
Partner Yoga	2 (1)
Restorative Yoga	28 (13.7)
Sivananda Yoga	6 (2.9)
Tantric Yoga	2 (1)
Tibetan Yoga	2 (1)
Vinyasa	73 (35.8)
Yin Yoga	31 (15.2)
Yoga Nidra	11 (5.4)
Yogic Breathing	36 (17.6)
Other	11 (5.4)
<b>Frequency of yoga practice</b>	
Less than once per month	17 (7)
Once per month	23 (9.4)
Twice per month	22 (9)
Three times per month	19 (7.8)
Once a week	38 (15.6)
Twice per week	33 (13.5)
Three to five times per week	46 (18.9)
Daily	46 (18.9)
<b>Years practising yoga</b>	
Less than 1 year	33 (16.2)
1-3 years	50 (24.5)
3-5 years	35 (17.2)
5-10 years	39 (19.1)
10-20 years	26 (12.7)
20-30 years	11 (5.4)
30 + years	10 (4.9)
<b>Location of yoga practice</b>	
Yoga studio	51 (25)
Gym	26 (12.7)
With a private instructor	10 (4.9)
At home (self-directed)	87 (42.6)
At home (online class)	85 (41.7)
Outdoors	20 (9.8)
Other	28 (13.7)
<b>Yoga therapist or teacher</b>	
No	153 (75)



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Yes, a yoga teacher	50 (24.5)
Yes, a yoga therapist	1 (0.5)

### Familiarity with the eight limbs of yoga ( $n = 200$ )

Completely unfamiliar	40 (20)
Quite unfamiliar	37 (18.5)
Somewhat unfamiliar	21 (10.5)
Neutral	17 (8.5)
Somewhat familiar	46 (23)
Quite familiar	25 (12.5)
Very much familiar	14 (7)

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*Note.* 'Frequency of yoga practice' responses ( $n = 244$ ) as this includes participants who practice yoga less than twice per month ( $n = 40$ ), who were considered 'non-yoga practisers'.

Participants could provide multiple responses to 'location of yoga practice' question.

Four participants did not complete the eight limbs questionnaire in full and did not respond to question regarding familiarity with the eight limbs of yoga.