DOCTOR OF PHILOSOPHY

Yoga as a Psychosocial Intervention for Anxiety and Depression in Adults with Intellectual Disability

a Feasibility Study Testing Laughter Yoga versus Vinyasa Yoga as a Group Based Adjunct Therapy

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Award date:
2021

Awarding institution:
Coventry University

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Yoga as a Group Based Adjunct Therapy

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Original citation: Yoga as a Psychosocial Intervention for Anxiety and Depression in Adults with Intellectual Disability: a Feasibility Study Testing Laughter Yoga versus Vinyasa Yoga as a Group Based Adjunct Therapy.

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[Citation]

Yoga as a Psychosocial Intervention for Anxiety and Depression in Adults with Intellectual Disability: a Feasibility Study Testing Laughter Yoga versus Vinyasa Yoga as a Group Based Adjunct Therapy.

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June 2021

Yoga as a Psychosocial Intervention for Anxiety and Depression in Adults with Intellectual Disability: a Feasibility Study Testing Laughter Yoga versus Vinyasa Yoga as a Group Based Adjunct Therapy.

A thesis submitted in partial fulfilment of the University's requirements for the

Degree of Doctor of Philosophy

June 2021

Coventry University

Coventry University

Certificate of Ethical Approval

Applicant:

Louise Gates

Project Title:

Psycho-social interventions for adults with intellectual disability and associated mental health conditions.

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as High Risk

Date of approval:

29 July 2018

Project Reference Number:

P67972

Abstract

Background: Adults with intellectual disabilities (ID) experience mental health conditions at twice the rate of the non-disabled population (Cooper et al, 2007). There is limited evidence for the effectiveness of complementary, group-based interventions as an adjunct to usual care explicitly targeting the mental wellbeing of adults with ID. Group-based, psychosocial interventions provide for social interaction, which is often lacking for this population group. The present study aimed to identify the scientific benefits of laughter yoga (LY) as a psychosocial intervention for adults experiencing depression and anxiety secondary to ID. Alongside two systematic reviews, it focused on testing LY in comparison with vinyasa yoga (VY) as a specific, group-based intervention using both quantitative and qualitative methods. LY involves simulated laugher made possible via laughter exercises. To date, no studies have examined the effect of any style of yoga on anxiety and depression in adults with ID. This study is the first to assess two different styles of yoga as psychosocial interventions for adults with ID.

Method: Two systematic reviews were carried out prior to the feasibility study design. Both quantitative (mood rating scales, blood pressure, salivary cortisol) and qualitative data (participant interviews) was collected. This provided preliminary quantitative and qualitative data in addition to the main feasibility data examining the data collection methods. In the mixed-methods, feasibility study (with a one-month follow-up), LY was compared to VY with the goal of isolating and identifying the effect of laughter. The feasibility of the intervention was assessed using five methods: the evaluation of recruitment capability and resulting sample characteristics, assessment and refinement of data-collection procedures and outcome measures, evaluation of the acceptability and suitability of the intervention and study procedures, evaluation of the resources and ability to manage and implement the study, and intervention and preliminary evaluation of participant responses to intervention. Thirteen participants were randomly assigned to the LY intervention (n=4), the VY intervention (n=4), and the control group (n=5). The participants in the LY and VY groups took part in six weekly yoga sessions, with a one-month follow-up. The participants completed the Glasgow mood rating scales adapted for ID at baseline (T0), week three (T1), week six (T2), and one month post-intervention at week 10 (T3). Salivary-cortisol samples and blood-pressure measurements were taken at baseline (T0), before and after each session and at the follow-up (T3).

Findings: Both systematic reviews found that no study has examined yoga on mental health in adults with disability and that the recommend research approach was to undertake a feasibility study. The feasibility results evidenced by the evaluation of the acceptability and suitability of the intervention and study procedures, show that LY is a plausible intervention for adults with ID. The preliminary quantitative data showed no significant relationship between group and time was found for anxiety, depression, blood pressure, or salivary cortisol. Similarly, no significant main effect of group was found for anxiety, depression, blood pressure, or salivary cortisol. However, a significant main effect of time was found for anxiety ($F(3, 24) = 4.369$; $p = .014$). Five themes emerged from the qualitative data through thematic analysis, with two of these themes highlighting positive views of the intervention and reflections of the participants' positive emotional state.

Conclusion: A full-scale, randomised control trial to explore LY for adults with ID would be beneficial if the recommended future directions were followed and modifications were made to the intervention and study design. The findings of this thesis enhance understanding of how yoga can be made a feasible psychosocial intervention for adults with ID. These findings also contribute to a better understanding of the recruitment challenges faced when undertaking research with this vulnerable population group.

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Conference Proceedings

The abstract for the feasibility study included within this thesis was presented at the IASSID 2019 conference in Glasgow. The abstract was peer reviewed and then published in the Journal of Intellectual Disability Research (JIDR) following a 15 minute presentation at the conference. (See appendix 13.18)

Gates, L., & Bollard, M. (2019). Challenging Behaviour and Mental Health. *Journal of Intellectual Disability Research*, *63*(7), 686. https://doi.org/10.1111/jir.12653

Acknowledgements

Firstly, I would like to thank my supervisors. They have been an excellent support and a great help in assisting me whilst I journey through the PhD process. I would like to acknowledge Dr Pablo Domene for his unwavering support and guidance throughout my PhD project and his ability to answer my multiple questions along the way. Dr Martin Bollard for introducing me to a field of academic research on yoga that I had always wished to enter. Dr Derek Renshaw for his invaluable support during my quantitative data analysis and laboratory work. Thank you to Dr Laurence Baldwin for his yearly guidance and consistency at my PRP's and for joining the supervisory team in full during the last leg of the journey offering his full support and encouragement.

Acknowledgements must also go to my friends, for their continual encouragement and many reminders of my capabilities to complete my PhD and to my fiancé Ryan, for his unconditional love and support. I thank my parents for their support and encouragement over the last 3.5 years, especially this last year. Lastly, acknowledgement and thanks must go to the study site and participants, making this project possible.

1. Introduction

It is common for adults with intellectual disability (ID) to experience discrimination and stigma throughout their lives (Hughes et al, 2012). The stigmatisation of this group is likely due, in part, to the general population's limited understanding of ID. This stigma has a negative effect on the mental health and psychosocial wellbeing of adults with ID, which can lead to experiences of depression and anxiety (Hatzenbuehler et al, 2013). Sikabofori et al (2012) conclude that people with ID are more likely to be affected by psychosocial factors. Numerous studies have provided evidence that people with ID are often affected by low self-esteem (LaBarbera, 2008), which is known to be a catalyst for depression and anxiety (Erol & Orth, 2011). However, research examining the prevalence, diagnosis, and treatment of depression and anxiety in adults with ID has only begun in recent years, and findings remain scarce and unreliable (Hatton, 2002). The WHO states that, "significant limitations characterise intellectual disability both in intellectual functioning and adaptive behaviour as expressed in conceptual, social and practical adaptive skills" (WHO, 2011). These limitations – particularly in social functioning – could explain why the prevalence of depression and anxiety is higher among people with ID than in the general population group. Numerous studies have shown that people with ID experience lower self-esteem than their non-disabled peers (LaBarbera, 2008), as well as challenges in problem-solving, adding to the increased likelihood of depression and anxiety disorders (Zigler et al, 2002).

In recent years, the health and medical industry has become increasingly interested in the preventative and therapeutic benefits of alternative and complementary medicine for numerous health conditions, such as the use of acupressure for depression and anxiety (Coubasson et al, 2007) and of exercise for high-blood pressure (Fagard & Cornelissen et al, 2007). Due to this increase in interest, researchers are attempting to measure the effects of psychosocial interventions, such as yoga and mediatation. Although it is known that rates of mental disorders are higher in adults with ID, there is a lack of knowledge about the efficacy of psychosocial interventions for treatment of depression and anxiety within this population group (Hamers et al, 2018). This chapter is followed by a literature review and then two systematic reviews that examine the psychosocial intervention studies published thus far on the treatment of depression and anxiety in adults with ID.

1.1 Positionality and thesis structure

At this stage it is important to acknowledge my positionality as the researcher. It is imperative from the offset to be aware of my possible biases, values and experiences and how this could affect the research. As a yoga practitioner and teacher who experiences clinical depression as well as obsessive compulsive disorder (an anxiety disorder), I have personal experience of deriving benefits from practicing various styles of yoga including, vinyasa yoga as well as laughter yoga. Knowing the high prevalence of mental illness within adults with ID, I developed an interest in discovering if these benefits could be replicable within this population group. As a registered nurse, in my clinical practice I have seen first-hand the stigma adults with ID face, as well as the lack of available psychosocial interventions for them that have proven to show benefit on the mental health of the general population.

The aim of this study is to identify the feasibility and scientific benefits of laughter yoga (LY) as a psychosocial intervention for adults experiencing depression and anxiety secondary to ID. This will be done via two systematic reviews and a mixed methods feasibility study. A feasibility study methodology will enable the evaluation of recruitment, participant retention, and adverse effects as well as evaluation of acceptability of the data collection. Both quantitative and qualitative methods will be used to ensure a complete view of the effect of the intervention, as well as how it is received, providing evidence for its feasibility with the aim to answer the research question:

What is the feasibility and scientific benefits of laughter yoga as a psychosocial intervention for adults experiencing depression and anxiety secondary to ID?

First, this current chapter will deliver further context and demonstrate rationale for the study. Presented in chapter three is a thorough literature review highlighting all the current available literature within the field of yoga and mental health, specifically with a focus on laughter yoga and mental health in adults with intellectual disability. This literature review will narrow down the gaps in research which need to be addressed.

Chapter four provides two systematic reviews. Further narrowing the research area of yoga and mental health towards the niche area of laughter yoga for adults with intellectual disability and their associated anxiety and depression. These reviews will provide additional evidence for the requirement of high quality research in this field. Critical analysis of the papers included in the reviews will aid in research design and methodology for a feasibility study.

Outlined in chapter five are the methodological considerations that need to be taken into account during the study design stage. First, the requirement for a feasibility study is discussed as evidenced by the literature and systematic reviews. The second part of this chapter then details the study design and procedures. The method was developed to answer the research question, "What is the feasibility and benefit of a laughter yoga as a psychosocial intervention for adults with ID and associated mental health conditions?"

Chapter six showcases the preliminary quantitative and qualitative results, culminating in the feasibility results of the study. The feasibility results include; the evaluation of recruitment capability and resulting sample characteristics, evaluation and refinement of data collection procedures and outcome measures, evaluation of the acceptability and suitability of the intervention and study procedures, evaluation of the resources and ability to manage and implement the study and intervention as well as the preliminary evaluation of participant responses to intervention provided by the quantitative and qualitative data.

Provided in chapter seven is a discussion encompassing the entire body of work, from the systematic review findings through to the feasibility study results. Additionally by incorporating the preliminary quantitative and qualitative results it follows the desired mixed methods structure. Lastly, chapter eight provides a well-rounded conclusion which includes a summary of the work. Strengths and weaknesses of previous research are highlighted and recommendations for future research and practical application are given.

2. Context

The contents within this chapter will provide background, context and rationale for identifying the feasibility and scientific benefits of laughter yoga (LY) as a psychosocial intervention for adults experiencing depression and anxiety secondary to ID, in line with the study aims and objectives that were presented in the introduction chapter.

2.1 Intellectual Disability and Mental Health

The World Health Organisation (WHO, 2017) recently conducted a synthesis of epidemiological studies examining the prevalence of the two most common global mental disorders, depression and anxiety, estimating that 322 million people have had depression disorder and 264 million have had anxiety disorder. The WHO ranks depression as the leading contributor to global disability (WHO, 2017), with anxiety disorders ranked sixth. There are varying types of depression and anxiety disorders, but the most common are major depression and generalised anxiety disorder (American Psychiatric Association, 2013). One symptom of these mental disorders is suicide. Approximately 800,000 people commit suicide each year, equating to nearly 1.5% of all deaths worldwide. However, the risk of suicide is more common in other forms of depression, such as bipolar disorder. The adult psychiatric morbidity survey reported in 2014 that 39% of adults aged 18-74 in the UK were accessing treatment for depression or anxiety (McManus, 2016). In total, 17% of the adults surveyed in the UK met the criteria for depression or anxiety.

Examination of the aetiology of depression and anxiety reveals that people with intellectual disabilities (ID) are at a higher risk than others of developing these mental disorders (Emerson & Hatton, 2008). The genetic or biological factors that cause the ID may also be associated with an increased risk of mental illness (Emerson & Hatton, 2008). Emerson and Hatton (2008) observe that people with ID have increased rates of poverty, unemployment, and general adverse life events, which are all known to be catalysts for depression and anxiety.

In its long-term plan, "Transforming Care", published in January 2019, the NHS outlined its goal of increasing their understanding of adults with ID and their specific needs, with the aim of improving this population's health and wellbeing (NHS Long Term Plan, 2019). This new policy will ensure that all healthcare providers are making appropriate adjustments to support those with ID. Over the next five years, education about ID will be improved and implemented across the funded areas within the NHS. It is anticipated that these changes will promote greater consistency in the treatment of the healthcare needs of adults with ID (NHS Long Term Plan, 2019). By 2023/24, the aim is that a "digital flag" will be present in a patient’s medical files, making qualified professionals aware of their ID. Collaboration with local authorities will improve support for this vulnerable population group and their specific needs, which are not limited to their predisposition to depression and anxiety (NHS Long Term Plan, 2019).

Due to diagnostic challenges, it is difficult to obtain an exact figure of the prevalence rates of anxiety and depression in adults with ID, but estimates of reported prevalence range between 30% and 50% (Smiley, 2005). Though this study focuses on adults, the prevalence of depression and anxiety amongst children with ID is 36%, compared to just 8% for children without ID (Emerson et al, 2012). Based on these figures, it is estimated that, for every 2,000 adults, 32 will have an ID and 10-15 of these will have a mental disorder such as depression or anxiety (Joint Commissioning Panel Mental Health, 2013). This is further confirmed by

Cooper et al. (2007), who found that more than a third of their cohort of adults with ID had mental disorders, with 40% having a clinical diagnosis of depression or anxiety.

Common comorbidities with ID include pain, epilepsy, constipation, side effects of using numerous medications, and infections. Combined or singular, these can all have a significant impact on a person's mental health (Emerson et al, 2012). Specific syndromes common in adults with ID – such as Prader-Willi, Cornelia de Lange, and Down's – are known to be associated with certain mental health problems, including depression and anxiety-related disorders such as obsessive-compulsive disorder (Emerson et al, 2012).

2.2 Intellectual Disability

In 2016, Public Health England estimated that 1,087,100 people in the UK had ID, with 930,400 of these being adults (Public Health England, 2016). However, only 252,446 were registered with a GP. This equates to approximately 4.4 per 1,000 people with ID being registered with a GP (Public Health England, 2016). Although there is no precise data on the number of people with ID, the figure of 930,400 is reached by combining the total number of adults with mild ID (those with an IQ range of 50-70), moderate ID (IQ 35-49), and severe ID (IQ 20-34). An IQ of below 20 would be categorised as a profound ID. The exact rate of prevalence for each severity level is unknown, but it is thought that most have mild-moderate ID, with severe or profound ID being the least common (Simpson et al, 2016). A review by Hughes-McCormack et al. (2017), synthesising studies measuring the prevalence of ID in adults, found that just under 49% of papers failed to document the specific levels of ID (from mild to profound) in their results and instead published combined totals for the prevalence rates.

Most definitions of ID distinguish people with ID from their peers in the general population by listing the deficits of the former group. However, this method often excludes information about the remaining intellectual functions. The Department of Health (2003) defines ID as "a considerable loss in the capacity to grasp new or complicated knowledge, to learn new skills (impaired intellect), with a diminished ability to deal independently (impaired social functioning) that begins before adulthood”. The fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) categorises ID using three criteria: deficits in intellectual functioning, confirmed by professional assessment; severe impairments in adaptive functioning skills; and the emergence of intellectual and adaptive deficits during the developmental period (American Psychiatric Association, 2013). While the DSM has previously used the term "mental retardation", it now promotes the use of "intellectual disability" in the professional, medical, and academic fields, and this expression has been in common usage for the past two decades (Tull & Newman, 2009).

2.3 Depression

The most commonly diagnosed mental illness is depression (National Institute of Mental Health, 2019). The WHO accurately estimated that, by 2020, depression would be the most common illness in the developed world (WHO, 2011). The DSM-5 defines depression by the following symptoms: poor appetite or overeating, insomnia or hypersomnia, low energy or fatigue, low self-esteem, poor ability to focus, difficulty making decisions, feelings of hopelessness, lack or interest in previously enjoyable activities, and thoughts of suicide (American Psychiatric Association, 2013). Within the general population, contributors to the development of depression tend to include stress, adverse life events, low income or lack of employment opportunities, and lack of social support. These contributing factors are shared by adults with ID, who may then be doubly disadvantaged by experiences of stigma and discrimination and limited coping mechanisms and communication skills (Smiley, 2005).

2.4 Anxiety

Anxiety can come in many forms and is often diagnosed alongside other mental health conditions, most commonly depression (American Psychiatric Association, 2013). The DSM-5 defines anxiety as comprising the following symptoms: excessive worry, difficulty coping with worry, restlessness, feeling tired easily, difficulty focusing, brain fog, irritability, muscle tension, and sleep disturbances (American Psychiatric Association, 2013). When these symptoms become persistent and impair day-to-day functioning, it is classed as anxiety. There are various anxiety disorder diagnoses, including generalised anxiety disorder, social anxiety, specific phobias, and panic disorder. All have common traits of excessive fear and worry. Fear is the emotion that triggers the fight or flight response in the automatic nervous system. Few studies have examined the exact prevalence of anxiety in adults with ID. However, one study by Stavrakai and Mintsioulis (1997) reported that 27% of 257 adults with ID living in the community met the specific measures for anxiety disorder.

With the WHO (2017) describing depression and anxiety disorders as including feelings of "low self-worth" and "poor concentration", among others, adults with ID are doubly disadvantaged. Adults with ID face stigma and are socially marginalised. This stigma can be manifest in different ways, from discrimination or disempowerment, by well-meaning yet overprotective loved ones who deny adults with an ID the everyday opportunities accessible to the general population (Jahoda et al, 2006). Reliance on other people to help make their decisions – combined with likely negative views of themselves, their environments, and their futures (Sikabofori et al, 2012) – are all predictors of depression and anxiety.

The reported global occurrence of depression and anxiety in adults with ID is estimated to be 20-35%. This is significantly higher than the general population prevalence rate of 15% (Kerker et al, 2004). Exact figures vary due to the challenges of diagnosing mental disorders in adults with ID, owning primarily to communication problems such as limited communication abilities and limited ability to self-report symptoms of depression or anxiety to caregivers (Hemmings et al, 2013). A study in the UK by Singleton et al. (2003) found that more than a third (40.9%) of participants with ID had depression and anxiety. These findings were supported in another UK-based study by Bhaumik et al. (2008), who discovered that more than one-third of adults with ID met the diagnosis of a mental disorder. However, the discrepancies between figures are likely due to the methodological challenges of research within this population group (Brothwick-Duffy, 1994).

2.5 Diagnostic Challenges and Current Treatment

Assessing mental health symptomology in the ID population is a challenge (Moss, 2002). Due to this lack of knowledge, it is more than likely that mental disorders such as depression and anxiety in adults with ID are under-recognised, and this is confirmed in studies by Patel et al. (1993) and Reiss et al. (1990). In addition, adults with ID often have difficulties with coherent verbal communication. The National Association of Independent Schools and Non-Maintained Special Schools (NASS, 2007) reported that students aged 5-19 years with ID lacked confidence when voicing their mental health needs. There are complexities around self-reporting by those adults with ID who have communication difficulties associated with their ID. Individuals with mild to moderate ID may describe their feelings as “moody”, “no fun”, or “empty” (Raghavan et al, 2011) in place of "sad" or "depressed". A diagnosis may be underpinned by reporting of more physical and external behaviours – such as loss of appetite, disrupted sleep patterns, and increased fatigue – rather than limited verbal expressions of feelings (Raghavan et al, 2011). Due to this limitation, mental disorders are frequently misdiagnosed (Smiley, 2005). Furthermore, those with more profound and severe ID have an even more significant reduction in their capacity to recognise and self-report symptoms.

The descriptors of depression and anxiety in the DSM-5 are not always compatible with the experiences of adults who have mild to moderate IDs – and even less so with those of adults who have severe or profound ID (Marston et al, 1997). Thus, it has been argued that the DSM-5 definitions of depression and anxiety may be inappropriate for this population (Cooper et al, 2007). This is because these definitions and lists of symptoms produce criteria designed for adults in the general population with average cognitive functioning.

Symptoms such as "increased feelings of guilt" or "brain fog" may not be present in adults with ID (Marston et al, 1997). Furthermore, parallels to the symptoms listed by the DSM-5 such as anger and irritability may better reflect the experiences of depression or anxiety in this population group (Matson et al, 1999). Carers and family members may be the first to notice symptoms of depression and anxiety in adults with ID, and they may not have substantial knowledge about psychosocial wellbeing and the clinical importance of reporting changes in behaviour (Moss et al, 1998).

Amongst adults with ID, the most common reason for referral to psychiatric services is challenging behaviour (Moss, 2002). Carers or family members may find that they notice a change in behaviours in individuals with ID but they do not wish to attach another diagnostic label, such as depression or anxiety, which could further stigmatise them (Deb et al, 2001). This can frequently lead to a phenomenon of "diagnostic overshadowing". This is where symptoms of mental disorder such as depression or anxiety are attributed to the ID, rather than being seen as standalone and indicative of a mental illness (Deb et al, 2001). There is evidence that diagnostic overshadowing is widespread (Deb et al, 2001, Hemmings et al, 2013). GPs may also tie presenting symptoms – such as grouchiness, boredom, and challenging behaviour – to the ID, rather than highlighting concerns about a mental disorder (Daniels, 2012). For this reason, diagnostic overshadowing occurs due to decisions of both carers and medical professionals and can often lead to delayed diagnoses and treatment plans (Ali et al, 2013). Thus, diagnostic tools with good reliability and validity are required to assess the mental health of this vulnerable population group.

2.6 Diagnostic Tools

Several diagnostic tools have been developed. The reliability and validity of the psychiatric assessment schedule for adults with a developmental disability (PAS-ADD) as an assessment tool for depression and anxiety in adults with ID has been tested. This screening tool was designed to help staff and carers who work with adults with ID to recognise any mental disorders that may be present and make informed decisions (Moss et al, 1998). It is a checklist, comprising 29 items scored on a four-point scale. The scores are combined to produce a threshold score: there are three thresholds, and if any are crossed, this indicates the need for further assessment (Moss et al, 1998). The Hester Adrian Research Centre designed the semi-structured interview assessment, and studies show that this has acceptable reliability and validity (Costello et al, 1997, Moss et al, 1997). For this reason, it is currently the most commonly used tool for diagnosing mental illness in adults with ID (Smiley, 2005). However, further studies of better quality are required to confirm its validity (Deb et al, 2001).

Additionally, a lack of research on undertaking assessment of those with severe ID makes the currently available data difficult to interpret (Deb et al, 2001). Alongside the PAS-ADD, the Mini PAS-ADD provides a framework for professionals to undertake additional assessments without the need for interviews. Carers and health worker staff can also access the PAS-ADD checklist for family members to assess whether an adult with ID under their care needs further assessment (Smiley, 2005). However, all these versions of the tool require a level of education and understanding of the behavioural symptoms attributed to anxiety and depression when not tied to people with ID. The NICE guidelines (2016) for ID also suggest using more than one diagnostic assessment tool, if available. Carers and professionals' efforts to screen for mental disorders in adults with ID are likely to be limited due to the shortage of available literature on these tools and their validity. Due to delayed diagnosis and implementation of treatment plans, preventative mental health interventions could be beneficial for this population group.

2.7 Current Treatment for Depression and Anxiety

Following the recent Winterbourne View hospital abuse scandal in the UK (Department of Health, 2012), a report was published, reporting "deep concerns" about the over-prescription of antipsychotic and antidepressant medication in adults with ID. A synthesis of epidemiological studies of adults with ID and mental disorders found that up to 10% of the ID population is prescribed antidepressants despite the lack of an actual diagnosis and 13% are prescribed antipsychotics with no psychotic illness (Public Health England, 2019). In 2016, the NHS launched a programme concerned with "stopping over medication of people with an ID, autism, or both" (STOMP), which it included in the NHS long-term plan, "Transforming Care". In 2016, the Royal College of Psychiatrists also published a document discussing the prescription of antipsychotics and antidepressants in adults with ID. The document concludes that, where there is no clinical diagnosis of a mental disorder and the challenging behaviour exhibited by an adult with ID is due to psychosocial influences, then practitioners should strongly consider not prescribing medication and were possible, should instead implement non-pharmacological treatment, such as a psychosocial intervention (Royal College of

Psychiatrists, 2016). However, while there is evidence that antidepressant medication can reduce the symptoms of depression in adults with ID (Verhoeven et al, 2001; Janowsky et al, 2005), reliance on polypharmacy can have adverse and unwanted side effects (Deb et al, 2009). For these reasons, psychosocial approaches should be examined for their feasibility as a treatment method for depression and anxiety within this population group.

Before January 2019, when the most recent policy on services for adults with ID in the NHS long-term plan was published, the Joint Commissioning Panel for Mental Health (JCPMH) published their guidance for commissioners of mental health services for people with ID. This document explained how people with ID could interact with health services when suffering from depression and anxiety. This can occur via primary care, psychological therapies, community ID services, inpatient ID services, and numerous other generic mental health services (JCPMH, 2013). However, the JCPMH explain that collaboration and coordination between these services is often poor, leading to further delays in treatment and higher costs. This adds to the need for a low-cost, feasible, and preventative method for mental health problems within this vulnerable population group.

2.8 Psychosocial Interventions

There is little published research on any forms of intervention for people with ID and associated depression and anxiety. Though this context chapter and following literature review are focused on psychosocial interventions, it is worth nothing that very few studies even examine the effectiveness of pharmacologic approaches (Brylewski & Duggan, 2004). Amongst psychosocial interventions that look specifically at mental health in adults with ID, cognitive behavioural therapy (CBT) seems to be the only intervention to date that has been researched within this population group. The use of CBT has been researched in relation to adults with ID and depression (Lindsay et al, 1993, Kroese et al, 1997, Lindsay & Walker, 1999) and anxiety (Baty et al, 1989, Dixon & Gunary, 1986, Lindsay & Michie, 1988). However, even this published research relies on small populations and limited numbers of case studies (Hatton, 2002).

A wide range of systematic reviews have been published on the effects of psychosocial interventions for depression and anxiety in the general population, with promising preliminary results (Kvam et al, 2016; Lee et al, 2016; Stubbs et al, 2015). However, none of their conclusions can be generalised to adults with ID. Non-pharmacological psychosocial interventions such as CBT or psychotherapy are often not feasible for adults with ID. There have been studies in which an adaptive CBT approach was used for adults with ID (Unwin et al, 2016), but this was only appropriate for participants with mild ID.

A systematic search of the literature revealed that the second most commonly researched psychosocial intervention for depression and anxiety is yoga. The NHS "Live Well" website (2018) defines yoga as an ancient activity intended to increase mental and physical wellbeing that emphasises building strength, improving flexibility, and breathing. The term "yoga" originates from the Sanskrit word *yuj*, meaning "union" (Feuerstein, 1975). Saraswati (2002) explains that yoga works to balance a person's mental and physical aspects, both internal and external. This practice pays attention to the person as a "whole", making it an ideal psychosocial intervention. Patanjali, considered one of the most prominent teachers of yoga, wrote the yoga sutras in approximately 200BC (Johnston, 2013). The yoga sutras are a classical yoga text compromising over 192 aphorisms, outlining the eight limbs of yoga (Johnston, 2013). Patanjali's yoga sutra, "*yogash chitta-vritti-nirodhah",* as written in Sanskrit, translates to a description of yoga as "*t*he cessation of the fluctuations, or overthinking, of the mind" (Johnston, 2013). A typical yoga practice from start to finish incorporates a combination of breathing exercises (*pranayama*), followed by movement via physical postures (*asanas*). It culminates in a meditation and relaxation (*shavasana*) at the end of a practice. In this way, the practice focuses on the person as a "whole" (Evans et al, 2009). Though current evidence-based research is limited, yoga is increasingly employed as a tool to support enhanced health and wellbeing in the lives of both the healthy and the medically unwell (Evans et al, 2009).

As highlighted in the introduction, there is a dearth of literature available on the effectiveness of psychosocial interventions for adults with ID and associated mental disorders of depression and anxiety (Gates & Atherton, 2001). For the reasons highlighted above – namely, the higher prevalence of mental disorders within this vulnerable population group, leading them to be doubly disadvantaged, as well as the adverse side effects of the over-prescription of medications – there is a need to examine the available literature on depression and anxiety in adults with ID and psychosocial interventions. A specific focus on yoga as a treatment for depression and anxiety could be prudent, as evidence has shown it to be beneficial in the general population (Bridges & Sharma, 2017).

Similarly to adults with ID, multi-morbidity is common in older adults. Tew et al (2021) proposed a study to examine the effects of yoga on older adults with multi-morbidity. The aim was to deliver a 12 week face to face yoga offering for adults aged over 65 with multi-morbidity. Though, due to the Covid pandemic, this intervention was transformed to become an online yoga study (Ward et al, 2021). The initial study aim of focusing on quality of life as the primary outcome measure, evolved into qualitatively exploring participant and provider experiences and acceptability of the adapted online delivery format. Ward et al's (2021) results presented interviews with 10 participants. Themes around IT skills and improved accessibility to online classes were highlighted, as well as well comments about lack of external distractions and teacher adaptability to the online format. Though their study did not focus on adults with ID, it is worth nothing that accessibility and yoga teacher adaptability are two areas in which would be relevant to intervention design for a study focusing on adults with ID. Ward et al (2021) conclude that further research of online inclusion barriers could enhance accessibility in an older adult's population, which could also be the case for adults with ID and worth exploration. Additionally, the £1.4million grant supplied to this study provides evidence for the increased trend of yoga as an alternative method for health and wellbeing that deserves high quality scientific research.

2.9 The Need for Psychosocial Interventions

A contributing factor in the increasing need for psychosocial interventions for adults with ID and associated mental health challenges is the over-prescription of medication to this population group. A 2019 report by Public Health England (PHE) about prescribing psychotropic drugs to people with intellectual disabilties found that, of the adults with ID who were taking antipsychotics, 22.5% were on more than one drug. In adults taking antidepressants, 10.4% were on more than one drug. Of those taking antiepileptics, 43.3% were taking at least one other daily medication (PHE, 2019). Two in five adults with ID were reported as using more than two different psychotropic medications (PHE, 2019). Recent studies by Perry et al. (2018) and Branford et al. (2019) reported often overprescribing of psychotropic medications for adults with ID, with the authors concluding that, although these interventions can work, they are often inappropriately prescribed.

In 2016, the aforementioned STOMP programme was launched nationally throughout the UK. The organisation has the aim of helping people stay healthy and experience a good quality of life (NHS England STOMP, 2016). It is estimated that 30,000 to 35,000 adults with ID take psychotropic medications for mental disorders that they do not have (PHE, 2019). Adults with ID can experience the negative side effects of these medications, both in the short and long-term (Eady et al, 2015). Matson and Mahan (2010) found that adults with ID are more susceptible to developing side effects than the general population, with complaints ranging from physical to neurological damage, alongside movement and physiological problems (Sheehan et al, 2017). Furthermore, when more than one medication is used, the probability of experiencing adverse side effects becomes even more significant (Matson & Mahan, 2010). For these reasons, there is a need to develop a non-pharmacological psychosocial intervention for depression and anxiety in adults with ID.

In 2008, the Department of Health recommended that their "Improving Access to Psychological Therapies" programme deliver effective psychosocial interventions to people with ID (Department of Health, 2008). Despite this recommendation, little research has been conducted into the efficacy of psychosocial interventions for adults with ID and associated mental disorders (Unwin et al, 2016). Kroese et al. (2012) note that this lack of research and the limited availability of feasible psychosocial interventions could be due to a lack of training, knowledge, and experience amongst health workers who work with adults with ID. Adults with ID are more likely to experience difficulties attaining health care and appropriate treatments (Disability Rights Commission, 2002). NHS specialist provisions for people with ID vary from inpatient clinics to outpatient community services and centres (Emerson et al, 2012). In the past, some people with ID were housed in long-term hospital facilities. However, most have lived in their communities with carers. The process of de-institutionalisation began in the 1970s due to the Better Services White Paper for Mentally Handicapped, which was published as a white paper in June 1971. A further catalyst for this process came more recently, when the abuse of patients at the Winterbourne View Hospital came to light (Emerson et al, 2012). The Better Service Act (Department of Health & Social Security, 1971) set out to increase community-based care as an alternative to institutionalised care. This ongoing movement towards people with ID living in community settings further emphasises the need for adaptable psychosocial interventions that can be tailored to this environment.

2.10 Existing Research into Psychosocial Interventions for Adults with Intellectual Disabilities

Currently, the evidence base for psychosocial interventions for adults with ID is limited. CBT has been the most researched approach to treating mental ill-health in adults with ID (Unwin et al, 2016). Though this intervention is often shown to positively affect the wellbeing of adults with ID, the collected data has not been adequately synthesised (Vereenooghe et al, 2018), leaving this population and their carers often confused as to the best methods. Additionally, there are often barriers to implementing such psychosocial interventions, such as the cost of training and delivery and the technical skills required to adapt mainstream therapeutic approaches such as CBT for this population group.

In recent years, the health and medical industry has become increasingly interested in the preventative and therapeutic benefits of alternative and complementary medicine (Tabish, 2008). Due to this increase in interest, researchers are now beginning to measure the effects of such psychosocial interventions. However, while there has been a wide range of systematic reviews of psychosocial interventions published in recent years (Lee et al, 2016, Stubbs et al, 2015), no conclusions can be drawn from these reviews and the findings cannot be generalised to adults with ID, as the studies all examined non-pharmacological interventions for the general population group only.

2.10.1 Cognitive Behavioural Therapy

As previously mentioned, so far in this population group, though there has only been a small amount of studies on psychosocial interventions, the majority of these studies have examined the effects of CBT as a psychosocial intervention for adults with ID. CBT remains the preferred method for the treatment of depression (Hamers, 2018). CBT is a talking therapy in which negative thoughts are challenged and modified to control mood and behaviour. In a review of psychosocial interventions for adults with ID, Vereenooghe et al. (2018) found eight studies examining the effects of CBT on adults with ID (Lindsay et al, 1993, 2014; McCabe et al, 2006; McGillivray et al, 2008, McGillivray & Kershaw 2013a, 2013b; Ghafoori et al, 2010; Hassiotis et al, 2013). However, this review included no exclusion for outcome measures, so there was no focus on the interventions as treatments for depression and anxiety. Previous obstacles to the use of CBT for adults with ID have included the assumption that the therapy is too complex for this group (Taylor et al, 2008) and that adults with ID lack the cognitive abilities required for the intervention. CBT has been used in a small number of studies for adults with ID, and some have examined the reduction in symptoms of depression and anxiety as outcome measures. Lindsay et al. (1993) used a modified version of CBT, identifying an improvement in depressive symptoms with the adapted version of the Zung depression inventory. A single case study by Kroese et al. (1997) found that CBT yielded improvements in crying behaviours in adults with ID. A further study by Lindsay et al. (1999) reported a 50% decrease in depression symptoms after a course of CBT and a continued remission of symptoms at two- and six-month follow-up.

Like studies of depression, research focusing on CBT as a treatment for anxiety is also limited. As a whole, evidence-based research into psychosocial interventions for adults with ID and anxiety is lacking (Koslowski et al, 2016, Osugo & Cooper, 2016). Lindsay and Michie (1988), focused on CBT as an intervention for specific anxiety-inducing phobias amongst the population of adults with ID. Other studies have proven that focusing on behavioural techniques for relaxation purposes can help to reduce the severity of anxiety (Baty et al, 1989). However, the currently available research on CBT for adults with ID often relies on small-scale feasibility studies, with inconsistent adaptions of the interventions. A full systematic review examining CBT as a treatment for depression and anxiety in adults with ID follows in the next chapter. Though the results from the aforementioned studies are promising, the studies only examined adults with mild to moderate ID, and CBT training can be costly and time-consuming to implement. Additionally, CBT may be seen as a less social psychosocial intervention unless carried out in a group therapy setting.

In a study of yoga as a psychosocial intervention for adults with ID, Hawkins et al. (2012) noted the social benefits of engaging in a yoga practice. Though only two individuals were studied, the yoga classes they attended were group lessons mixed with other non-disabled peers, and some anecdotal evidence was reported to confirm this social benefit. Kinser et al. (2013) also provide evidence of these social benefits, with their study focusing on the general population. Women with depression in the control group attended health education sessions and experienced a significant decrease in symptoms. However, the researchers noticed that these women were engaging in conversation before and after the health education sessions and going to the gym with the other participants; while a few even attended a group psychotherapy session. The authors concluded that bringing a group of women socially together each week could constitute an intervention in itself.

Hawkins et al. (2012) conclude that, in addition to giving people with ID an increased chance of experiencing a healthier life and perhaps preventing severe health issues (such as obesity and heart disease), yoga gave the individuals studied an opportunity to socialise with others. Hawkins et al. (2012) also highlight that the individuals with an ID had the opportunity to be exposed to other people who did not have ID. Individuals with severe ID are, at times, housed in secure community settings and not given a chance to engage in conversation with non-disabled peers. The authors add that participation in yoga could help people with ID improve their motor skills and life functions. Ellis et al. (2017) examined laughter yoga (LY) as an activity for elderly people living in care homes and found that the residents enjoyed the sense of wellbeing that was attained through LY, as well as the feeling of connectedness between them, highlighting the benefit of the social connection.

2.11 Exercise Elements of Psychosocial Interventions

Treatments involving "talking therapies" for depression and anxiety are prevalent, while methods involving movement remain scarce, despite a body of evidence for the benefits of movement and exercise for alleviating depression and anxiety (Anxiety and Depression Association of America, 2014). It is widely acknowledged that older adults with ID are more likely to have deficient physical activity levels than those in the general population – and even compared to frail elderly people (Van Schijndel-Speet et al, 2016). Physical activity levels amongst youths with ID are also deficient (Stanish & Temple, 2012). Some studies have shown that adolescents with ID are less active than children with ID (Shields et al, 2009). Though there is a lack of evidence for adults with ID from 18-65 years, it can be assumed that this group also lacks exercise opportunities (Emerson, 2005). Messant et al. (2009) identified barriers such as lack of transport, low staffing, low income, and limited adaptability of the available physical-therapy options as preventing adults with ID from accessing these exercise opportunities. Rimmer et al. (1994) found that body fat percentage increases in adults with ID in line with a decrease in IQ, highlighting the need for movement-based therapies. However, accessing these therapies can be challenging for adults with ID. Adding to this, Emerson (2005) found that adult women with ID who lived in the community with their carers were at a greater risk of obesity. Most studies looking at rates of obesity – a contributing factor to depression and anxiety – have shown that obesity rates amongst adults with ID may be up to 50% higher than those of the general population (Pitetti & Yarmer, 2002).

For this reason, it would be beneficial to identify a psychosocial intervention such as yoga that incorporates movement and exercise elements, as well as mindfulness aspects, for the treatment of depression and anxiety. The benefits of such an intervention have been documented by various researchers. Hawkins et al. (2012) researched the effects of partaking in a yoga practice on the level of exercise participation, compared to engaging in non-structured exercise sessions. Although the paper does not focus on mental health conditions, it does note that people with ID are significantly less likely to engage in exercise than those with no impairment.

The requirement for a wider choice and inclusion of adults with ID in psychosocial interventions is emphasised by governmental policy (JCPMH, 2013). When the JCPMH (2013) met with a group of adults with ID to discuss what would make an ideal psychosocial intervention for mental health, the group highlighted the need for individually tailored services, physical health care, and a choice of interventions. Due to the nature of yoga as a fluid movement class, it can be tailored to each individual with ease, maintaining benefits for mental and physical health even when practised slowly. Furthermore, some researchers have highlighted similarities between cognitive therapies (such as CBT) and yoga. They state that yoga can also be used as a behavioural intervention, adaptable to the specific needs of adults with ID, decreasing levels of rumination, a common symptom of depression (Uebelacker et al, 2010). A practice with limited movement, such as LY, also has the benefits of exercise (as explained later in this review). The UK Government's most recent guidelines for physical activity for disabled adults (Department of Health & Social Care, 2019), including people with cognitive impairments, advises 150 minutes a week of moderate exercise to a level where a participant "can talk, but can't sing"*.* Although medical professionals generally agree that exercise is beneficial for depression and anxiety, the limitations of the previous studies with this population group should not be ignored, and further research into physical movement-based psychosocial interventions such as yoga is needed. Additionally, there are many different styles of yoga from which to choose.

2.12 Yoga

Yoga is an ancient Indian tradition that involves a varied mix of physical and mental practices. A "yogi" aims to attain a state of all-round positive mental health. All elements of yoga incorporate three aspects: namely, respiration through breathing, the body through the postures (*asanas*), and the mind through meditation. In LY, there is also laughter. Therefore, as a practice that considers the person as a whole, LY is potentially an ideal psychosocial intervention. Although yoga is believed to have originated in India in approximately 500BC (Hanson, 2016), it has only gained popularity in the Western world in recent years, and a number of studies have been undertaken since 2000 (McCall, 2014). However, most of this research has been conducted within the general population.

Numerous yoga styles are popular in the Western world. There are more than 15 official types of yoga, with further variants of the practice evolving. It is worth noting that these types of yoga can be practised in various ways (Hanson, 2016). A useful way to explain this is the "eight limbs of yoga" (Table 1), which describes the eight aspects of yoga. These limbs are *yamas* (restraints), *niyamas* (observances), *asana* (mind-body postures), *pranayama* (breath control), *pratyahara* (sensory withdrawal), *dharana* (concentration), *dhyana* (meditation), and *samadhi* (pure awareness/consciousness), (Horovitz & Elgelid, 2015). The most common yoga practice in the Western world is *hatha*, which incorporates both *asanas* (mind-body postures) and *pranayama* (breath control). Most yoga practices that we see today in the West (Table 2) fall under the umbrella of *hatha* yoga – including *Ashtanga*, *Kundalini*, *Vinyasa,* and LY. These versions of *hatha* yoga each comprise these two elements of *asana* and *pranayama* (Uebelacker et al, 2010).

Table 1: Definitions of each of the eight limbs of yoga.

Eight Limbs of Yoga	
Yamas	Restraint, moral discipline, or moral vows
Niyamas	Positive duties or observances
Asana	Physical postures
Pranayama	Breathing exercises
Pratyahara	Sense withdrawal
Dharana	Focused concentration
Dhyana	Meditative absorption
Samadhi	Bliss, enlightenment

Table 2: Definitions of the most commonly practised yoga styles.

Style of Yoga	**Description**
Laughter Yoga	Originated in India in 1995, pioneered by Dr Madan Kataria. It combines yogic breathing (*pranayama*) with laughter exercises that do not rely on jokes, humour, or comedy. It is to be practised with childlike playfulness and eye contact for connection. Classes end with a laughter meditation.

Vinyasa Yoga	A yoga practice that combines yoga postures (*asanas*) with breath (*pranayama*). Each class can be different, using combinations of yoga postures in differing sequences.
Hatha Yoga	Hatha refers to the holistic practice of yoga. When practised, it incorporates all eight limbs of yoga. In the Western world, only two limbs (*asanas* and *pranayama*) tend to be practised.
Bikram Yoga	A series of 26 poses and breathing exercises, repeated twice in a room heated to around 40 degrees Celsius.
Ashtanga Yoga	Sanskrit for "eight limbs". A physically demanding style of yoga, consisting of six series. Each series has a set sequence. Often referred to as "Mysore" style.
Power Yoga	Power yoga is a high-intensity and dynamic practice. It is one of the most physically demanding types of yoga, with advanced postures that can be sustained for lengthy periods of time.
Sivananda Yoga	This is a spiritually oriented activity that emphasises Vedanta philosophy and mantra recitation. It incorporates the most spiritual components of yoga, such as karma (selfless service), bhakti (devotion), raja (mind development), and jnana (knowledge) (knowledge).
Yin Yoga	A restorative yoga practice that involves using props such as bolsters, blocks, and blankets to assist practitioners in remaining in restorative yoga postures for a prolonged period, usually between 5-15 mins per *asana*.
Iyengar Yoga	Iyengar yoga emphasises anatomical accuracy and alignment in postures to develop

	awareness. There is a strong emphasis on physical recovery and healing.
Kundalini Yoga	A yoga method influenced by Hinduism's tantra traditions. The goal of this type of yoga is to awaken the kundalini energy at the base of the spine. Asanas, meditation, pranayama, and chanting are all included. It's also known as the "yoga of mindfulness."

Yoga can be seen to have a clear advantage over pharmacotherapy due to it being devoid of negative side effects (Rao et al, 2013). Despite this, yoga has not been studied as a psychosocial intervention for its effects on the symptoms of depression and anxiety in individuals with ID. Currently, there is a deficiency of clinical research into the field of yoga as a whole or how it could add value to the healthcare industry. To date, only one study has examined yoga's effect on adults with ID (Hawkins et al., 2012) and this applied no outcome measures for mental health. Instead, the study examined exercise behaviours as a means of managing obesity and included only two participants. (This study is reviewed in one of the systematic reviews presented in the chapter 4.)

Although there have been no studies to date looking at the effects of yoga on mental health in adults with ID, some studies have examined the effects of yoga in relation to hyperactivity and behavioural problems in children with ID (Zipkin, 1985). Furthermore, Telles et al. (1993) found that yoga improved motor skills performance in children with ID and the relaxation that yoga bought improved the children’s concentration. Additionally, Hawkins et al. (2012) demonstrated that yoga benefits young adults with ID by reducing their chances of obesity, and thereby reducing their risk of obesity-related health issues, and giving participants an opportunity to socialise. Yoga has been described as a safe and beneficial way of improving strength, fitness, and flexibility, as well as an effective treatment for stress (Chong et al, 2011) and, as reported in the review of Uebelacker et al. (2010), an effective intervention for depression and anxiety. Moreover, practising yoga has been shown to lower blood pressure (Granath et al, 2006) and cortisol levels (Rocha et al, 2012; Vera et al, 2009). However, these studies have only been undertaken within the general population. The available literature does not indicate how yoga could specifically benefit adults with ID and their associated mental health conditions.

When examining the effects of yoga on adults with ID, one must consider whether different styles of yoga make a difference. Hanson (2016) conducted a review of reports on yoga as a psychosocial intervention and found that a significant theme was the modification of yoga to make it accessible for participants with various comorbidities. Five of the articles he found focused on the use of modifications, one of which focused on modifications for anxiety (Brown & Gerbarg, 2005). In a review by Cramer et al. (2016), the authors conclude that, due to the positive outcomes of all relevant randomised controlled trials (RCTs), the choice of yoga style can be left to the participant, as all styles have proven beneficial and devoid of negative side effects. In their study of yoga as an intervention for depressed adults in the general population, Uebelacker et al. (2017) found that the most serious complaint from the participants was that the yoga classes were too demanding for their current physical abilities. As yoga is an extremely adaptable intervention, the study recommended that modifications were made to ensure that all participants could partake in the yoga sessions in future studies (Uebelacker et al, 2017).

2.13 Yoga for Anxiety and Depression

There have been no studies of yoga and its effects on depression and anxiety in adults with ID. The adverse effects of depression and anxiety on the quality of life of those with ID has been acknowledged in numerous studies, both small and large (Ali et al, 2015). As previously mentioned, mental disorders within this population group are highly prevalent, but the only literature on yoga as a mental health intervention is concerned with people in the general population. Gaiswinkler and Unterrainer. (2016) revealed that increased participation in yoga practice led to an increase in mindfulness and general wellbeing. Qualitative data from this study includes reports from participants that, “by practising yoga, [they were able to] concentrate better”. This suggests that yoga, which is frequently regarded as a spiritual practice, should be researched further as a means of reducing symptoms of poor mental health in those with ID. The use of a mixed methods research approach may enable the collection of data showing the more subtle changes that can occur during participation in yoga, rather than gathering solely quantitative data on physical outcomes (Kishida et al, 2018).

Schuver and Lewis. (2016) reported a greater decrease in anxiety scores compared to a walking group after a 12-week yoga intervention. Similarly, anxiety levels were found to be lower in the yoga group and the drugs-and-yoga group than in the only-drugs group in a 4-week study by Gangadhar et al. (2013), who assessed 58 outpatients suffering from depression. Manincor et al. (2016) conclude that yoga plus regular treatment was more effective than regular treatment alone at reducing symptoms of anxiety and depression. One study focused specifically on state anxiety after a yoga practice session was compared to a yoga theory session (Telles et al, 2009). Decreases in anxiety were seen in both groups, with a larger decrease (14.7%) in the yoga practice group than in the yoga theory group (3.4%). The frequency of the yoga classes in these studies with the general population varied, from once a week to six times a week (Patwardhan, 2016). However, Saper et al. (2013) found no difference in efficacy between once and twice weekly yoga classes.

It is worth highlighting here a study by Richardson et al (2020), who explored whether a yoga intervention worked as a problem and emotion focused coping strategy for adults with ID. Though the outcome measures were not looking at specific mental health conditions, they aimed to determine the feasibility of researching stress and yoga as a coping tool among adults with ID. Throughout their study, Richardson et al (2020) referred to the framework curated by Crowe et al (2016) that suggested yoga can work as a problem or emotion focused coping strategy. Through the use of the elements that make up a hatha yoga sequence such as breathing, asanas (yoga postures) and meditation, Crowe et al (2016) reported that these practices could help individuals manage their stress. Richardson et al (2020) is the first study to examine this theory for the population group of adults with ID.

For replication purposes, Richardson et al's (2020) study can be commended due to the clarity given in the reporting of the yoga intervention methodology, for example, the specific asanas and breathing exercises used and the reported implementation of 12 yoga sessions over seven and half weeks. However, their study only comprised of nine participants, and only six of the participant's qualitative data was used in the analysis for results. This was due to three of the participants having difficulty comprehending the interview questions asked. The study was also presented as a mixed-methods study, however little to no quantitative data was reported or discussed during their paper. Richardson et al's (2020) findings suggest that through the social element of yoga and the mood improvement effect, yoga can act as an emotion-focused strategy for adults with ID. However, due to the small sample size, their results are not generalisable. Perhaps more importantly, the researchers did not attain any formal diagnoses of ID, or severity level of ID, for the participants in the study. This vital information could have helped in the appropriate selection of outcome measures and data collection techniques used to ensure a higher qualitative response rate than six of nine participants.

Though Richardson et al's (2020) study is innovative for yoga and ID research, despite the greater prevalence of depression and anxiety amongst adults with ID, non-pharmacological resources for the treatment of these conditions are still limited. The first treatment to be implemented is usually medication, which is costly and often over prescribed and can have unwanted side effects (NHS England STOMP, 2016). Yoga has been shown to be of benefit in the general population. For the benefit of the ID population, feasibility studies and evidence-based research must be undertaken to develop recommendations for this side effect-free treatment as possible adjunct therapy for their mental health conditions. Mental health and medical professionals are often not informed about the efficacy of yoga. Thus, benefits would be derived from the production and publication of further high-quality studies.

Though most studies in the field of yoga focus on depression, it is speculated that slow and deep breathing (*pranayama*) can soothe symptoms of anxiety by increasing parasympathetic tone, an effect which can be attributed to a sense of calmness generated by the practice (Kaushik et al, 2006). An increase in parasympathetic activity and a decrease in sympathetic activity was detected in a group of healthy adults practising *pranayama* (Pal et al, 2004). For this reason, the two styles of yoga under study here are LY and *vinyasa* yoga (VY). The rationale for this is that both are adaptable and similar, as they are *hatha* style yoga involving *asanas* (yoga postures) and *pranayama* (breath control). In VY, each *asana* (yoga posture) is synchronised to each breath: with a change of posture for each inhale and exhale, in a flowing movement. The *pranayama* element is bought to this practice by breath control. It is a highly adaptable yoga practice that can be tailored to meet the needs of each individual practitioner. LY, in contrast, employs laughter as a method of breath control. It would be useful to examine whether the laughter element makes a difference in the levels of depression and anxiety in adults with ID or if yoga *in general* is of benefit, hence VY is applied as a comparison. Although yoga is traditionally a holistic lifestyle practice with a spiritual purpose, the physical elements of the *asanas* (yoga postures) and *pranayama* (breathing exercises) have therapeutic and physiological effects (Rao et al, 2013).

2.14 Laughter Yoga (LY)

LY combines simulated unconditional laughter exercises with yogic breathing (*pranayama*). It was founded in Mumbai in 1993 by Indian physician Dr Madan Kataria (2002) and his wife, who is also a yoga teacher (Krebs et al, 2014). It brings together laughter exercises with *pranayama* and does not rely on jokes or humour: participants in LY laugh for no reason. A typical LY session begins with clapping and chanting exercises, where participants say “ho ho, ha ha ha”, while clapping in rhythm. Laughter exercises then follow, and these are carried out with childlike playfulness. The session concludes with a laughter meditation and relaxation. LY has become increasingly popular in recent years, with now more than 10,000 LY clubs in more than 100 different countries (Laughter Yoga University, 2017). Dr Kataria further popularised LY in his book, *Laugh For No Reason* (Kataria, 2002). There are currently seven books available on LY, all self-published and written by just three authors.

2.15 Laughter Research

To understand LY, it is important to consider the origins of laughter and its relationship with wellbeing. Mora-Ripoll (2010), in her review of the benefits of laughter, states that laughter is, in its simplest form, a psychophysiological response to stimulus that produces contractions of the facial muscles and numerous other neurophysiological processes. It has been said that, in the fourth century, a Greek doctor highlighted the fact that laughter is “*gelos*" in Greek, the root of which is the word "*hele*", meaning health (Yim, 2016). In the 16th century, philosophers said that laughter was physical exercise; and in the 18th century, laughter was said to help maintain balance in physical health (Yim, 2016). In the 19th century, laughter was proven to ease tension and improve general health (Dean & Gregory, 2004). Even the Bible states, “a merry heart doeth good like a medicine, but a broken spirit drieth the bones” (Proverbs 17:22; Strean & Chaplin, 2009).

Despite this historical knowledge that laughter is beneficial for health and wellbeing, it was not until the 20th century that academics and medical professionals such as Norman Cousins and Dr Adams acknowledged it (Yim, 2016). Norman Cousins found pain relief to be a benefit of laughter (Cousins, 1989), which he documented in his popular book, *An Anatomy of Illness*. Dr Adams was known to bring humour and laughter to his practice as a doctor (Krebs et al, 2014). His innovative way of working was even made into a popular film, "Dr Patch Adams", starring Robin Williams. Dr William Fry from Stanford University was considered one of the first researchers in gelotology (the study of laughter) and his 40-year research career has focused on the effects of laughter. He found laughter to produce an analgesic effect, as well as increasing endorphins and improving blood circulation (Fry & Salameh, 1987). In 1995, after 18 years of research, Berk and Tan, based in Loma Linda University in California, found that laughter could activate natural killer cells (Berk & Tan, 1995). It was in 1993, that LY was founded by Dr Kataria.

While laughter has long been known to have positive effects for health, the specifics are not yet clearly understood (Law et al, 2018). There are two types of laughter; “spontaneous" and "simulated" (Mora-Ripoll, 2010). Spontaneous laughter is regarded as "natural", and this occurs due to a humour stimulus. Simulated laughter is distinguished as laughter that does not rely on humour. It is often referred to as "fake" laughter (Mora-Ripoll, 2011). LY specifically employs simulated laughter (Nagendra et al, 2007) and is a moderately under researched area of gelotology. Dr Madan Kataria, the founder of LY, postulated that "motion creates emotion", arguing that the body cannot differentiate between spontaneous or simulated laughter (Law et al, 2018). Dr Kataria adds that both spontaneous and simulated laughter can produce the same positive mental and physical benefits (Woodbury-Fariña & Rodiguez Schwabe, 2015). Different types of laughter have been reported in studies to reduce levels of depression (Shadhidi et al, 2010), improve mood (Foley et al, 2002), improve the immune system (Dillion et al, 1986), and reduce levels of stress hormones within the body (Berk et al, 1989).

The study by Law et al. (2018) was the first to compare simulated and spontaneous laughter. The authors found that participants randomly assigned to the simulated laughter group had a significantly higher heart rate and lower root mean square of successive differences (rMSSD) than the spontaneous laughter group or the control group. The rMSSD reveals the parasympathetic activity of the heart, rather than a general measure of heartrate variability. The simulated laughter group was also found to have a higher laughter frequency than the spontaneous laughter group, who had watched a humorous video. Law et al. (2018) showed that the intensity and frequency of laughter increased the body’s energy output, therefore increasing the heartrate and producing the same effects on the body as exercise (Buchowski et al, 2006). Laughter has been shown to increase heart rate, improve the immune system, and provide movement exercise for the skeletal system (Mahony et al, 2002). It has also been shown to exert the abdominal muscles similarly to the abdominal exercises or back exercises typically practised in the gym (Wagner et al, 2013). Filippelli et al. (2001) examined respiratory dynamics during laughter and found that changes in breath, lung capacity, and airways are similar to those seen during exercise**.** The similarities between laughter and exercise validate the theory that the positive effects of laughter could be due to its exercise elements, rather than the laughter itself. This proves that laughter is beneficial, even when it is simulated (Mora-Rippoll, 2010).

In 2015, Kim et al undertook an RCT examining the effect of laughter therapy on mood state and self-esteem in cancer patients. Levels of mood disturbance decreased and self-esteem increased significantly compared to the control group. The laughter therapy group had a 14.12 point reduction in mood disturbance, compared to a 1.21 reduction in the control group. The results of this study support the claim that laughter can be a positive, nonpharmacological intervention to increase self-esteem and improve mood, thereby alleviating some symptoms of depression. Fonzi et al. (2010) conclude that the possible stimulation by laughter of some regions of the brain involved with depression – as well as the regulation of the HPA dysfunctions seen in depression – could potentially neutralise the symptoms. Ko and Youn. (2011) provides further evidence for this theory. The authors researched the effects of laughter on depression, cognition, and sleep among the community-dwelling elderly. Participants took part in four laughter therapy sessions over a period of one month. Outcomes were assessed using the geriatric depression score, the mini mental state examination, and the Pittsburgh sleep quality index and found to be positive, compared to the control group. Ko and Youn. (2011) conclude that laughter can be a beneficial and easily accessible intervention. Though numerous studies have produced evidence for laughter as a health intervention, these studies lack rigour and fail to include qualitative data to report the participant's experience.

To date, four systematic reviews have examined the effects of laughter for various populations and outcomes. The first review was completed by Mora-Ripoll (2011), who undertook a narrative review of spontaneous and simulated laughter interventions. He concludes that there is some evidence that simulated laughter has more positive effects than either the control or the other intervention groups. A review by Bennett et al. (2014) focused on outcome measures related to symptoms experienced by dialysis patients such as pain, sleep quality, depression and anxiety, as well as respiratory function. The authors conclude that simulated laughter interventions such as LY are appropriate for dialysis patients. Both RCTs and non-RCTs were included within both of these reviews.

A recent review by Gonot-Schoupinsky and Garip. (2018) included only studies with participants over the age of 60 years. Though the authors found that the laughter interventions had positive effects, they recommended that the laughter be isolated and measured to produce more rigorous evidence. Due to the lack of specific focus on the laughter, the authors conclude that they cannot attribute these positive results to the laughter itself. Van Doren. (2015) produced the first systematic review to include a meta-analysis. Due to the limited research available, meta-analysis has not always been a possibility. Van Doren. (2015) conclude that the general quality of the evidence for laughter as a health intervention is low, but this is likely due to this area of research not yet having reached maturity. However, their meta-analysis did show that simulated laughter is more effective than spontaneous and that it can cause a reduction in levels of depression. Nonetheless, it was established that all the studies were of low quality, with a significant risk of bias (Van Doren, 2015).

All four reviews conclude that there is evidence that laughter has positive effects on health, both mental and physical. The reviews by Mora-Ripoll (2011) and Bennett et al. (2014) also show that simulated ("fake") laughter is a highly adaptable approach for these interventions, due to its lack of requirement for humour or jokes. Though the evidence in the literature for the benefit of laughter could be more substantial, most of the studies have yielded positive results. Equally, no negative side effects have been reported (Mora-Ripoll, 2011). However, there is a need for studies of longer duration and with follow-up measurements, as this would reveal whether the benefits of laughter are sustainable in the long-term. To prevent the overuse of prescription medications by adults with ID, there is a need for simple, non-pharmacological interventions that can be given by professionals or carers with minimal training. A simulated laughter intervention such as LY has potential as an adjunct to other treatments for mental ill-health, though methodological research of greater rigour is required to provide more substantial evidence for this.

2.16 Outcome Measures

The literature highlights various outcome measures that could be used to assess the effectiveness of yoga as a psychosocial intervention. There is currently no consensus on the most appropriate measures for adults with ID, but it would be prudent to select options that are efficient to administer and appropriate for – or could be adapted for use with – ID service users. The British Psychological Society (2009) suggest that outcome measures should be "straightforward and immediately relevant' " for use with adults with ID. The National Disability Authority (NDA, 2019) adds to this, stating that they should be practical to use, with good reliability and validity for adults with ID.

2.17 Psychological Indicators of Stress

2.17.1 Depression and Anxiety

There has been a marked growth of self-report measures for adults with ID over the last couple of decades (Hartley et al, 2008). These self-report assessment tools for mental health (as seen in Table 3 below) reflect a movement away from previous reliance on lengthy medical assessments and observational ratings (Stancliffe, 2000). Six instruments have been developed or adapted for adults with mild to moderate ID (Hermans et al, 2012). These are the Glasgow depression scale for people with ID (GDS-LD), the Glasgow anxiety scale for people with ID (GAS-LD), the self-report depression questionnaire (SRDQ), the psychopathology instrument for mentally retarded adults self-report (PIMRA-SR), the Beck depression inventory (BDI), and the Zung self-rating depression scale (Zung). Of these six, two also include informant-report versions – namely, the Glasgow depression and anxiety scales carer supplement (GDS-CS & GAS-CS) and the PIMRA-I.

Table 3: Self Report Mood Rating Scales

Name of tool	Qualities	Validity	Informant/carer version	Adapted For ID
The Glasgow Depression Scale (GDS-LD)	20 item questionnaire based on DSM-5 criteria for depression. Yes or No questions followed by a confirmatory response of "sometimes", "a lot" or "always" scored as 0, 1, 2 respectively.	Test-retest reliability (r=0.97). Internal consistency (r=0.90)	Yes The Glasgow Depression Scale Carer Supplement (GDS-CS)	Yes
The Glasgow Anxiety Scale (GAS-LD)	27 item questionnaire based on DSM-5 criteria for anxiety. Yes or No questions followed by a confirmatory response of "sometimes", "a lot" or "always" scored as 0, 1, 2 respectively.	Test-retest reliability (r=0.95). Internal consistency (r=0.96)	Yes The Glasgow Anxiety Scale Carer Supplement (GDS-CS)	Yes
The Self-Report Depression Questionnaire (SRDQ)	32-item self-report measure of depressive symptomatology	Test-retest reliability (r=0.63). Internal consistency (r=0.90)	No	No

The Psychopathology Instrument for Mentally Retarded Adults Self-Report (PRMRA-SR)	57 items with symptoms identified as present or absent. It assesses seven types of psychopathology: schizophrenic, affective, psychosexual, adjustment, anxiety, somatoform, and personality disorder.	Test-retest reliability (r=0.96). Internal consistency (r=0.64)	Yes The Psychopathology Instrument for Mentally Retarded Adults Informant Version (PRMRA-I)	No
The Beck Depression Inventory (BDI)	21 descriptive statements related to aspects of depression. For each category, there are 4-5 statements of increasing severity. The patients select which statement is most applicable. The score ranges from 0 (n depression) to 3 (suicidal). A total score can fall between 0-62	Internal consistency (r=0.91)	No	No
The Zung Self-Rating Depression Scale (Zung)	20 items, with a four-point scale ranging from a little of the time (1) to most of the time (4). Of the 20 items, 10 are worded positively and 10 are worded negatively. The former 10 items are reversed items.	Internal consistency (r=0.91)	No	No

It is important that adults with ID are actively involved in research about ID, and self-report measures can be used to achieve this (Beart et al, 2004). Although the most valuable quality of a screening or diagnostic tool is accurate predicative validity, only the Glasgow mood rating scales have been studied for their sensitivity and specificity compared to those of qualified psychiatric diagnosis (Hermans et al, 2012). Herman et al (2012), in their review of depression and anxiety in adults with ID, found that the Glasgow mood rating scales had the highest quality of psychometric properties. This aligns with the results of the Mindham and Espie's (2003) preliminary study, which found that the GAS-ID gives a practical and psychometrically robust assessment of anxiety level in adults with ID. As a self-report instrument tool for anxiety, the GAS-ID has good test-retest reliability (r=0.95) and good internal consistency (r=0.96) (Mindham & Espie, 2003). Additionally, Cuthill et al. (2003) produced similar findings for the GDS-ID for depression, with evidence of internal consistency and good test-retest reliability.

Both studies found that the Glasgow mood rating scales adapted for adults with ID take 5-15 minutes to administer, depending on the participant's level of ability and cooperation. The GDS-ID has 20 items based on the DSM-5, and the GAS-ID has 27 items based on eight previous self-report measures for anxiety, with additional guidance from clinical judgement (Hermans et al, 2012). It has been reported that the layout of answering the items on each scale is of benefit to those with ID. The initial question requiring a "yes" or "no" as an agreement or disagreement to the item, followed by a confirmatory response of "sometimes", "a lot", "always" has shown comprehension in adults with ID (Cuthill et al, 2003). Using self-report measures in the general population permits researchers to gain insights into personal behaviours and subjective perspectives (Cuthill et al, 2003). For these reasons, data gathered from self-report measures are necessary for studies of adults with ID.

2.18 Physiological Indicators of Stress

2.18.1 Blood Pressure

Blood pressure is the most commonly used outcome measure in the literature on yoga interventions (Tyagi and Cohen, 2014). When referring to blood pressure, both the systolic and diastolic measurements are taken into account: both measure the pressure within the arteries as the heart muscles contracts and relaxes to pump blood around the body (Shahoud et al, 2020), while the systolic measurement gives the maximum pressure within the arteries and the diastolic gives the lowest pressure when the heart muscle is relaxed. Jonas (1997) studied the links between hypertension, depression, and anxiety and conclude that people suffering these mental health conditions often take on unhealthy habits. Activities such as smoking, drinking, and weight gain can all be causes of hypertension. However, even though weight gain may be more of an issue for adults with ID than smoking or drinking, the authors suggest that being depressed or anxious keeps the body in a constant state of fight or flight, which puts many of the body's physiological organ systems – such as the cardiovascular system, which controls blood pressure – under continuous strain (Jonas, 1997). Treating hypertension, even if secondary to depression or anxiety, is crucial because this can lead to serious cardiac, cerebral, and renal complications (Shahoud et al, 2020).

With most studies focusing on the general population, further research into high blood-pressure amongst adults with ID is needed. Of 48 RCTs reviewed by Cramer et al. (2014), 73% conclude that there was a decrease in blood pressure in yoga intervention groups. However, the heterogeneity of the yoga practices and the varying research quality make it challenging to recommend a specific type of yoga for blood-pressure management and reduction. However, one study focusing on LY and its effects on mood and heartrate variability amongst patients awaiting organ transplants (Dolgoff-Kaspar et al, 2012) showed an increase in heartrate variability and decreased blood pressure in participants following the LY sessions.

It is thought that, aside from the *asanas* (yoga postures), it is the *pranayama* (breathing exercises) that cause a significant reduction in heartrate (Kaushik et al, 2006). This is important to note, as increases in heartrate, pace of breathing, and blood pressure are all symptoms of anxiety.

It has been proposed that the *pranayama* and meditation aspects of yoga assist in reducing blood pressure by increasing the activation of the parasympathetic nervous system and changing baroreceptor sensitivity (Tyagi & Cohen, 2014). The baroreflex is the bodily tool that regulates critical blood-pressure changes by regulating the heart rate and contractility, as well as regulating peripheral resistance, which is the arteries' resistance to blood flow. Yoga may change baroreceptor activity due to slow breathing inducing slow rhythmic proprioceptive and exteroceptive (internal and external) impulses, causing a reduction in peripheral adrenergic activity and enabling autonomic balance, which then leads to this change and the enhancement of baroreceptor sensitivity (Tyagi & Cohen, 2014).

2.18.2 Cortisol Levels

Schuver and Lewis. (2016) conclude that specific biomarkers such as cortisol should be examined to assess the effects of yoga on stress, a leading cause of depression. Salivary cortisol is a biomarker of stress. The measurement of cortisol levels in saliva provides a non-invasive alternative to other methods and could be beneficial for those with ID. However, this has not yet been assessed in relation to stress associated with depression and anxiety in adults with ID. The use of saliva-sampling methods with adults with ID should be assessed with a feasibility study to develop evidence-based recommendations for future studies. In studies of the general population, cortisol levels in adults with anxiety have been shown to decrease following a yoga intervention. Following the intervention, cortisol levels were comparable to those of adults who did not display symptoms of anxiety (Smith et al, 2011). In addition, Berk et al. (1989) found that laughter decreased serum levels of cortisol, producing a reversal of the stress response.

It is well known that high levels of cortisol can have numerous negative effects, including problems with learning and memory, obesity, reduced immune system, and increased blood pressure and cholesterol (Shields et al, 2015). Pandey et al. (2016) state that high cortisol levels can be a catalyst for the development of depression or anxiety. For this reason, cortisol testing would be a useful outcome measure in studies examining yoga's effect on mental health. Cortisol is one of the two hormones secreted in the circulation when the hypothalamic-pituitary-adrenocortical (HPA) axis is stimulated by stress. The HPA axis is heavily involved in the neurobiology of mental disorders such as depression and anxiety (Stephen & Wand, 2012). Antidepressants, the most common treatment for depression, work by regulating the function of the HPA axis (Pariante, 2003). There is strong evidence that antidepressants can improve the neurobiological symptoms of depression, as well as the over stimulation of the HPA axis, by controlling the glucocorticoid receptor (Anacker et al, 2011). Glucocorticoids are a hormone that has numerous functions in almost all tissues of the human body, helping to regulate energy metabolism, the immune system, and mood, amongst other elements. The glucocorticoid receptor has been shown to have altered function in depressed patients, possibly highlighting the weakened feedback regulation of the HPA axis (Anacker et al, 2011).

Evidence is emerging that yoga has a positive effect on the sympathetic nervous system and the HPA axis (Pandey et al, 2016). Varambally et al. (2012) states that yoga plays a role in regulating the automatic nervous system by reducing sympathetic tone and thereby generating a reaction opposed to the "fight or flight" response. This then affects the HPA axis, leading to the regulation of the heartrate and blood pressure – *increases* in which are seen as physiological symptoms of anxiety (Varambally et al, 2012).

Having looked at outcome measures relevant to yoga and laughter yoga studies and due to the limited amount of data within the field of laughter yoga for adults with ID and their associated mental health conditions, the following chapter will collate the entirety of all currently available literature on laughter yoga and present it for examination and as a tool towards the study design presented in chapter five.

3. Literature Review

The following literature search shows that no studies were located with a focus on the effects of LY on mental health conditions secondary to ID. A search with broader parameters yielded a paper by Shahidi et al. (2010), which studied the effects of LY – versus a group exercise programme – for elderly women with depression. This provided some promising results with regards to life satisfaction, as an increase in life satisfaction was reported by the group who took part in the LY practice. The paper concludes that LY was at least as effective as a physical exercise programme for the women in the study and states that further research would be required to strengthen the recommendations. A scoping search for LY on Cochrane, SCOPUS, Medline, AMED, CINHAL, SportsDiscus, PsychARTICLES, and PsychINFO delivered 66 results. Further examination revealed that in some papers, the laughter therapy cited was not specifically LY, so a further 34 papers were excluded for this reason or due to being duplicates. A total of 29 results remained. A further three unpublished studies were found in the grey literature, bringing the total to 32 studies (Table 4). Study protocols were found for a further three studies (Table 5).

Table 4: Laughter Yoga (LY) studies registered on the Cochrane Library 1990 – present. Last accessed: 20th September 2020.

Author/title/year	Beckman et al, 2007. Effect of Workplace Laughter Groups on Personal Efficacy Beliefs.
Study design	Pre and post intervention study. 15 days + 90 day follow up.
Participants	33 employees of a behavioural health centre. 4 males and 29 females. Average age 48.
Intervention	LY – 15 minute LY session each morning for 15 consecutive work days.
Control	No control group.
Main outcome measures	Capabilities Awareness Profile (CAP), a self-report self-efficacy questionnaire.
Measurements	At baseline (T0), post study (T1) and 90 day follow-up (T2).
Main results	Employees demonstrated a significant increase in several different aspects of self-efficacy, including self-regulation, optimism, positive emotions, and social identification, and they maintained these gains at follow-up.
Comments	Intervention only 15minutes long.
Author/title/year	Bennett et al, 2015. Intradialytic Laughter Yoga Therapy for Haemodialysis Patients: A Pre-Post Intervention Feasibility Study.
Study design	Pre and post intervention feasibility study. 4 weeks.

Participants	18 mixed sex adult dialysis patients. One withdrew due to unrelated medical reasons.
Intervention	4 week LY programme – 30 minute intervention 3 times per week. 11 LY sessions in total.
Control	No control group.
Main outcome measures	General Life Satisfaction (GLS). Subjective Wellbeing (SWB) was measured using the Personal Wellbeing Index (PWI). Mood was measured using Russell's circumflex model of affect. Optimism was measured using the Life Orientation Test-Revised (LOT-R) Control was measured using five items from Pearlin and Schooler's Mastery scale. Self Esteem was measured using Rosenberg's Self-Esteem Scale. Depression, Stress, and Anxiety using the subscales of the DASS-21. Lung function was measured by the Medical Research Council (MRC) dyspnoea scale, forced vital capacity (FVC), and forced expiratory volume in 1 second (FEV1). Mean arterial pressure (MAP).
Measurements	Pre and post first (T0) and last (T1) LY sessions.
Main results	There were non-significant increases in happiness, mood, and optimism and a decrease in stress. Episodes of intradialytic hypotension decreased from 19 pre and 19 during LY to 4 post LY. There was no change in lung function or blood pressure. All nurses agreed or strongly agreed that LY had a positive impact on patients" mood, it was a feasible intervention and they would recommend LY to their patients.
Comments	Nursing staff in the haemodialysis unit were invited to complete an anonymous 12-item web-based questionnaire to explore their perceptions of the intervention.

Author/title/year	Bressington et al, 2019. Feasibility of a Group-Based Laughter Yoga Intervention as an Adjunctive Treatment for Residual Symptoms of Depression, Anxiety and Stress in People With Depression.
Study design	Feasibility study. 4 weeks.
Participants	50 mixed sex participants.
Intervention	Twice weekly, LY sessions. 45 minutes long (n=23). 8 sessions over 4 weeks.
Control	TAU (n=27).
Main outcome measures	Participants completed the Depression Anxiety Stress Scale and the Short Form 12 item Health Survey. Client Satisfaction Questionnaire (CSQ8). Individual qualitative interviews.
Measurements	Depression Anxiety Stress scale at baseline (T0), post-intervention (T1) and at 3 month follow-up (T2). LY participants also completed a Client Satisfaction Questionnaire (CSQ8) (T1) 11 participated in individual qualitative interviews (T2).
Main results	The LY group had statistically greater decreases in depression and improvements in mental health related quality of life compared to the control group from T0 to T1. The CSQ8 scores indicated a favourable level of satisfaction with the LY intervention. The qualitative interviews highlighted aspects of the intervention that were effective and those requiring modification.

Comments	This feasibility study used a non-blinded parallel-group RCT design. The LY groups were facilitated by one experienced certified lead LY trainer and supported by one of the three co-investigators who were also certified LY facilitators.
Author/title/year	Carlos et al, 2014. Effectiveness of laughter yoga as an adjunct to naproxen treatment in relieving symptoms of knee or hip osteoarthritis in geriatric patients: a randomized controlled trial.
Study design	RCT. 3 weeks.
Participants	22 participants for an age care home. Mean age 68. 70% were women.
Intervention	LY (n=11) every other day for 3 weeks. 10 LY session's in total of 20 minutes long.
Control	Naproxen only. (n=11)
Main outcome measures	Western Ontario and McMaster Universities Osteoarthritis (WOMAC)
Measurements	At baseline (T0) and post final session (T1) of LY.
Main results	Significant improvement from baseline in pain, stiffness and disability in both groups. However, no significant difference between groups.
Comments	Fishbowl method used to randomise participants.
Author/title/year	De Caro and Brown, 2016. Laughter Yoga, Adults Living With Parkinson's Disease, and Caregivers: A Pilot Study.

Study design	Pre and post intervention study. One off intervention.
Participants	85 participants Adults diagnosed with Parkinson's disease (n = 47) and accompanying caregivers (n = 38).
Intervention	45-min LY session.
Control	No control group.
Main outcome measures	Laughter Yoga "How Do You Feel?" (HDYF) form. The form consists of a series of 10 scales labelled "wellbeing" measures.
Measurements	Pre (T0) and post intervention (T1).
Main results	Paired sample t-tests reveal statistically significant improvements in wellbeing for adults with Parkinson's and their caregivers after attending an LY session.
Comments	Data collection occurred at six different PD support groups in Southern California. LY session was conducted by a Certified LY Teacher.
Author/title/year	Deshpande and Verma, 2013 Effect of Laughter Therapy on happiness and life satisfaction among elderly.
Study design	One off intervention.
Participants	80 participants from Mumbai over age 60.
Intervention	6 months of attending LY sessions (n=40).
Control	No exposure to LY (n=40).

Main outcome measures	Satisfaction with Life Scale (SWLS). Subjective Happiness Scale (SHS).
Measurements	One time completion.
Main results	The participants who had been attending LY sessions over a period of 6 months showed a higher score of happiness and life satisfaction.
Comments	The specific amount of LY sessions attended by the experimental group was not reported.
Author/title/year	Dolgoff-Kaspar et al, 2012. Effect of laughter yoga on mood and heart rate variability in patients awaiting organ transplantation: A pilot study.
Study design	Pilot study. 4 weeks.
Participants	6 participants. 2 women and 4 men (aged 51-69 y).
Intervention	10 LY sessions over 4 weeks. Sessions were 20 minutes long.
Control	The 20-minute control intervention involved the study's personnel discussing health and study-related topics with the participants.
Main outcome measures	Heart rate, HRV, blood pressure (BP). Beck Anxiety Inventory. Beck Depression Inventory.
Measurements	Heart rate, HRV, blood pressure (BP), and immediate mood before (T0) and after (T1) the laughter and control interventions. The team assessed participants' longer-term mood (anxiety and depression) at the study's initiation (T0), after a no-treatment control week (T1), and at the end of the study (T2).

Main results	Participants showed improved immediate mood (vigor-activity and friendliness) and increased HRV after the laughter intervention. Both the laughter and control interventions appeared to improve longer-term anxiety.
Comments	The team had planned quantitative statistical analysis of the data at the study's initiation but did not complete it because the number of enrolled participants was too low for the analysis to be meaningful. The team visually examined the data, however, for trends that would indicate areas to examine further in a follow-up study.
Author/title/year	Ellis et al, 2017. Laughter yoga activities for older people living in residential aged care homes: A feasibility study.
Study design	Feasibility study. 6 weeks.
Participants	28 participants. 23 women, 5 men. The mean age was 84 years, and the age range was 61 to 96 years with eight residents in their 90s.
Intervention	6 weekly 30 minute LY sessions.
Control	No control group.
Main outcome measures	The Positive and Negative Affect Schedule (PANAS). The General Happiness Scale (GHS). Blood pressure (BP) and pulse.
Measurements	Data were collected before and after the LY sessions at three times points during the 6-week period: in weeks 1 (T1), 3 (T2) and 6 (T3).

	Each participant's BP and pulse were measured just before and immediately after each session by the first author (a nurse researcher).
Main results	Post-session mean scores for positive mood, and happiness were significantly higher than pre-session scores in weeks 1, 3 and 6, and the post-session mean negative mood scores were significantly lower than pre-session scores in weeks 3 and 6. Post-session readings for mean systolic BP were significantly lower than pre-session readings in weeks 1 and 6.
Comments	Qualitative data was collected at the end of each LY session. Participants were asked the following: Did you enjoy the laughter group session? If yes, what aspects did you enjoy? If no, tell me why? Their comments were written down verbatim by the researcher.
Author/title/year	Farifteh et al, 2014. The Impact of Laughter Yoga on the Stress of Cancer Patients before Chemotherapy.
Study design	Pre and post intervention study. One off intervention.
Participants	37 cancer patients.
Intervention	LY (n=23) 1 x 20-30 minute session.
Control	TAU (n=18).
Main outcome measures	Questionnaire QSC-R23 (Questionnaire on Stress in Cancer Patients).
Measurements	Immediately before (T0) and after (T1) laughter yoga session.

Main results	The results show there is a meaningful difference in the stress average before and after interference in the test group ($p<0.05$).
Comments	Having conducted the research, LY was performed in control group as well to conform to the ethics.
Author/title/year	Flint, 2004 The Copenhagen Laughter Yoga study in a computer business.
Study design	Pre and post intervention study. 4 weeks.
Participants	4 employees.
Intervention	LY sessions daily for 1 month every workday morning.
Control	No control group.
Main outcome measures	AIR-PAS (Artificial Intelligence Respiratory-Psycho physiological Analysis System)
Measurements	At baseline (T0) and cessation of study (T1).
Main results	The body stress levels significantly reduced. The AIR-PAS test contributes also as an awareness raiser, that is, the individual becomes aware about how the body and mind interact. The importance of a correct breathing behaviour was also highlighted.
Comments	No follow-up. Unpublished study, found in grey literature.
Author/title/year	Fujisawa et al, 2018. Effect of laughter yoga on salivary cortisol and dehydroepiandrosterone among healthy university students: A randomized controlled trial.

Study design	RCT. One off intervention.
Participants	120 adult university students. All third year medical students.
Intervention	1 x 30 minute LY session programme (n=40).
Control	Comedy movie group (n=40) watched comedy film for 30 minutes. Reading group (n=40) read for 30 minutes.
Main outcome measures	Salivary cortisol and DHEA concentrations were the outcome measures.
Measurements	Saliva samples taken immediately before (T0) and 30 minutes after (T1) intervention.
Main results	Cortisol levels and C/D ratios significantly decreased by time in the LY and comedy movie groups. Significant group*time interactions were found between these two groups for cortisol levels and C/D ratios. DHEA levels did not change by time in the LY group.
Comments	Smoking status and medication details recorded for each participant to see if it affected results. Random number generator was used to assign participants to each group.
Author/title/year	Fukuoka et al, 2016. Effect of laughter yoga on pulmonary rehabilitation in patients with chronic obstructive pulmonary disease.
Study design	Pilot study. 2 weeks.

Participants	Stable outpatients with COPD (7 men and 1 woman, age 64 to 84 years).
Intervention	10-min LY session before exercise training.
Control	TAU. Patients in both groups had exercise training.
Main outcome measures	St. George's Respiratory Questionnaire (SGRQ). Medical Research Council (MRC) Health Survey Short Form 36-item (SF-36). Self-rating Depression Scale (SDS). State-Trait Anxiety Inventory (STAI). Spirometry measure by the 6-minute walk test. MRC dyspnea scale.
Measurements	Before (T0) and at 2 weeks after (T1) the programme in both groups.
Main results	There were significant improvements in the SGRQ impacts domain and the SF-36 general health domain in the LY group, while the SF-36 physical functioning domain significantly improved in the control group. SDS and STAI result did not significantly change in either group. Spirometry, the 6-minute walk test and MRC dyspnea scale results did not significantly change in either group.
Comments	The patients were divided into 2 groups based on a sealed envelope randomisation method.
Author/title/year	Herodez et al, 2013. The inhibitory effect of laughter yoga on the increase in postprandial blood glucose in type 2 diabetic patients.
Study design	Pre and post intervention study. One off intervention.

Participants	211 participants.
Intervention	LY (n=110) 30 minute session after a 90 minute lecture.
Control	Control group (n=101) only took part in 90 minute lecture. Control participants listened to another 30minute lecture instead of doing LY.
Main outcome measures	Blood glucose.
Measurements	On arrival after eating a 250kcal brunch (T0) and 120 minutes after the intervention began (T1).
Main results	The inhibitory effect of laughter on the increase in postprandial blood glucose (P<0.05) was found.
Comments	Both groups were subdivided into those taking medicines for hyperglycaemia reduction and those not taking these medicine.
Author/title/year	I Shattla et al, 2019. Effectiveness of Laughter yoga Therapy on job Burnout Syndromes among Psychiatric Nurses.
Study design	Pre and post intervention study. 12 weeks.
Participants	64 nurses (42 female and 22 male) Two groups, 21 female, 11 male for each group.
Intervention	LY (n= 32) 30 minutes per day for 1 week and repeated for 3 months to the experimental group only.
Control	Just 1 week of 30min daily LY (n=32).

Main outcome measures	Maslach Burnout Inventory Human Services Survey (M BI-HSS). A LY attitudes and perceptions survey.
Measurements	Immediately after first week to both control and experimental group (T1). Again, 3 months later (T2) to both groups once the experimental group has completed their 3 months of continued LY.
Main results	A highly significant reduction in the mean score of burnout among experimental group compared to control group after the LY.
Comments	A pilot study was conducted on 8 psychiatric nurses to test the clarity, applicability of the instruments and to estimate the time needed for data collection. On the basis of the pilot results, the necessary modifications were done accordingly.
Author/title/year	Kuru and Kublay, 2016. The effect of laughter therapy on the quality of life of nursing home residents.
Study design	Pre and post intervention study. 10 days.
Participants	65 nursing home residents from two nursing homes in Turkey, all over the age of 50.
Intervention	21 LY sessions twice a week over 10 days (n=32). Sessions were between 30-45mins in length. 16 men / 16 women from the same nursing home.
Control	TAU (n=33) 18 men/ 15 women from the same nursing home but a different home to the intervention group.
Main outcome measures	SF-36 health survey. Socio-demographic form.

Measurements	SF-36 health survey was completed by participants immediately pre (T0) and post study (T1). Socio-demographic form only pre intervention (T0).
Main results	Scores from the SF-36 health survey significantly improved in comparison with the pre-test scores in the experimental group.
Comments	Researchers carried out a pilot study with just 10 nursing home residents prior to this larger study, in which 4 sessions of LY were taken by participants with a pre and post-test SF-36 survey.
Author/title/year	Kherirandish et al, 2015. Effectiveness of Laughter Yoga on stress (subscales of stress frustration and aggressiveness) and depression patients with multiple sclerosis (MS).
Study design	Pre and post intervention study. 5 weeks.
Participants	30 patients with MS.
Intervention	2 x 30 minute LY sessions (n=15) a week for 5 weeks, 10 in total.
Control	TAU (n=15)
Main outcome measures	Beck Depression Inventory Questionnaire response to stress (SRI).
Measurements	Baseline (T0) and post (T1) final LY session.
Main results	Levels of stress frustration and aggressiveness decreased in the experimental group.
Comments	An inclusion criteria was to be independent of a wheelchair, no rationale was reported for this decision.

Author/title/year	Krebs et al, 2014. Communicational method of impact of “exercise of laughter yoga” on the elderly behaviour.
Study design	Pre and post intervention study. 10 weeks.
Participants	52 randomly selected volunteers whose average age was 52.5 years.
Intervention	LY weekly for 60 minutes for 10 weeks.
Control	No control group.
Main outcome measures	Their wellbeing, before and after exercise, was assessed using non-standardized numerical nine-stage questionnaire with a scale of 1 to 10. Blood pressure (BP).
Measurements	Questionnaire before (T1) and after (T2) each session. BP before (T1) and after (T2) 1 hour Laughter yoga workout.
Main results	LY has statistically significant effect on the level of BP by volunteers who did not take any medications (n = 41; systolic: 7.73% (p <0.0001), diastolic: 5.83% (p <0.0001)). In volunteers who took medications (n = 11), a drop decrease in the value, without statistically significant differences was seen (systolic: 2.70% (p = 0.86), diastolic: 1.41% (p = 0, 25)). Statistically significant differences (p <0.05) were observed in the average change in enthusiasm, optimism, connectivity, energy levels, mood, muscle relaxation, breathing awareness, the ability to laugh for no reason. The most significant change was measured in the sense of stress after LY exercise (60%).

Comments	Volunteers were, based on a questionnaire on health, divided into those who take some drugs (n = 11) and those who do not take them (n = 41).
Author/title/year	Memarian et al, 2017. The effect of laughter yoga exercises on anxiety and sleep quality in patients suffering from Parkinson's disease.
Study design	Pre and post intervention study. 8 weeks.
Participants	24 patients suffering from Parkinson disease aged between 55 to 75.
Intervention	2 x LY (n=12) sessions a week for 8 weeks. 45 minutes long.
Control	TAU (n=12).
Main outcome measures	Beck Anxiety Inventory. Sleep Quality Inventory of Pitezbourg (PSQI)
Measurements	Before (T1) and after (T2) each intervention
Main results	Results indicated that there is a significant difference between the average of stress changes and sleep quality of patients suffering from Parkinson’s disease in the exercise group of LY and control group.
Comments	No follow-up.
Author/title/year	Miles et al, 2016. Effect of Laughter Yoga on Psychological Wellbeing and Physiological Measures

Study design	Pre and post intervention study in 3 phases. One off interventions.
Participants	379 participants.
Intervention	1 x LY session in both phase 1 (n=109) and phase 2 (n=247) of the study, lasting between 20mins-60minutes.
Control	TAU (n=23) Convenience sample only.
Main outcome measures	Psychological Outcomes of Wellbeing (POWB). Blood pressure (BP). Blood oxygenation. Heart rate in beats per minute (BPM).
Measurements	Pre (T0) and post intervention (T1).
Main results	All 10 POWB measures for phases 1 and 2 showed significant improvements between the pre and post-intervention testing (P <.001). Phase 3, the control, showed no significant improvement.
Comments	The study was conducted in 3 phases. The pilot, phase 1, included only an intervention group. Phase 2 also included only an intervention group. Phase 3, the control element, was conducted with a control group only.
Author/title/year	Morishima et al, 2019. Effects of Laughter Therapy on Quality of Life in Patients With Cancer: An Open-Label, Randomized Controlled Trial.
Study design	RCT. 7 weeks.
Participants	56 mixed sex participants, aged 40-64.

Intervention	LY sessions (n=26) once every 2 weeks for 7 weeks. A total of 4 sessions.
Control	TAU (n=30).
Main outcome measures	European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 (EORTC QLQ-C30)
Measurements	The questionnaire was completed at baseline (T0) and at weeks 3 (T1) and 7 (T2).
Main results	Questionnaire completion rates were high (>90%), with similar QOL scores reported at baseline in both groups. The mixed-effects models showed that the intervention group had significantly better cognitive function and less pain than the control group for a short period.
Comments	4 participants retracted consent and 1 participant was retrospectively excluded from analysis due to unmet inclusion criteria.
Author/title/year	Namazi Nia et al, 2019. Effect of Laughter Yoga on Mental Wellbeing of Cancer Patients Undergoing Chemotherapy.
Study design	RCT. 4 weeks.
Participants	69 adult, mixed sex, cancer patients undergoing chemotherapy
Intervention	4 weekly LY sessions 20-30 min long prior to chemotherapy.
Control	Routine self-care training.
Main outcome measures	Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS).

Measurements	Before (T1) and after (T2) each of the four sessions.
Main results	The mean post-test WEMWBS score in the intervention group (50.0±8.9) was significantly higher than that in the control group (47.9±10.4, P=0.004). There was also a significant increase in the mean post-test WEMWBS score in the intervention group (P<0.001).
Comments	The 2 groups in this study were reported as being homogeneous in terms of all underlying and confounding variables but the implementation of LY.
Author/title/year	Nagendra et al, 2007. What are the effects of Laughter Yoga on stress in the workplace?
Study design	Pre and post intervention study. 18 days.
Participants	200 IT professionals in Bangalore, India. Non-smokers aged 20-50.
Intervention	7 x one hour LY sessions over 18 days.
Control	TAU.
Main outcome measures	Autonomic & respiratory variables by Polygraph. Salivary Cortisol: early morning test. PANAS: Positive & Negative Affect Scale. PSS: Perceived Stress Scale. TAS: Toronto Alexythemia Scale.
Measurements	At baseline (T0) and on day 18 at cessation of the study (T1).
Main results	In the LY group there was a significant drop in heart rate, blood pressure dropped significantly, cortisol levels were significantly reduced, positive emotions increased by 17% and negative

	emotions dropped by 27%, perceived stress dropped significantly, and Alexithymia dropped by almost 9%, indicating a significant improvement in emotional intelligence.
Comments	No follow-up. Unpublished study, found in grey literature. It was reported that no participants had taken part in LY before.
Author/title/year	Suraj-Narayan, 2011. Biopsychosocial Impact of Laughter Yoga on Stroke Survivors.
Study design	Pre and post intervention study. One off intervention.
Participants	Stroke survivors.
Intervention	The LY participated in movement exercises using LY and therapy. One time session.
Control	Control group participated in the same exercises without the LY and therapy
Main outcome measures	Blood glucose. Blood pressure (BP). Positive and Negative Affect Scale (PANAS).
Measurements	Pre test (T0) and post test (T1).
Main results	Evidence of lowered BP, lowered blood sugar levels, enhanced mobility, improvement in speech and increase in positive emotions, and enhanced social functioning was visible in the LY group.
Comments	Study found in grey literature, unpublished. Lack of detail in reporting available. Unknown how many participants took place and results data unpublished only summarised.

Author/title/year	Sahai-Srivastava et al, 2014. Pilot study of laughter yoga therapy in treatment of chronic migraine.
Study design	Pilot study. 8 weeks.
Participants	19 female migraine sufferers, average age 39.7
Intervention	LY (n=12) once a week for 1hr for 8 weeks plus daily at home LY practice.
Control	TAU (n=7)
Main outcome measures	Migraine specific quality of life questionnaire (MSQOLQ). HeachacheImpace test (HIT-6). Fatigue Severity Scale.
Measurements	At baseline (T0) and cessation of study at week 8 (T1).
Main results	Quality of life scores at 8 weeks improved in in the LY group MSQOLS (42 to 65) compared to usual care (31 to 32). HIT-6 scores for LY group showed a mild improvement at 8 weeks (65 to 60) compared to usual care group (67-68). Fatigue scores showed a trend towards improvement in both groups with greater improvement in the LY group5 (47 to 41) compared to the usual care (54 to 49).
Comments	No follow-up, unpublished study, found in grey literature.
Author/title/year	Shahidi et al, 2010. Laughter Yoga Versus Group Exercise Programme in Elderly Depressed Women: A Randomized Controlled Trial.
Study design	RCT.

Participants	70 depressed women with an age range of 60–80 years.
Intervention	10 sessions of LY (n=23). Exercise group (n=23) 10 sessions of aerobic exercise.
Control	TAU (n=24).
Main outcome measures	Diener life satisfaction scale (LSS). Yesavage Geriatric depression scale (GDS).
Measurements	Pre (T1) and post (T2) first and last of the 10 sessions.
Main results	Significant difference in decrease in depression scores of both LYand exercise therapy group in comparison to control group($p < 0.001$ and $p < 0.01$, respectively).
Comments	The study does not document the duration of the study, but if the 2 sessions were held a week we could assume 5 weeks long, or 1 session a week, it could have been 10 weeks long.
Author/title/year	Tanaka et al, 2018. Psychological and Physiological Effects of Laughter Yoga Sessions in Japan: A Pilot Study.
Study design	Pilot study. 6 months.
Participants	13 adults (11 women, 2 men).
Intervention	45 min LY session 1 x month for 6 months.
Control	No control group.

Main outcome measures	Profile of Mood States–Brief Japanese Version (J-POMS-B). Adrenocorticotropic hormone and cortisol values via blood samples.
Measurements	Before (T1) and after (T2) each session. Blood was sampled twice,15 min before (at 10:15am) and 15 min after (at 11:30am) the LY session, at the first and fourth LY sessions.
Main results	Results showed that repeated sessions of LY had psychologically beneficial effects, especially on the aspects of tension–anxiety, and vigour. Adrenocorticotropic hormone and cortisol values related to the participants' stress levels were significantly decreased after the fourth LY session.
Comments	The initial enrolment of 13 individuals was reduced to 10 after excluding those who attended less than 4 sessions.
Author/title/year	Tavakoli et al, 2019. Comparison of Laughter Yoga and Anti-Anxiety Medication on Anxiety and Gastrointestinal Symptoms of Patients with Irritable Bowel Syndrome.
Study design	RCT. 7 weeks.
Participants	60 mixed sex adults with IBS.
Intervention	LY (n=19) 7 weekly sessions varying length between 30- 60 minutes.
Control	Anti-anxiety medication group (n=18) (sertraline dose of 50 to 200 mg per day) Symptomatic treatment (n=18).

Main outcome measures	ROME–III Diagnostic Criteria for IBS IBS Symptom Severity Scale (IBS-SSS) Beck's Anxiety Questionnaire
Measurements	Pre (T1) and post (T2) first and last of the 7 sessions.
Main results	The severity of IBS symptoms after the interventions was more significantly reduced in the LY group than in the anti-anxiety medication and control groups ($p = 0.006$). The severity of anxiety after interventions decreased in all three groups, especially in the LY treatment group, but the difference was not statistically significant ($p = 0.1$).
Comments	Not reported whether the LY teacher was qualified, just documented that the LY session leader was "familiar" with the style.
Author/title/year	Wagner et al, 2013. Laughing: A Demanding Exercise for Trunk Muscles.
Study design	Pre and post intervention study. One off intervention.
Participants	14 students (7 male, 7 female), average age of 24.9.
Intervention	LY session (study doesn't specify duration) prior to doing abdominal crunch and back lifting exercises.
Control	No control group.
Main outcome measures	The muscular activation during LY and the traditional exercises was measured by surface electromyography
Measurements	Muscular activation measured during LY session followed by abdominal crunch and back lifting exercises.

Main results	The activation level of internal oblique muscle during LY is higher compared to the traditional exercises. The multifidus, erector spinae, and rectus abdominis muscles were nearly half activated during LY, while the activation of the external oblique muscle was comparable with the crunch and back lifting exercises. Results indicate that LY has a positive effect on trunk muscle activation.
Comments	Because LY should be performed in groups, additional participants attended the sessions.
Author/title/year	Weinburg et al, 2014. The impact of laughter yoga on subjective wellbeing: a pilot study.
Study design	Pilot study. One off intervention.
Participants	44 participants (72.7% female, mean age 58.86) from Melbourne LY clubs.
Intervention	1 x 30 minute LY session.
Control	No control group.
Main outcome measures	General Life satisfaction (GLS). Subjective Wellbeing (SWB). The Depression, Anxiety Stress Scale (DASS).
Measurements	Immediately pre (T0) and post (T1) LY session.
Main results	Following the LY session significant improvements in positive emotions, reduction in symptoms of anxiety and stress were reported. Those experiencing lower wellbeing before the LY session experience a greater improvement.

Comments	As participants were recruited from LY clubs, the majority would have been practicing LY once weekly for some time. Data regarding this was not reported.
Author/title/year	Weinberg et al, 2015. The psychological impact of Laughter Yoga: Findings from a one--month Laughter Yoga programme with a Melbourne Business.
Study design	Pre and post intervention study. 4 weeks.
Participants	80% females, 20% males. Mean age 36.76.
Intervention	One month, daily LY sessions on weekdays.
Control	No control group.
Main outcome measures	Deakin University Wellbeing Questionnaire.
Measurements	Baseline (T0) prior to their first LY class. The questionnaire was completed immediately after the first LY class (T1). Data were collected the following Monday (T2), after participants had attended the LY class for that day, and was also completed the Monday after that (T3). A final data collection time point (T4) was collected on another Monday, one week after the completion of the LY classes.
Main results	The change in both General Life Satisfaction and Self--Esteem were statistically significant (p<.05) after the first LY session. The high score recorded at T4 for Workplace Wellbeing indicates that, after the completion of the programme, participants felt a greater sense of satisfaction.
Comments	Study found in grey literature. The study does not report how many people took part and participation was not compulsory, only those

	who felt they were actually obtaining a benefit out of the sessions would be likely to continue to attend.
Author/title/year	Wu et al, 2018. Brief take-home laughter yoga practice (B-TLYP): impact on multi-dimensional affects among Chinese adults in Hong Kong.
Study design	Pre and post intervention study. One off intervention.
Participants	36 mixed sex adults (86% women).
Intervention	1 hour LY workshop and 7-day home LY practice.
Control	No control group.
Main outcome measures	Positive and Negative Affect Scale (PANAS).
Measurements	Immediately before (T0) and after (T1) plus one week post intervention (T2).
Main results	The mean score of PANAS PA subscale showed an increasing trend across time, whereas there was no difference in the mean score of PANAS NA subscale.
Comments	Exclusion criteria: absence of antipsychotic medications, no history of cardiac diseases, hypertension, chronic coughs, asthma, hernia, acute haemorrhoid, incontinency, epilepsy, acute low back pain, or acute mental disorders, no history of surgery in the past 3 months prior to the study.
Author/title/year	Yazdani et al, 2014. The effect of laughter Yoga on general health among nursing students.

Study design	Pre and post intervention study. 4 weeks + 4 week follow up.
Participants	38 male nursing students in the nursing and midwifery school of Isfahan University of Medical Sciences.
Intervention	8 x 1 hour sessions of LY were held (two sessions a week) Held at 7.00-8.00am
Control	TAU.
Main outcome measures	Goldberg and Hiller's General Health Questionnaire.
Measurements	Baseline (T0), cessation of study (T1) and one-month follow-up (T2).
Main results	The findings showed a significant difference in the mean scores of general health before and after LY intervention in the 2 groups of study and control. The findings showed that LY had a positive effect on students' general health and improved the signs of physical and sleep disorders, lowered anxiety and depression, and promoted their social function.
Comments	The list of the participants was made and numbered from which the odd and even numbers were randomly assigned to control and study groups by lottery.

Table 5: Study protocols of unpublished studies on laughter yoga (LY).

Author	Fatma Oxlem Ozturk.
Study Title	Effect of Laughter Yoga on Mental Symptoms Frequency and Level of Saliva Cortisol.
Location	Ankara University.
Date of protocol	Jan-19
Author	Zülfünaz Ozer.
Study Title	Effects of Laughter Yoga on Hemodialysis Patients' Plasma-Beta Endorphin Levels, Pain Levels and Sleep Quality.
Location	Istanbul Sabahattin Zaim University.
Date of protocol	Nov-19
Author	Mansour Arab.
Study Title	Effect of laughter therapy on quality of life and depression on patients undergoing hemodialysis in dialysis ward.
Location	Kerman University of Medical Sciences.
Date of protocol	Jul-16

As shown in the table above, research has examined LY in relation to numerous health issues, such as stress, high blood pressure, self-efficiency, and regulation, as well as life satisfaction (Nagendra et al, 2007; Weinburg et al, 2014; Shahidi et al, 2010; Farifteh et al, 2014). Memarian et al. (2017) found that LY helped to release neurotransmitters from brain cells, producing feelings of happiness and potentially alleviating feelings of anxiety in adults with Parkinson’s disease. These studies have included various participant groups – such as company employees (Beckman et al, 2007), dialysis patients (Bennett et al, 2015), and elderly people in a care home (Carlos et al, 2014). However, all participant groups came from the general population, and most of the studies had pre-post designs and lacked a control group. There is also a significant lack of high-quality RCTs in the literature. Other studies have demonstrated that LY is a safe, cost-effective, and low-intensity form of physical activity that can be beneficial for the mood (Nagendra et al, 2007, Miles et al, 2016, Tanaka et al, 2018).

Though LY research is in its infancy, numerous studies have been done, albeit all have limitations. One study by Beckman et al. (2007) implemented a LY intervention that only lasted for 13 minutes. Though it showed some beneficial effects, a much longer session – closer to the length recommended by Dr Madan Kataria (2002) of 45 minutes to 1 hour – would have been preferable.

A review of the literature identified three studies focusing on the effects of LY on mental health conditions (depression, anxiety, or both). Shahidi et al. (2010) found that the 23 women in the LY group of their study saw significant improvements in their quality of life assessment scores, compared to the 24 women in the control group, and had equally promising results to the exercise comparison group (comprising of 23 women who undertook aerobic exercise classes). The LY group also saw the most considerable reduction in the geriatric depression scale score, with an average pre-test score of 16 and post-test score of 10 (Shahidi et al, 2010). Another study by Memarian et al. (2017) concludes that LY reduced levels of anxiety and improved sleep quality in adults suffering from Parkinson’s disease. The most recent research on LY was undertaken by Bressington et al. (2019), and despite the limitations of this feasibility study, the results indicate a reduction in symptoms of depression and an increase in quality of life immediately following the LY intervention. A further four studies employed self-report depression or anxiety mood rating scales, though these were not the outcome measures under examination. The above results are positive and promising for adults with ID, as they indicate the potential to decrease levels of depression and anxiety and improve social connections (Shahidi et al, 2010). To date, there has been no research on the effects of laughter or LY on adults with ID. With the potential for immense benefits and the dearth of negative side effects associated with laughter and LY, this intervention requires feasibility studies to provide evidence-based research into the effects of laughter for this population. The health benefits reported for the general population cannot be generalised to adults with ID, but the existing research indicates that this vulnerable population group could also benefit from the positive effects of LY.

3.1 Summary

Despite the high incidence of mental disorders amongst people with ID, few studies have been undertaken with this population group to explore psychosocial interventions such as yoga and CBT as treatment (Hawkins et al, 2012). There is no study to date on the effects of LY or VY in adults with ID on their associated mental health conditions. As mental health conditions in people with ID are often complicated and multi-faceted, further studies are needed to assess the efficacy of alternative methods of treatment for this group of vulnerable individuals.

The literature available is insufficient to support a conclusion on whether yoga as a psychosocial intervention can be beneficial for adults with ID who suffer depression and anxiety. It has been shown that yoga can be of benefit in the general population, but a feasibility study would be the first step towards identifying whether these results can be replicated for those with ID. Effective psychosocial interventions could limit the unnecessary suffering experienced by adults with ID and potentially reduce the need for expensive mental health and clinical care services. What follows are two systematic reviews focusing narrowly on studies that examine the feasibility and benefit of psychosocial interventions, including yoga, for adults with ID and associated mental health conditions.

4. Systematic Reviews

The previous chapters thoroughly examined the broader literature surrounding mental health in adults with ID, including the challenges of conducting research with this population group. A further refined systematic approach was also undertaken to examine studies of yoga as a psychosocial intervention for mental ill-health in adults with ID. As predicted, an initial scoping search identified few studies for review; thus, two separate review questions were prepared with widened search parameters. There are numerous benefits to systematic reviews, including the ability to answer clearly framed questions and to critically and more deeply examine the relevant literature (Higgins & Green, 2008). Equally, standardised reporting formats such as PRISMA (Moher, 2009) allow for a systematic identification and selection of appropriate literature.

To avoid repetition, a condensed version of the systematic reviews is presented in this chapter. Definitions of the search terms – including *intellectual disability, depression, anxiety,* and *yoga* – have been removed, as these have been provided elsewhere (sections 2.2, 2.3, 2.4 & 2.12). The first review presented here focuses on psychosocial interventions for adults with ID and associated mental health conditions. However, none of these studies included yoga, as this has yet to be researched. The second review focuses purely on yoga for adults with ID, but none of the outcome measures are focused on mental health. The key purposes of these reviews were to examine the relevant literature in more depth and to obtain guidance from the studies' cited limitations, which will be valuable when designing an innovative feasibility study to examine the effects of laughter yoga (LY) and vinyasa yoga (VY) on anxiety and depression in adults with ID. An information scientist was contacted prior to both reviews to provide a revision session on database search techniques as well as an education on how to access restricted journal papers. This session took place at Coventry University Library.

The Cochrane guidelines for systematic reviews (Higgins & Green, 2008) and recommended structure were followed for both reviews. A detailed description of the methodology is given, and Cochrane's tables and diagrams are used to present the findings. The recommended Cochrane collaboration tool was used to assess the risk of bias and to carry out the quality assessment for each study included in each review to carry out the quality assessment (Higgins et al, 2011). Conducting a risk of bias assessment using the Cochrane tool can be more time-consuming (Hartling et al, 2009) than doing so with other rating scales. However, as there are so few studies included in the reviews, it was deemed acceptable to utilise it. The tool enabled the primary reviewer to assess all elements of the studies included in the reviews. Selection bias was assessed, along with performance, detection, attrition, and reporting bias. The assessment also examined the extent of the "blinding" of participants and researchers.

The primary reviewer carried out the quality assessment and extracted data for the outcome measures in the studies. These findings were then appraised by the secondary reviewer. After risk of bias was assessed and the extracted data put into tables, these findings were analysed via a narrative synthesis in the results section of each review. A meta-analysis was not possible in either systematic review, as there were a total of five studies across the two reviews.

4.1 Systematic Review One

What is the Feasibility and Benefit of Psychosocial Interventions for Adults with Intellectual Disabilities and Associated Mental Health Conditions?

4.2 Abstract

Background: Mental illness is highly prevalent amongst people with ID, and those affected are treated with often complex and sometimes numerous pharmacological treatments. It is clear that high-quality studies are needed to assess the feasibility of implementation of psychosocial interventions as alternative or adjunct treatments.

Methods: One reviewer independently applied the inclusion criteria to the search results and extracted data from the selected studies for inclusion in the review. All papers for inclusion were reviewed by a second reviewer, as were the reasons for excluding other papers. The databases searched were Cochrane, SCOPUS, Medline, AMED, CINHAL, SportsDiscus, PsychARTICLES, and PsychINFO.

Results: Four studies were included in this review. These were the only studies deemed eligible for inclusion and all were rated as having a low risk of bias.

Conclusion: There is a dearth of literature on psychosocial interventions for adults with ID and associated mental health conditions. This review provides evidence that more studies should be undertaken to assess the feasibility and implementation of psychosocial interventions with this vulnerable population group.

4.3 Introduction

This systematic review aims to explore the effects of psychosocial interventions on adults with ID and associated mental health conditions, showing how such interventions can be implemented. There is currently a dearth of research in this field. The aim of this systematic review is to synthesise the present data and make evidence-based recommendations for further research. Literature on psychosocial inventions for adults with ID is scarce (Hawkins et al, 2012). In this population, the rate of comorbidities (such as mental illness), as previously discussed, is considerably higher than it is in the general population. For clinicians, managing these additional conditions is a challenge due to the associated higher rates of morbidity and mortality (Kinnear et al, 2018).

All psychosocial interventions – including CBT, alternative therapies such as yoga and meditation, and exercise – were included in the search. There is little literature on psychosocial interventions for those with ID and even less on those with mental illness comorbidities (Hawkins et al, 2012). Dagnan et al. (2012) cites four types of psychosocial intervention. The first is an intervention with the individual alone (Butler et al, 2006), intended to achieve a reduction in symptoms (Tarrier, 2005) or to promote vocational skills and social interaction (Kopelowicz et al, 2006). A second category of psychosocial interventions looks at effects on the primary social aspects of an individual and may involve employed carers and family members (Pharoah et al, 2006). Third, interventions that target the broader social situation may focus on housing, employment, and free time activities (Mc Gurk & Meuser, 2006; Chilvers et al, 2006). Finally, some researchers also consider the service structure through which interventions can be delivered and packaged as a type of psychosocial intervention (Krupa & Clark, 1995). Although these can all be seen as psychosocial interventions, reviewing the effects of all these varieties would be beyond the scope of this review. Therefore, individualised interventions that focus solely on individuals with ID were reviewed. The review was intended to provide an unbiased summary and rationale for recommending psychosocial interventions for adults with ID and associated mental health conditions.

4.4 Method

4.4.1 Rationale for Review

A search of the Cochrane Library for systematic reviews (last accessed: June 2021) revealed that the available literature was incredibly sparse. For example, there were no systematic reviews of the feasibility and benefits of psychosocial interventions for adults with ID and depression and anxiety.

4.4.2 Aims and Objectives

A central aim of this review is to assess the data derived from studies in which psychosocial interventions are applied as an intervention for mental illness in adults with ID. The main objective was to assess the feasibility of psychosocial interventions for the population group. This objective was achieved by evaluating the efficiency and feasibility of the psychosocial interventions in the few studies carried out, seeking to derive from these a conclusion on the efficacy of the intervention for managing depression and anxiety in adults with ID. The rationale for this review was clear, with an evident need for effective, suitable, accessible, and non-pharmacological interventions, the existing literature needs to be reviewed in order to be built upon in future studies.

4.4.3 The "Population, Intervention, Comparison, and Outcome" Question

The question to be answered by this systematic review is as follows: "What is the feasibility and benefit of psychosocial interventions for adults with ID and associated mental health conditions?" Table 6 below presents the "population, intervention, comparison, and outcome" (PICO) format used to develop this question. Unit five of the *Cochrane Handbook of Systematic Reviews of Health Promotion and Public Health Interventions* (Jackson & Waters, 2005), titled, "Asking an Answerable Question", was used to develop the question in the outlined PICO format.

Table 6: The "population, intervention, comparison, and outcome" (PICO) question.

Population (P)	**Intervention (I)**	**Comparison (C)**	**Outcome (O)**
Which group of people?	What intervention is being considered?	What comparison is being used?	What is the aim to accomplish?
People with intellectual disabilities	Psychosocial interventions	No comparison	Reduction in mental illness symptoms (anxiety and depression)

4.4.4 Key Search Terms

The key search terms used for this systematic review are shown in Table 7 below, and all the mesh terms and Boolean operators are listed in the table.

Table 7: Key search terms

P (Adults)	**I (Psychosocial interventions)**	**C (No comparison)**	**O (All outcome measures)**
learning difficult* **OR** intellectual disabilit* **OR** mentally disabled **OR** mental disab* **OR** Rubinstein-Taybi syndrome **OR** Cri-Cu-chat syndrome **OR** De Lange syndrome **OR** Down* syndrome **OR** mental* retard* **OR** Fragile X syndrome **OR** Prader-Willi syndrome **OR** Williams syndrome **OR** development* disab* **OR** development* delay **OR** learning disorder* **OR** learning disab* **OR** neurodevelopmental disorder*	laughter therap* **OR** humor therap* **OR** humour therap* **OR** yoga **OR** psychosocial **OR** psychosocial interventions **OR** complementary **OR** complementary therap* **OR** alternative therap*		mental health **OR** mental* ill* **OR** mental disorder* **OR** mood disorder **OR** depression **OR** depressive disorder **OR** major depression **OR** anxiety **OR** anxiety disorder* **OR** stress **OR** stress disorder* **OR** cortisol **OR** cortisol levels **OR** CAR **OR** ACR **OR** cortisol awakening response **OR** stress hormone **OR** quality of life **OR** QOL **OR** blood pressure **OR** heartrate
	AND		

The original search for this review was carried out in October 2019, and searches will continue until the paper is submitted for publication. The last search was undertaken in June 2021.

4.4.5 Search Methodology

One reviewer independently ran the search and applied the inclusion criteria to the results. The findings were then reviewed by a second reviewer. The chosen databases were Cochrane, SCOPUS, Medline, AMED, CINHAL, SportsDiscus, PsychARTICLES, PsychINFO, and Google Scholar.

4.4.6 Inclusion Criteria

Only studies assessing people with ID were included. Due to the dearth of relevant literature, it was necessary to include studies with participants of all ages. Factors such as puberty and adolescence – which could alter results – will be documented in the discussion.

To capture as much data as possible, no date range was set for the database searches. All styles of psychosocial intervention focusing on individuals with ID were included. All outcome measures to assess anxiety and depression were included. Studies could include quantitative data, qualitative data, or both. All types of studies were included (e.g., randomised controlled trials [RCTs], pilot studies, feasibility studies). Only those evaluating the effects of the intervention on anxiety or depression were included.

4.4.7 Exclusion Criteria

Non-English papers were not included, due to a lack of translation resources. Papers looking at attention deficit hyperactivity disorder (ADHD), Asperger’s, or autism were excluded, as these are not considered to be an ID. Due to the limited research available, it was deemed appropriate to apply broad inclusion criteria for the outcome measures; thus, no exclusion criteria were set for possible outcome measures.

4.5 Findings

4.5.1 Search Results from Electronic Data Base Searches

The PRISMA flowchart provides a detailed presentation of the search results. PsychINFO produced 212 results and PsychARTICLES produced three results. All results derived from the Cochrane Library, SCOPUS, Medline, AMED, CINHAL, SportsDiscus, and Google Scholar were duplicates of those collected from PsychINFO. After the results were summarised, the databases had together yielded a total of 215 studies. Of these, (n=203) were not deemed relevant and excluded after an initial screening of their titles and abstracts. Another (n=8) were removed after a full text-screening. After both reviewers had gone through the results, a total of four studies were included for review. A third reviewer would have been utilised to mediate any disagreements if required, but this was not necessary.

Filtering process (Prisma flow diagram)

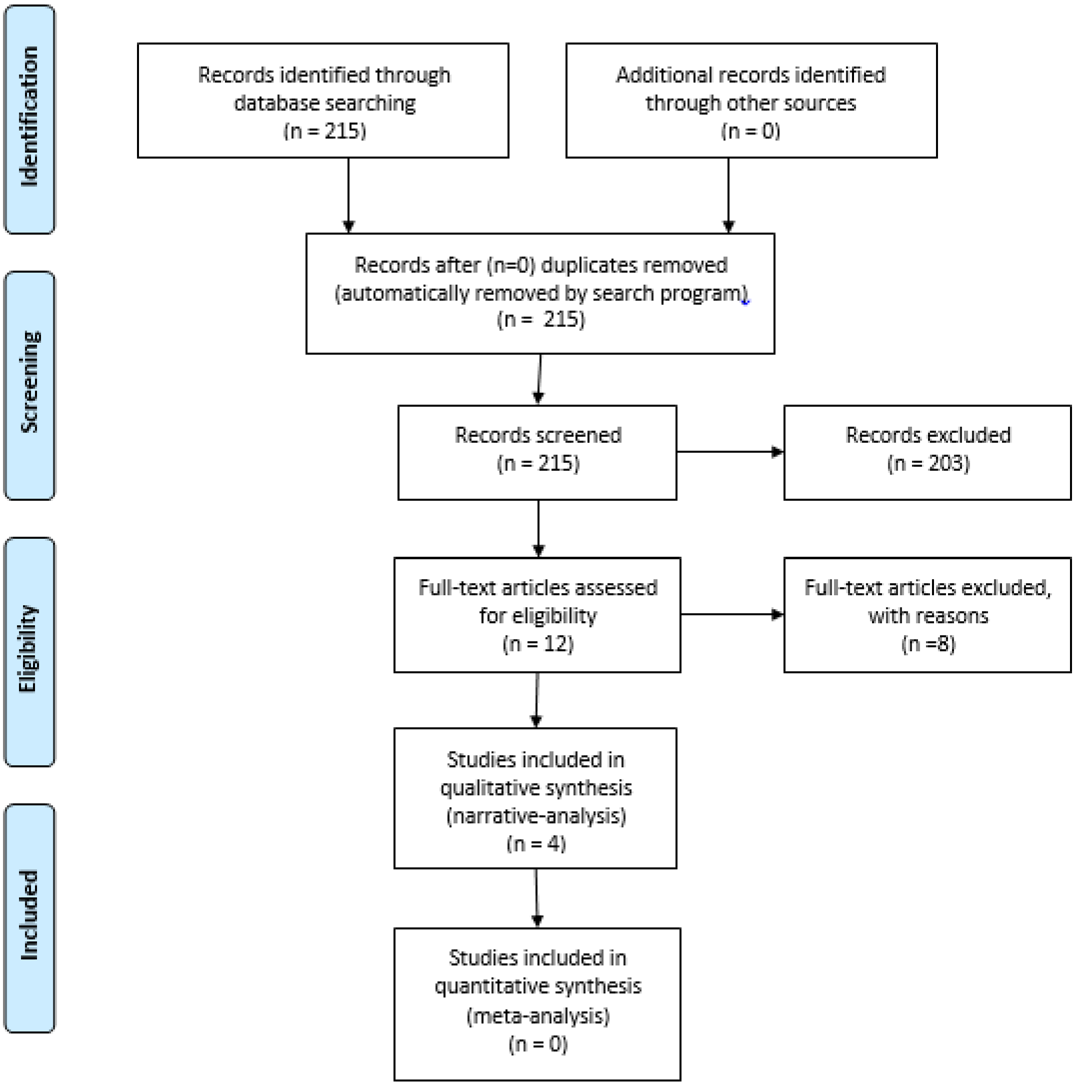

Figure 1: Exclusion flowchart adapted from (Moher, 2009)

4.5.2 Excluded Papers

Table 8 below presents the reasons for excluding certain papers from the review after a full text-screening.

Table 8: Reasons for exclusion

Reference	**Reason for exclusion**
Wachtel and Hagopian, 2006	Participants are being treated with medication and not a psychosocial intervention.
Dykens et al, 2015	No psychosocial intervention being used.
Isherwood et al, 2006	Paper researching nurses experience of working with people with ID.
Leitner et al, 2007	No psychosocial intervention being used.
Frea and Hughes, 1997	No psychosocial intervention being used.
Beare et al, 2004	Single participant study using positive reinforcement of good behaviours, not mental illness associated.
Rapee, 2002	Participants do not have ID.
Miltenberger et al, 1989	Not looking at mental illness just behavioural issues from ID.

4.5.3 Selected Studies

The four studies described in Table 9 below were selected for inclusion in this review.

- "Effects of an exercise programme on anxiety in adults with intellectual disabilities" (Carraro & Gobbi, 2012)
- "Exercise intervention to reduce depressive symptoms in adults with intellectual disabilities" (Carraro & Gobbi, 2014)
- "Cognitive behavioural therapy for depressed adults with mild intellectual disability: A pilot study" (Hartley et al, 2015)
- "Putting the C into CBT: Cognitive challenging with adults with mild to moderate intellectual disabilities and anxiety disorders" (Roberts & Kwan, 2018).

Details of these studies can be found in Table 9, with further information in Table 14. All four studies examined the effect of the psychosocial intervention on anxiety and depression, secondary to ID. Two of the papers documenting an RCT (Carraro & Gobbi, 2012; Carraro & Gobbi, 2014), were part of a larger mixed methods study, thus the same participants were used; but each paper presents results for differing outcome measures. With so few research papers identified from the search, it was decided that both studies would be included, despite the participants being duplicated. All the data available in the studies was clearly documented and reported, thus no additional data analyses or tests were required (Roberts & Kwan, 2018, Hartley et al, 2015, Carraro & Gobbi. 2012, 2014). For this review authors were not contacted as all papers were self-sufficient in providing the required data. The studies' differing outcome measures meant that a synthesis of the results via a meta-analysis was not possible. Instead, a narrative comparison was conducted.

All four studies involved small numbers of participants: Roberts and Kwan (2018) included 13 participants and the Carraro and Gobbi (2012, 2014) studies had 27 – with 13 in the intervention group and the remaining 14 in the painting activity group. Hartley et al. (2015) involved a total of 24 participants, and eight of these were in the control group. None of the studies document the nationalities of the participants or even the locations in which the research took place. Factors such as these could have had an effect on the outcome measures. Table 9 below reports the baseline demographics for each study, and details of the study designs is given in Table 15.

Table 9: Baseline demographics.

Study	Carraro and Gobbi, 2012
Sample size	27 (16 men, 11 women)
Mean age	40.1
ID	18 mild ID / 9 moderate ID
Psychosocial intervention	Physical exercise programme
Duration of intervention	12 weeks
Comparison group	Painting activity programme
Outcome measures	State-Trait Anxiety Inventory + Zung Self-rating Anxiety Scale
Study	Carraro and Gobbi, 2014
Sample size	27 (16 men, 11 women)
Mean age	40.1
ID	18 mild ID / 9 moderate ID
Psychosocial intervention	Physical exercise programm
Duration of intervention	12 weeks
Comparison group	Painting activity programme
Outcome measures	Zung Self-rating Depression Scale
Study	Hartley et al, 2015

Sample size	24 (13 men, 11 women)
Mean age	39.23
ID	24 mild ID
Psychosocial intervention	Cognitive Behavioral Therapy (CBT)
Duration of intervention	10 weeks
Comparison group	Treatment as usual (TAU)
Outcome measures	The Self Report Depression Questionnaire + Caregiver version of the Glasgow rating scale for Depression – ID version
Study	Roberts and Kwan, 2018
Sample size	19 (6 men, 13 women)
Mean age	27.61
ID	10 mild ID / 3 moderate ID
Psychosocial intervention	Cognitive Behavioral Therapy (CBT)
Duration of intervention	6 weeks
Comparison group	No comparison group
Outcome measures	Glasgow rating scale for Depression ID version + Caregiver version

4.5.4 Quality Assessment and Risk of Bias

Data extraction and quality assessment were undertaken by the primary reviewer, and the findings were then appraised by the secondary reviewer. For each study, the mean and standard deviation data were extracted, as well as the p-values of each outcome measure. This extracted data was put into data-extraction tables, then detailed and analysed via a narrative synthesis (presented in the results section). A meta-analysis was not possible due to the differing outcome measures. Tables 10, 11, and 12 show the risk-of-bias assessment for each study included in this review.

Table 10: Summary of risk-of-bias for Carraro and Gobbi (2012) and Carraro and Gobbi (2014).

Domain	Author's judgment	Support of judgment
Selection bias - Random sequence generation	Low risk	Randomly assigned by random numbers table.
Selection bias - Allocation concealment	Low risk	Randomly assigned by random numbers table.
Performance bias - Blinding of assessors and participants.	Medium risk	There was no blinding of group allocation to the assessors during the study
Detection bias - Blinding on outcome assessment	Low risk	Non applicable. There was no blinding of group allocation during the study
Attrition bias - Incomplete outcome data	Low risk	All participants completed the entire duration of the study. No missing data.
Reporting bias - Selective reporting	Low risk	All outcome measures were reported as pre-indicated
Other bias - Other sources of bias	Low risk	None

Table 11: Summary of risk-of-bias for Hartley et al. (2015).

Domain	Author's judgment	Support of judgment
Selection bias - Random sequence generation	Medium risk	Randomisation technique not mentioned in study
Selection bias - Allocation concealment	Medium risk	No concealment of group allocation to the assessors.
Performance bias - Blinding of assessors and participants.	Low risk	Non applicable as a non-blinded study.

Detection bias - Blinding on outcome assessment	Low risk	Non applicable. There was no blinding of group allocation during the study
Attrition bias - Incomplete outcome data	Low risk	All participants had complete data listed in the results.
Reporting bias - Selective reporting	Low risk	All outcome measures were reported as aforementioned in the method.
Other bias - Other sources of bias	Low risk	None.

Table 12: Summary of risk-of-bias for Roberts and Kwan (2018).

Domain	Author's judgment	Support of judgment
Selection bias - Random sequence generation	Low risk	Non applicable, no control group.
Selection bias - Allocation concealment	Low risk	Non applicable, all participants had the same intervention.
Performance bias - Blinding of assessors and participants.	Low risk	Non applicable, no control group.
Detection bias - Blinding on outcome assessment	Low risk	Non applicable, all participants had same intervention.
Attrition bias - Incomplete outcome data	Low risk	This study had full participant retention.
Reporting bias - Selective reporting	Low risk	All outcomes reported as planned in the method.
Other bias - Other sources of bias	Low risk	None.

All the studies were assessed as "low risk". This rating is partially due to the fact that one of the studies lacked a control group, thus many of the assessments are non-applicable. In addition, none of the studies were blinded, which led to further non-applicable assessments. The rating can also be attributed to the full participant retention throughout all studies, with no drop-out and no missing data.

4.5.5 Participant Recruitment, Compliance, and Flow

Prior to their involvement in the studies, the participants had each received a diagnosis of anxiety or depression from a psychiatrist or specialist who had undertaken specific training in diagnosing mental illness in adults with ID. For detailed participant retention information, see Table 13.

Table 13: Participant retention (Moher et al, 2010).

Study	Lost to follow up -Intervention	Lost to follow up -Comparison	Discontinued – Intervention	Discontinued - Comparison
Carraro and Gobbi , 2012	n=0	n=0	n=0	n=0
Carraro and Gobbi , 2014	n=0	n=0	n=0	n=0
Hartley et al, 2015	n=0	n=0	n=0	n=0
Roberts and Kwan, 2018	n=0	n=0	n=0	n=0

Table 14: Evidence table for interventions (Adapted from www.nice.org.uk) Int = intervention, Cont = control.

Study	Study type	Number of patients	Patient characteristics	Int	Cont	Measurement timings	Outcomes measures
Carraro and Gobbi, 2012	RCT	27	27 (16 men, 11 women) of these 18 mild ID 9 moderate ID	13	14	Baseline (T=0) 6 weeks halfway (T=1) 12 weeks, end of intervention (T=2)	State-Trait Anxiety Inventory + Zung Self-rating Anxiety Scale
Carraro and Gobbi, 2014	RCT	27	27 (16 men, 11 women) of these 18 mild ID 9 moderate ID	13	14	Baseline (T=0) 6 weeks halfway (T=1) 12 weeks, end of intervention (T=2)	Zung Self-rating Depression Scale
Hartley et al, 2015	Pilot study	24	24 (13 men, 11 women) all mild ID	16	8	Baseline (T=0) 10 weeks, end of intervention (T=1) 3 month follow up (T=2)	The Self Report Depression Questionnaire + Caregiver version of the Glasgow rating scale for Depression – ID version
Roberts and Kwan, 2018	Pilot study	13	19 (6 men, 13 women) of these 10 mild ID 3 moderate ID	13	N/A	Baseline (T=0) 6 weeks, end of intervention (T=1)	Glasgow rating scale for Depression ID version + Caregiver version

4.5.6 Psychosocial Interventions

Physical Exercise Programme

In the Carraro and Gobbi (2012, 2014) studies, participants took part in twice-weekly, one-hour exercise sessions. The sessions involved individual, paired, and group exercises, using sports equipment such as balls, ropes, and dumbbells. Each session had the same format: a warm-up, the main section, and a cool-down section involving breathing exercises and relaxation. The comparison group in the Carraro and Gobbi (2012, 2014) studies took part in a painting activity. This activity was chosen for the combination of minimal physical activity with social interaction.

Cognitive Behavioural Therapy

In the Hartley et al. (2015) study, 1.5-hour weekly meetings were held to deliver CBT to the participants. As an outcome of focus-group discussions within the study, a treatment manual was created to share information about the "Empower" CBT treatment programme that was developed for the study.

Robert and Kwan’s (2018) study also involved focus groups, and the usual CBT model was modified for use in the study. The "Empower” CBT programme developed by Hartley et al. (2015) ran over 10 weeks. It was led by a therapist and an additional 2-3 co-facilitators. The "Empower" programme was based on the CBT treatments used with typically developing children (Gillham et al, 2006), adolescents with depression, and adults with mild ID. In total, 17 adults with mild ID, 28 professionals in the area of ID, and three sets of parents formed the discussion group that proposed the final intervention.

The CBT model in Robert and Kwan’s (2018) study involved an amendment by a registered clinical psychologist (“LR”). The CBT model was based on others used with typically developing individuals with anxiety. Additionally, LR's clinical work with adults who have ID and anxiety was reviewed and considered in the development of the programme. Elements of the CBT programme were further adjusted based on a literature review of variations in psychological treatment for adults with ID (Whitehouse et al, 2006).

4.5.7 Outcome Measures

All four studies used a variety of outcome measures to gather data. In the Hartley et al. (2015) study alone, six different forms of assessment were used. These included the SRDQ (Reynolds and Baker, 1988), a 32-item self-report measure of depressive symptoms created for self-completion by adults with ID. They also used the caregiver version of the Glasgow rating scale for depression – ID version (GDS-LD; Cuthill et al, 2003). This is a 16-item questionnaire about depressive symptoms in adults with ID, designed for caregivers to complete. In addition, the social performance survey schedule (SPSS; Matson et al, 1983) was incorporated. This is a 57-item informant rating of social skills for adults with mild to moderate ID. Understanding and application of CBT was assessed using the emotion recognition task (ERT), which requires participants to identify emotions (e.g., sadness, happiness, anger) using the pictures of facial affect system (Ekman and Friesen, 1976). The thought/feeling/behaviour (TFB; Oathamshaw and Haddock, 2006) assessment involves participants reading aloud a set of 24 sentences, then being asked whether this is "something you do", "something you think", or "something you feel". Finally, in the cognitive mediation task (CMT; Dagnan et al, 2000), which was developed for adults with ID, participants are asked about a variety of "situation-though-emotion" pairings, such as, "You walk into a room and your friend starts laughing … and you feel happy. Would you be thinking 'my friends are nice' or 'my friends are mean'?".

The Psychiatric Assessment Schedule for Adult with Developmental Disability (PASS-ADD) (Moss et al, 1998) was used as a screening measure for anxiety in Robert and Kwan's (2018) and Hartley et al. (2015) studies. Roberts and Kwan (2018) used the Kaufman brief intelligence test (Kaufman and Kaufman, 2004) as a screening test for cognitive ability, alongside the the Peabody Picture Vocabulary Test (PPVT-4) (Dunn and Dunn, 2007). This was run at the baseline measurements to assess the participants' receptive vocabulary language skills. The Glasgow anxiety mood rating scale (GAS-ID) was used as an outcome measure, applied before and after the intervention. The TFB used by Hartley et al. (2015) was used also by Roberts and Kwan (2018), as well as the thought-to-feeling (TTF) task, which involves the same process and concept as the CMT assessment used by Hartley et al. (2015). Finally, the clients competency checklist, adapted from another designed for anger management treatment of individuals with ID (Taylor and Novaco, 2005), was used as a post-treatment outcome measure. These four assessments were carried out before and after the 6-week intervention, which involved participants undertaking 1.5 hours per week of CBT.

Carraro and Gobbi (2012) used two self-report anxiety scales: the state-trait anxiety inventory form Y (STAI-Y; Spielberger, 1989) and the Zung self-rating anxiety scale (SAS; Zung, 1971) modified for individuals with ID (SAS-ID; Lindsay & Michie, 1988). Both scales contain 20 items, rated on a four-point frequency scale, from 1 (almost never) to 4 (almost always). In Carraro and Gobbi's (2014) paper, the Zung self-rating depression scale (SDS; Zung, 1971), comprising 20 items, was used to measure depressive symptoms in adults with ID. This was adapted by Kazdin et al. (1983), with yes/no responses used in place of the four-point frequency scale (SDS-ID). *Yes* and *no* responses were given scores of either 1 or 2 points, with the higher score correlating with greater severity of depressive symptoms. In both cases, measurements were taken at baseline, week 6 (halfway through the study), and week 12 (the end of the study).

4.5.8 Data Analysis

A random effects meta-analysis was intended to synthesise data from the selected papers. This was decided as the review included a multitude of psychosocial interventions and a mixture of outcome measures. However, due to the small yield of papers, a meta-analysis was not possible and a narrative approach was taken instead.

Given the small sample size in the Roberts and Kwan's (2018) study, all statistical analyses were conducted using IBM SPSS Statistics version 21, with nonparametric analyses. A Wilcoxon signed rank test was used to analyse scores from the GAS-ID, TFB, and TTF assessments. A McNemar test was conducted to identify the proportion of participants diagnosed as still clinically anxious following the CBT.

Hartley et al. (2015) used a multivariate analysis of variance (MANOVA) to determine the difference between the CBT and TAU groups. Repeated measure MANOVAs were carried out to determine the effect of time through pre-treatment, post-treatment, and the 3-month follow-up on each dependent variable – SRDQ, GDS-LD, SPSS, AND SIB-R. The Bonferroni adjusted alpha level of 0.013 was used to judge statistical significance. A post hoc Bonferroni comparison was conducted to identify the time and group affects. The three dependent variables (ERT, TFB, and CMT) were all analysed using a MANOVA, and repeated measure MANOVAs were also undertaken for these. The Bonferroni adjusted alpha level of 0.017 was used to judge statistical significance. A post hoc Bonferroni comparison was conducted to identify the time and group effects.

In the Carraro and Gobbis's (2012) study, Cronbach's *alpha* was calculated to assess the internal consistency of the STAI-Y scales. Independent t-tests were conducted to compare the baseline STAI-Y and SAS-ID of the control group and exercise group. The TRAIT-A convergent validity was investigated using the Pearson's correlation between TRAIT-A and

SAS-ID. The ANOVA for repeated measures was conducted on the TRAIT-A and SAS-ID scores to examine the effects of exercise on trait and generalised anxiety during the intervention. Scores from the STATE-A were analysed using a mixed model design ANOVA with group test and time. A significance level of $p<0.01$ was accepted. Carraro and Gobbi (2014) used an ANOVA for repeated measures to examine the SDS-ID scores and reveal the effects of exercise on depressive symptoms. Additionally, changes from pre- to post-test and effect size were calculated using Cohen's *d*.

4.6 Results

Due to the small number of papers included in this review, a meta-analysis was not possible; therefore, a narrative synthesis of the results is presented in the following sections.

4.6.1 The Psychiatric Assessment Schedule for Adults with Developmental Disabilities Clinical Interview (PAS-ADD)

Both Roberts and Kwan (2018) and Hartley et al. (2015) used the PAS-ADD as a screening measure to identify participants' levels of anxiety and depression prior to commencing the study. However, Roberts and Kwan (2018) applied this as a post-treatment outcome measure. It would have been beneficial for Hartley et al. (2015) to do the same, as the results of Roberts and Kwan (2018) are telling: they show that, of the 10 participants who commenced the study with either a subclinical or clinical diagnosis of depression or anxiety, nine had no current diagnosis at the end of the study. The one participant who did retain their diagnosis saw this reduced from a clinical to a subclinical level.

4.6.2 Social Performance Survey Schedule (SPSS)

Hartley et al. (2015) were the only researchers to look at social performance. A higher score from an SPSS indicates that the individual is more skilled at adapting socially. However, the results of this study highlighted no significant difference between the groups, with no evidence of a treatment effect at post-treatment or follow-up.

4.6.3 Emotion Recognition Task (ERT)

Hartley et al. (2015) assessed cognitive therapy principles using the ERT. Both the CBT and TAU groups in this study showed an improvement between pre- and post-treatment.

4.6.4 Cognitive Mediation Task (CMT), Thought/Feeling/Behaviour (TFB) Discrimination Task, and Thought-to-feeling (TTF)

Hartley et al. (2015) assessed cognitive therapy principles using the TFB task and CMT. The TFB and TTF tasks were also used by Roberts and Kwan (2018), the latter applying the same process and concept as the CMT assessment used by Hartley et al. (2015). The TFB and CMT scores in the Hartley et al. (2015) study indicated a significant improvement over time. For the CMT, a significant improvement was seen over time and between groups, indicating that this group demonstrated the largest improvement between pre- and post-treatment. Roberts and Kwan (2018) used both the TFB and TTF, and the results of both were analysed using a Wilcoxon signed rank test that revealed no statistically significant variations between pre- and post-treatment. Additionally, the TFB task revealed no major links between language skills and performance.

4.6.5 Depression Measures

Glasgow Depression Scale for People with a Learning Disability (GDS-ID)

The GDS-ID was used by Hartley et al. (2015). The results indicate a significant difference between the CBT and TAU groups at the three-month follow-up, indicating that the benefits of CBT treatment were sustained over the three-month period following the cessation of the intervention.

Self-Report Depression Questionnaire (SRDQ)

Hartley et al. (2015) used more than one type of depression scale, in the same way that Carraro and Gobbi (2012) used more than one type of anxiety rating scale. The SRDQ results in the Hartley et al. (2015) paper show a significant decrease in scores between pre- and post-treatment in the CBT group, indicating improvement as an effect of treatment. In addition, no significant difference was seen between post-treatment and three-month follow-up measurements in the CBT group, which provides evidence that the results were sustained during this time. There was no significant variation between pre- and post-treatment and three-month follow-up measurements in the TAU group, further signifying a benefit of CBT.

Zung Self-rating Depression Scale (SDS-ID)

Carraro and Gobbi's (2014) paper discusses only one outcome measure, which is the SDS-ID. The baseline measurements indicate no significant variations between the groups, levels of ID, or the sexes of participants. However, a significant reduction in scores was seen in the exercise group (compared to the control group) at the end of the study, showing a benefit of exercise as an antidote to symptoms of depression.

4.6.6 Anxiety Measures

Glasgow Anxiety Scale for People with a Learning Disability (GAS-ID)

Roberts and Kwan (2018) used the GAS-ID, for which a Wilcoxon signed rank test identified a statistically significant decrease in anxiety scores. There was no control group in this study, which gives slightly less validation to the results. Nonetheless, a reduction in scores was seen between pre- and post-treatment measurements.

State-Trait Anxiety Inventory, STATE-A, and TRAIT-A (STAI-Y)

Carraro and Gobbi (2012) used two rating scales for anxiety. The STAI-Y anxiety inventory measures levels of both "state" and "trait" anxiety. No statistical difference was seen between groups at baseline, nor in terms of sex or levels of ID. The repeated measures ANOVA found significant variation between pre- and post-treatment measures in the exercise group, for both TRAIT-A and STATE-A. It was also observed that before and after measures from single a session reflected a reduction in anxiety symptoms, while data covering the entire duration of the study showed even further reduction, with a continuation of exercise over time leading to continual reduction of anxiety and distress.

Zung Self-rating Anxiety Scale (SAS-ID)

The second anxiety rating scale used by Carraro and Gobbi (2012) was the SAS-ID. The results of this showed a significant reduction in scores between pre- and post-treatment, compared to the control group.

4.7 Discussion

4.7.1 Disclaimer

Few studies have examined the effect of psychosocial interventions on adults with ID, with even fewer looking specifically at the effects of these interventions on mental health. The impact of this limitation is substantial and has certainly influenced the results. Small sample sizes make it challenging to produce substantial findings and results. One of the studies included produced two papers from its results, and the two were included in this review as two separate studies. Additionally, none of the studies were fully blinded or randomised. The effect of these limitations means that little weight can be given to the findings. Caution must be taken when drawing any conclusions about whether the psychosocial interventions discussed in this review should be recommended to people with depression and anxiety secondary to their ID. The evidence at this stage may not be strong enough to support any such conclusions. However, the researchers noted no adverse reactions to taking part in the studies involving CBT and exercise.

4.7.2 Limitations and Future Research

Not all the limitations of the four studies included in this review were reported openly by the authors. For example, Carraro and Gobbi (2012, 2014) did not include a follow-up measurement in either of their papers. Only a brief mention is given to this limitation in their conclusions, where the authors state that a follow-up evaluation could be beneficial to identify whether the results had been sustained after a period without exercise. If a follow-up had been carried out but just not published the authors would have been contacted for this information. Carraro and Gobbi (2014) also made a recommendation that, in future studies, group discussions held after the cessation of the intervention could also be held for the control group to heighten the validity of the results. The aim of Carraro and Gobbis's (2012) study was to provide evidence that exercise can reduce levels of anxiety in adults with ID, much as exercise has been proven to be beneficial for adults in the general population (Carmeli et al, 2009; O'Connor et al, 2010). The baseline STAI-Y scores indicated higher levels of anxiety than found amongst the general population (Crawford et al, 2011). The decrease in symptoms of anxiety also mirrors that seen for the general adult population.

In all four studies, other factors may have contributed to the reduction in levels of anxiety and depression amongst the participants. A combination of elements – including the increase in social communication and interaction due to being a participant in the study – could have been a factor in the results. While Carraro and Gobbi's (2014) paper was the only one to report this as a possibility, it is well known that adults with ID enjoy less social interaction than people in the general population. Furthermore, it has been shown that a significant factor in the treatment of depression in adults with ID is participation in social activities (Mc Gillivray and McCabe, 2010). Therefore, this increase in socialisation may have had a positive effect on the mood of the participants. Dunn (2001) highlight this point in regard to exercise. They state that, although there is a strong body of research on the effects of exercise on symptoms of anxiety and depression, there is little specification as to exactly how the exercise affects emotional wellbeing. Thus, there is a need to investigate further the specific mechanisms of exercise that are involved in anxiety responses, as this would support the development of bespoke exercise interventions.

In contrast, the Hartley et al. (2015) study of a CBT intervention found no major changes between pre- and post-treatment measures of social skills. Hartley et al. (2008) state that adults with mild ID often experience negative rejection behaviours by the general population due to the social behaviours that they may exhibit when experiencing depression. Future research could consider whether specific social skills and behaviours could be examined during the CBT to reduce depressive symptoms.

Though the duration of these studies varied from 6 to 12 weeks (with some also including follow-up measurements), a longer duration would produce more valuable results and add evidence to the current findings. Additionally, the sample sizes were small, ranging from 19 to 27 participants each, which is almost the same size as a feasibility study (Campbell et al, 1995). This makes it difficult to identify statistically significant findings, due to the small amounts of data produced. While the Hartley et al. (2015) study was a pilot, 24 participants still comprised a relatively small sample size. Nonetheless, this was larger than any previous study exploring CBT treatment for adults with ID (Kroese et al, 1997).

Participant retention in this population group is high, possibly due to the caregiver's inclusion in the study design. Hartley et al. (2015) found that involvement of carers was of great importance. This finding emerged from the focus-group discussion with carers, who stated that knowledge of the intervention would enable them to employ the skills derived from the treatment outside of the sessions. A comparison with studies that did not include carers (Hassiotis et al, 2013) reveals that their inclusion could have been a contributing factor to the treatment effects seen in Hartley et al. (2015). However, while caregiver inclusion may be critical to the efficiency of treatment, this has not yet been explicitly researched (Taylor et al, 2008). Additionally, the impact of the psychosocial intervention itself on the caregivers could be assessed to obtain valuable information, such as the changes to their caregiving behaviours or stress levels.

The recommended number of CBT sessions for typically developing children is eight (Barkham et al, 1996), and the Hartley at al. (2015) study exceeded this. Both Roberts and Kwan (2018) and Hartley et al. (2015) modified their CBT interventions to adapt them to adults with ID. As the studies modified the treatment in two distinct ways (McCabe et al, 2006; Lindsay et al, 1993), it is difficult to generalise their findings. Researchers could look at the validity of these modifications so that future studies could utilise the method proven to be most successful.

Most of the papers were transparent in their reporting of the validity of their assessment measures. In the Hartley et al. (2015) study, adults with mild ID were given a training session to educate them about proper use of Likert-type scales (Hartley et al, 2005). The SRDQ (Reynolds & Baker, 1988) was used in their study. This self-reporting depression scale was explicitly created for adults with ID, so Hartley et al. (2015) additional need for training sessions for their use is unclear. However, high construct and criterion validity of the SRDQ has been reported by Reynolds and Baker (1988) and Ebensen et al. (2005). Hartley et al. (2015) and Carraro and Gobbi (2012) both benefited from the use of more than mood-rating scale. Carraro and Gobbi (2012) used two anxiety rating scales (STAI-Y and SAS-ID), and they showed paralleled results supporting the validity of trait anxiety with a scale modified for adults with ID.

All four studies specified differences between participants' levels of ID, ages, and sexes. With larger sample sizes, this information could be of benefit for generalising results to larger population. Previous studies have shown that effects of treatment differ for adults with mild and moderate to severe ID, as reflected in the systematic review and meta-analysis of psychosocial interventions for adults with ID by Vereenooghe and Langdon (2013). However, Carraro and Gobbi (2012) found that rates of anxiety reduction through exercise were comparable to those seen in the general population (Crawford et al, 2011).

None of the papers in this critical review make reference to ethics or the obtaining of ethical approval. However, Roberts and Kwan (2018) report the signing of "Easy English" consent forms by the participants. Hartley et al. (2015) do not report their process of obtaining consent, and Carraro and Gobbi (2012, 2014) state that they received written confirmation from the participants or their parents or legal guardians. However, none of the papers discuss any challenges that arose during the process of obtaining consent. All data relating to the participants must be held securely, according to current data protection standards. However, the papers do not indicate whether this was done.

Previous studies have suggested that approximately 50% of adults with ID take more than one psychotropic medication (Sheehan et al, 2015). Hartley et al. (2015) and Carraro and Gobbi (2012) make reference to this, but they do not specify whether their participants were currently on medication, which could be seen as a limitation in their reporting. If none of the participants were taking medications, the results may not provide a fair reflection of a real-life setting. Futhermore, research has shown that only 50% of adults with ID and depression respond well to antidepressant medication (Trivdei et al, 2006). As the participants may have been using psychotropic medications, it is difficult to identify the impact of the psychosocial intervention as a first-line treatment for anxiety or depression.

Lifestyle changes that involve exercise could be seen as cost-effective interventions (Verhaeghe et al, 2011). However, for adults with ID, it is highly likely that continual instruction would be required. Though exercise can be incorporated into one's life at no extra cost, the studies discussed in this review involved hiring professionally qualified instructors, as well as therapists for the CBT interventions, which can be costly. It was not possible to undertake a cost-benefit analysis due to the lack of cost-specific information given in the papers. As such, future studies could consider the cost of hiring professionals to enable ongoing exercise instruction and delivery of a CBT intervention. However, Bruce et al. (2010) state that there is evidence that adults with mild ID can be taught the abilities required for CBT. In a study by Bruce et al. (2010), 18 adults completed a 1-hour training session and displayed a progression in their ability to link thoughts to feelings, compared to a control group. If replicated, this could mean that fewer treatment sessions were required than initially thought.

4.8 Conclusion

There was no evidence in the four papers of CBT or exercise worsening the symptoms of depression or anxiety. The Hartley et al. (2015) pilot study found that a 10-week course of CBT led to significant reduction in depressive symptoms and behavioural difficulties. This was reported by both the participants and their caregivers in pre- and post-treatment reports. Carraro and Gobbi (2012) conclude that an exercise regime of a short duration could reduce anxiety levels in people with ID. Similarly, Carraro and Gobbi (2014) highlight that exercise led to a significant reduction in depressive symptoms, though their study has various limitations, as discussed earlier. Roberts and Kwan (2018) found a positive correlation between CBT and anxiety-level reduction, though it could be seen as succeeding more in addressing the difficulties that come with amending interventions such as CBT for adults with ID.

Due to the small sample sizes of the studies, it was not possible to undertake any advanced statistical tests, therefore the results cannot be generalised to larger populations. Thus, the four studies included in this review cannot be said to prove that the psychosocial interventions under study (i.e., CBT and exercise) had any significant impact on depression and anxiety secondary to ID. Additionally, there is a need for studies of various types of psychosocial interventions, as the results for one cannot be generalised to all other types.

Two of the four papers are pilot studies, one of which was assesses the feasibility of the interventions (Roberts and Kwan, 2018) and the reduction in anxiety symptoms. There is currently insufficient literature indicating that psychosocial interventions can be recommended over pharmacological approaches, but there is potential for these interventions to work as an adjunct approach. However, more research is needed. Furthermore, none of the studies were fully randomised and no blinding was used for the outcomes measures. Future research could produce higher quality findings by always incorporating a control group and assessing outcome measures for this group. Additionally, the inclusion of an individual who does not partake in the psychosocial intervention – and who is blinded to the groups – could be beneficial when assessing the outcome measures.

Results from these four studies should be seen as preliminary. More rigorous research is required in this area, including RCTs and further examination of the benefits of including caregivers in the interventions. The four studies examined in this systematic review all conclude that more studies of higher quality are needed. In summary, this review has addressed some of the challenges that arise when modifying and examining psychosocial interventions for treating anxiety and depression in adults with ID.

4.9 Systematic Review Two

The Effects of a Yoga Intervention on Adults with Intellectual Disabilities (ID)

4.10 Abstract

Background: Adults with ID are significantly more likely to be overweight or obese, and they are more likely to suffer from mental illness such as anxiety or depression. Currently, there is limited research into non-pharmacological approaches to enhancing wellbeing for adults with ID. Various studies have examined the positive impact of yoga interventions on the general population. However, to date, few studies have looked into psychosocial interventions (such as yoga) for adults with ID.

M**ethods:** The following databases were searched: Cochrane, SCOPUS, Medline, AMED, CINHAL, SportsDiscus, PsychARTICLES and PsychINFO. The inclusion and exclusion criteria were independently applied by one researcher. A second reviewer then checked the individual papers against these criteria. Data was then extracted from the studies selected for inclusion in the review.

Results: One study was included in this review. This was the only study deemed eligible for inclusion when the inclusion and exclusion criteria were applied. The paper was rated as having a medium risk of bias.

Conclusion: There is an extremely limited amount of published research available on the effects of yoga on adults with ID. This review concludes that – to support any initial positive findings on the implementation of yoga as an activity for this population group – more extensive, higher quality, and larger scale research is needed.

4.11 Introduction

The initial aim of this systematic review was to identify the effects of a yoga intervention – specifically LY – on levels on anxiety and depression in adults with ID. An initial scoping search revealed that no studies fitting this criteria had been undertaken. Therefore, the parameters of the review were broadened. This led to a revised aim of exploring the general effects of partaking in any style of yoga practice on adults with ID and how such an intervention may be implemented. This review was designed to provide an unbiased summary of yoga as a psychosocial intervention for adults with ID.

4.11.1 Yoga as a Psychosocial Intervention

An initial scoping search was conducted for "yoga" in the following databases: Cochrane, SCOPUS, Medline, AMED, CINHAL, SportsDiscus, PsychARTICLES, and PsychINFO. This resulted in 3,096 papers, 143 of which include outcome measures that assess mental health in the general population.

There is very little literature available on psychosocial inventions for adults with ID (Hawkins et al, 2012). Research on the effects of yoga on adults with ID is even rarer. As previously discussed, the rate of comorbidities such as mental illness is considerably higher amongst people with ID than in the general population. For clinicians, managing these additional conditions amongst people with ID is a challenge, due to these individuals' considerably increased rates of morbidity and mortality, which further emphasises the need for review of possible beneficial interventions.

4.12 Method

4.12.1 Rationale for Review

A search of the Cochrane Library for systematic reviews (last accessed: June 2021) revealed a dearth of relevant literature. There were no systematic reviews looking at the feasibility and benefits of yoga as a psychosocial intervention for adults with ID.

4.12.2 Aims and Objectives

An aim was to assess the data derived from studies in which yoga was used as an intervention for adults with ID. The objective was to gain an in-depth understanding of the limitations of the current research to develop recommendations and guidelines for future larger scale studies.

4.12.3 The Population, Intervention, Comparison, and Outcome (PICO) Question

Table 15: The population, intervention, comparison, and outcome (PICO) question.

Population (P)	Intervention (I)	Comparison (C)	Outcome (O)
Group of people?	What intervention is being considered?	What comparison is being used?	What is the aim to accomplish?
People with intellectual disabilities	Yoga (all styles)	No comparison	Decipher effect of yoga on adults with intellectual disability

4.12.4 Key Search Terms

Table 16: Key search terms.

learning difficult* **OR** intellectual disabilit* **OR** mentally disabled **OR** mental disab* **OR** Rubinstein-Taybi syndrome **OR** Cri-Cu-chat syndrome **OR** De Lange syndrome **OR** Down* syndrome **OR** mental* retard* **OR** Fragile X syndrome **OR** Prader-Willi syndrome **OR** Williams syndrome **OR** development* disab* **OR** development* delay **OR** learning disorder* **OR** learning disab* **OR** neurodevelopmental disorder*	laughter therap* **OR** humor therap* **OR** humour therap* **OR** yoga **AND**

4.12.5 Search Methodology

The databases deemed relevant were Cochrane, SCOPUS, Medline, AMED, CINHAL, SportsDiscus, PsychARTICLES, and PsychINFO. The inclusion and exclusion criteria were applied to the search results by two reviewers, who were working independently. The data was then extracted from the selected studies for inclusion in the review.

4.12.6 Inclusion Criteria

Only studies assessing people with ID were to be included. Due to the dearth of available literature, studies looking at participants of all ages were accepted. Factors such as puberty and adolescence – which could alter the results – will be documented during the discussion. No date range restrictions were implemented. All styles of yoga were included. All types of outcome measures were permitted. The studies could have quantitative data, qualitative data, or both.

4.12.7 Exclusion Criteria

Papers looking at ADHD, Asperger's, or autism were excluded, as these conditions are not considered ID. To gather as much data as possible, no exclusion criteria were set for the outcome measures.

4.13 Findings

4.13.1 Search Results Gathered from the Electronic Database Searches

The search results are presented in detail in the PRISMA flowchart (Figure 1). The Cochrane Library gave nine results, and SCOPUS gave 18 (three of which were duplicates). Medline produced 43 results (23 duplicates), AMED delivered three (1 duplicate), CINHAL presented 23 (9 duplicates), SportsDiscus gave 13 (11 duplicates), PsychARTICLES produced 36 (11 duplicates), and PsychINFO produced none.

The results were summarised, and the databases were found to have identified a total of 145 studies. Of this total, (n=50) were duplicates and a further (n=93) results were not relevant and thus excluded after an initial screening of their titles and abstracts. This left just two papers, one of which was removed after a full text-screening (Table 21). After the two reviewers had worked through the results, one final study was deemed eligible. A third reviewer was not required as there were no disagreements between the first and second reviewer.

Filtering process (Prisma flow diagram)

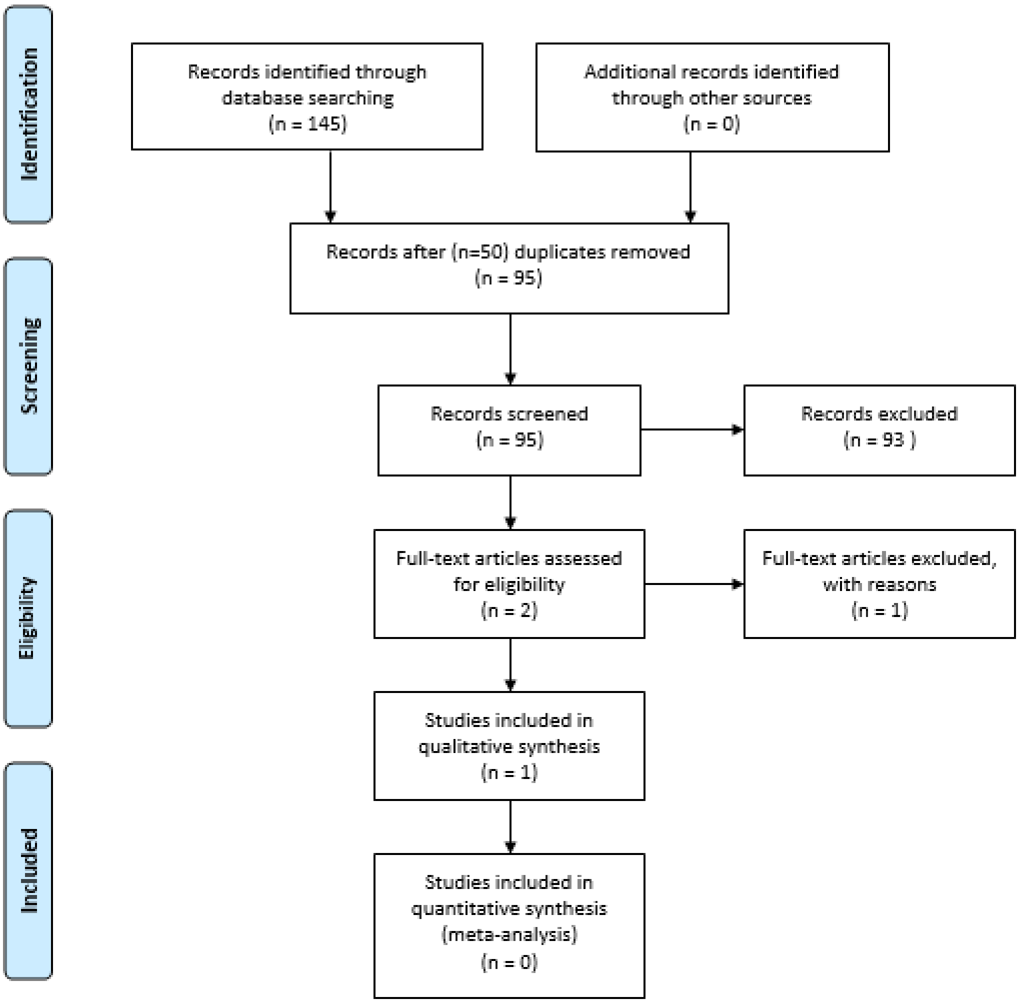

Figure 2: Exclusion flowchart adapted from (Moher, 2009)

4.13.2 Excluded Papers

Table 17: Reasons for exclusion.

Reference	Reason for exclusion
Jackson et al. (2015)	Study did not include yoga as an intervention, though study mentioned yoga in its abstract as a possible psychosocial intervention.

4.13.3 Selected Studies

When the inclusion criteria stated that participants must be adults only, no studies were found. Upon widening the search parameters, one study looking at young adults was found.

- "The influence of a yoga exercise programme for young adults with intellectual disabilities" (Hawkins et al, 2012)

Though the data in the paper was sufficient to review, due to this being the only study found on yoga for people with ID, an attempt was made to contact the primary author via email. No response was received nor at a second attempt, alos by email, three weeks later.

Table 18: Baseline demographics.

Study	Sample size	Mean age	ID	Additional diagnosis	Type of Yoga	Duration of intervention	Outcome measures
Hawkins et al. (2012)	2 (1 female, 1 male)	Female = 21 Male = 22	Both have mild ID	1 x Jobert syndrome (female),	Vinyasa	Unclear from documentation but 9 sessions took place.	Partial interval recording. Eston-Parfitt

				1 x Soto syndrome (male)			RPE scale. Physical Activity Enjoyment Scale (PACES)

4.13.4 Quality Assessment and Risk of Bias

The Cochrane collaboration risk-of-bias tool (Higgins et al, 2011) was used to assess the quality of each study. The following table (Table 23) shows the findings of the risk-of-bias assessment for the study included in this review

Table 19: Summary of risk-of-bias for Hawkins et al. (2012).

Domain	Author's judgment	Support of judgment
Selection bias – Random sequence generation	Low Risk	Non applicable as only two participants in the study
Selection bias – Allocation concealment	Low Risk	No blinding required as no comparison group
Performance bias – Blinding of assessors and participants.	Low Risk	Non applicable as both participants took part in the intervention
Detection bias – Blinding on outcome assessment	Low Risk	Non applicable. There was no blinding of group allocation during the study
Attrition bias – Incomplete outcome data	Low Risk	Both participants completed the study. No missing data.
Reporting bias – Selective reporting	Medium Risk	All outcome measures were recorded as pre indicated in paper. However not all

		outcome measures were fully published as well as not publishing study duration and intervention frequency details.
Other bias – Other sources of bias	Low Risk	None

4.13.5 Participant Recruitment, Compliance, and Flow

As appears to be common in studies examining interventions for adults with ID, participant retention rates were high. This could be due to carers often taking responsibility for timetabling and managing the participants' schedules. Though with only two participants in the study the recruitment result of no drop-outs throughout the study cannot be perceived as significant (Table 24).

Table 20: Participant retention (Moher et al, 2010).

Study	Lost to follow up -Intervention	Lost to follow up -Comparison	Discontinued – Intervention	Discontinued - Comparison
Hawkins et al. (2012)	n=0	n/a	n=0	n/a

Table 21: Evidence table for interventions (Adapted from www.nice.org.uk) Int = intervention, Cont = control.

Reference	Study type	No. of patients	Patient characteristics	Int	Cont	Measurement timings	Outcomes measures
Hawkins et al. (2012)	Single subject	2	2 (1 female, 1 male)	2	n/a	Baseline (T=0) then weekly throughout	Partial interval recording.

	research study		Both have mild ID.			duration of study. No follow-up.	Eston-Parfitt RPE scale. Physical. Activity Enjoyment Scale (PACES).

4.13.6 Implementation of Yoga

A total of nine group yoga classes were led by a qualified yoga teacher. All classes were one-hour long in duration and were included a variety of *asanas* (postures) appropriate for both beginners and advanced practitioners. The yoga practice was of a *vinyasa* style, which combines postures (*asanas*) with breathing (*pranayama*). Classes usually have a brief meditation at the end. Each class can be different, using a combination of yoga postures in differing sequences. The classes were held in the afternoon, with the same yoga teacher for every session. In addition to the two participants with ID in the study, 15-20 non-disabled and similarly aged college peers also took part in the yoga classes. Hawkins et al. (2012) do not specify the duration of the study or the frequency of yoga classes (e.g., once or twice a week). Attempts to contact the author for additional information were made via two emails (both to Brent L Hawkins) but to no avail as no response was received. It may be that the nine yoga classes comprised weekly classes over a period of nine weeks, but this cannot be assumed in this review.

A multiple baseline design was used for this study. This meant that the yoga intervention was delivered in a staggered sequence for the two participants. This was done to reveal the changes in the participants' behaviour that occurred when – and only when – the yoga intervention was given. The researchers stated that their rationale for this study design was to examine the effects of a yoga class on exercise behaviour and perceptions of physical exertion, as compared to a non-structured exercise class. The non-structured exercise sessions were the participant's usual scheduled time for exercise at the recreation centre, where the study took place. Both participants had two non-structured exercise sessions of one hour each, per week, in their timetables. However, after the first term of college, both students had stopped attending these at the recreation centre.

The two participants were observed in a non-structured exercise environment until a trend in their baseline behaviours had been established for each outcome measure. The yoga class then began for Participant A. When a change in Participant A's behaviour was seen in the yoga class, participant B was able to join. The yoga intervention was continued until the trends seen across all outcome measures were reasonably stable.

4.13.7 Outcome Measures

The researchers used three outcome measures. First, partial interval recording was used to identify whether the goal exercise behaviours set by the researchers had been achieved. If any of the chosen exercise behaviours were demonstrated by the participants, this was documented as an occurrence in that interval. The use of weights and engagement in balance, stability, and cardiovascular exercises were recorded as exercise behaviours. The participants were examined over two 15-minute exercise sessions, at intervals of 10 seconds each. Daily totals for this documented participation in exercise behaviours were converted into percentages.

Second, the Eston-Parfitt curvilinear rating of perceived excursion (RPE) scale was used to assess perceived levels of physical exertion amongst children partaking in physical exercise. This involves the use of a Likert scale from 1-10, where 10 describes exercises “so hard I am going to stop” and 1 refers to activities that require minimal effort and which the participants find “very, very easy”. Hawkins et al. (2012), on advice from a prior study (Hartley & MacLean, 2006), used a pictorial RPE scale to ensure the meaning was clear for the two participants with ID. Follow-up questions such as, “So, you found the exercise very easy?” were asked by the researchers to confirm the answers given.

Third, both participants were given a copy of the physical activity enjoyment scale (PACES). This involves a six-point, Likert-type scale for use with adults in the general population. However, it was reduced to four points to ensure the comprehension of adults with ID (Miller & Chan, 2008), with 1 indicating “I disagree a lot” and 4 indicating “I agree a lot”. The scale includes 18 items, with 11 positively worded statements and seven negatively worded statements with which participants may agree or disagree.

4.14 Results from the Paper

Table 22: Hawkins et al. (2012) results data.

	Session																	
Measurement	**1**		**2**		**3**		**4**		**5**		**6**		**7**		**8**		**9**	
Participant	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
Partial interval recording (Rounded to the nearest %)	81	85	73	71	54	68	47	100	100	72	97	50	100	97		99		100
Eston-Parfitt RPE scale	4	4	3	8	5	5	3	5	8	5	8	5	8	7		5		7

4.14.1 Frequency of Exercise Behaviour

As seen in Table 26, the partial interval recording measure was used to identify the frequency of the two participants' exercise behaviours. The table shows the percentage of exercise participation to the nearest whole figure. Participant A initially showed a decreasing trend in exercise behaviour, the opposite of the prediction made for the intervention. However, there was an increase from 50% to 100% in the first yoga class alone, and Participant A's exercise behaviours then stayed between 97% and 100% for the remainder of the sessions. The points exceeding the median reveal the effect size (ES) to be 100%. This provides evidence that participation in yoga was very effective for raising her engagement with exercise behaviours.

Similarly, participant B initially showed a decrease in exercise behaviour; and once again, an increase was seen immediately from the first yoga session. The rate of engagement in exercise behaviours then ranged from 98% to 100%, providing further evidence that participation in the yoga class was beneficial for promoting engagement in exercise behaviours – and to a greater extent than the group exercise sessions.

4.14.2 Perceptions of Physical Exercise

The Eston-Parfitt curvilinear RPE scale is used to rate the participants' perceptions of their experiences of the exercise. The results show that both Participant A and participant B defined the level of exertion as “starting to get hard”. Participant A's scores ranged from 3 to 5 (a median of 3.75), and participant B's scores ranged from 4 to 8 (a median of 5.33). Upon commencing the yoga sessions, Participant A's score saw an instant rise to 8, meaning that she found the yoga sessions between “very hard” and “so hard I’m going to stop”. Participant B's scores ranged from 5 to 7 upon commencing the yoga sessions, giving a median of 6.33, demonstrating that he found the sessions “very hard”. For Participant A, ES was calculated at 100%, meaning the intervention was highly effective at raising her perceived level of physical exertion. However, the ES calculation for participant B was 67%, indicating that the intervention was only slightly effective at raising his level of physical exertion.

4.14.3 Participant Satisfaction

The paper does not document the individual weekly PACES scores, but it summarises them briefly in the results. Participants A's scores went from 2.18 to 2.82, giving a median score of 2.42. Participant B's scores ranged from 2.36 to 3.36, with a median score of 3.00. It is recorded that the scores of both participants indicate a moderate level of enjoyment, with an increase seen as more yoga sessions were attended. Both participants recorded their peak scores at the end of the final yoga session.

4.15 Discussion

4.15.1 Disclaimer

Despite the limited literature available, this systematic review was conducted to highlight this dearth of literature and gather evidence to support further research. Two studies were excluded from the review due to their focus on children. One was published in 1969 and the participants were referred to as "mentally retarded". It can be assumed that this study is outdated and that both yoga and ID research has substantially developed since then. Another study on children, by Uma et al. (1989), also uses the term "mentally retarded". In work with adults with ID, the researcher has found this term to be considered inappropriate, with negative connotations. The term does not reflect modern-day understandings of ID. Though this term has not been entirely removed from scientific research, a paper describing people with ID using this term would be incredibly unusual today.

4.15.2 Limitations and Recommendations for Future Research

These results cannot be generalised, as they concern only two participants. The study could have had more validity if more young adults with ID had taken part. In addition, baseline measures of fitness were not recorded prior to the study, though these could have been beneficial and increased confidence in the findings. The use of specific fitness assessment tools, such as those used in prior studies (Moss, 2009. Tsimaras et al, 2003. Elmahgoub et al, 2009), could have delivered more accurate results, as the Eston-Parfitt curvilinear RPE scale depends on the participants' perceptions and communication skills.

4.16 Conclusion

This review highlights the shortage of randomised controlled trials examining non-pharmacological interventions for people with ID. To evidence the effects of yoga on adults with ID, more studies are needed. This review shows that there is a need for more rigorous and well-designed research to increase the quantity of literature available in this largely uncharted field. At this stage, it would be prudent to undertake feasibility studies to inform evidence-based recommendations for larger-scale research.

Given the prevalence of comorbidities in people with ID – and the quantity of medications this population is often required to take – more scientific research and good-quality evidence is needed to inform recommendations for non-pharmacological and psychosocial interventions, such as yoga.

5. Experimental Design and Methodology

Due to the challenges of conducting research with adults with ID, as discussed in the context chapter, as well as the additional considerations when implementing interventions, this chapter presents the methodological considerations taken into account during the study design stage. First, the requirement for a feasibility study is discussed. This is followed by an examination of the literature concerning the recruitment stage and the relevant ethics, including methods of obtaining informed consent from this population group. The second part of this chapter then details the study design and procedures. The method was developed to answer the research question, "What is the feasibility and benefit of a psychosocial intervention for adults with ID and associated mental health conditions?" This chapter will describe the methodology in detail to enable the learning from this feasibility study to be replicated in larger scale research in the future. The careful documentation of the specific methods used could enable the study to be replicated by others.

This feasibility study was designed to examine whether the intervention was appropriate for further testing. The study enabled the assessment of the methods and findings to identify whether they would be useful for future research. The strength of a feasibility study is that it identifies any elements of the design that may need modifying for a particular population group and enables recommendations to be made for implementing these amendments.

5.1 Methodological Considerations

5.1.1 Research with People with Intellectual Disabilities

When examining the field of ID research, it is prudent to reflect on the history of the treatment of people with disabilities. As far back as 1351, when the Statute of Labourers was passed by the English government, disability discrimination has been in evidence. This law made it illegal to give money to beggars who could work, while those with disabilities were still legally able to beg and receive money, reflecting the assumption that people with ID or physical disabilities could not work. This was the first occasion on which differential treatment of those with disabilities was written into law (BCODP, 1997). It was not until the 1970s, in the United States, that the first serious discussions and analyses of disability discrimination emerged. Demonstrations were held by a group of individuals from the city of Berkeley, California, about the rights of disabled people. The group took practical action, such as building their own ramps to ensure their access to buildings on the Berkeley University campus. Soon after the Vietnam War, disabled soldiers joined the movement, which resulted in added pressure on the US government. It was not until 1990 that the US government passed the Americans with Disabilities Act (BCODP, 1997), but this Act resulted in disabled people gaining legally enforceable rights. In contrast, the UK's Disability Discrimination Act, passed in 1995, allows for people with disabilities to be treated as "unequal" in some circumstances (Oliver, 2016).

In 2020, the UK's Disability Discrimination Act turned 25 years old. Its 20th anniversary, in 2015, garnered much attention and was widely seen as a celebration for disabled people. However, Mike Oliver (2016) suggests that this is not the case, with the Act a rather disloyal approach to the aims and desires of disabled people. Both the Statute of Labourers and the 1995 Disability Discrimination Act assume that disability is an individual's personal problem. The British Council of Organisations of Disabled People (BCODP) was founded in 1981 with the intention of giving a voice to discontented disabled people across the UK; and today, there are over 70 of these groups (BCODP, 1997). In 1991, the BCODP published a book (Barnes, 1991) detailing the outcomes of their research, providing substantial evidence of the discrimination that disabled people still face, and the government took action with the creation of the Disability Discrimination Act four years later (Oliver, 2016).

The BCODP state that the government, as well as many professionals and academics, still have a view of disability as a personal tragedy and an individual problem. This leads to the assumption that those with disabilities cannot participate fully in society due to the psychological or physical limitations caused by their disability. The BCODP gives voice to people with disabilities who argue that it is not their own personal limitations that prevent their full participation in society, but rather the social restrictions enforced by society itself. This leads to the conclusion that “disability is therefore a form of social oppression” (UPIAS, 1976). The notion of being disabled by society’s barriers – as opposed to the individual disability itself – is often referred to as the "social model' of disability. Physical barriers such as high-rise buildings without lifts or ramp access can disable someone who uses a wheelchair. In this scenario, the wheelchair is often seen as the problem – and not the stairs. When a person with ID wishes to be employed but struggles to complete an application form, the employer will blame the individual and not the form. The idea that those with disabilities are not as "able" as the rest of society is referred to as the "medical model" of disability (BCODP, 1997). Mike Oliver, writing in 1986, states that the academic research published before then had worked almost entirely with the "medical model", while those living with disabilities had been actively promoting the "social model".

Some have argued that those with disabilities have "special" needs and thus require "special" treatment or equipment to fully participate in society (BCODP, 1997). The belief that it is those with disabilities who must be changed – rather than the environment which must be adapted – has always been prevalent. However, it can be argued that "special" equipment is required by everyone throughout their lives. The BCODP (1997) gives the example of everyone requiring light in order to see during the night: rather than everyone using headlamps after dark, action was taken with the implementation of streetlights and electric lighting throughout buildings. In short, the environment was changed, not the individuals. This is the type of environmental solutions that the BCODP fights for. A society run by non-disabled people often ignores the needs of those with disabilities.

For these reasons, it is imperative that research into adults with ID is as inclusive and accessible as possible, with a person-centred approach taken throughout the entire process. Applying the concept of "no decision about me without me*"* (Powell & Gheera, 2011), the research in this area must involve adults with ID to ensure that that they are informing the research process as active participants, rather than being passive objects of the study (NDA, 2009). The UK Research Governance Framework for Health and Social Care (Department of Health, 2005) seconds this, adding that the involvement of adults with ID – and the use of their input to create study designs – is the gold standard for research with this population group.

Historically, it has been commonplace for the views of people with ID to go entirely unrepresented in these discussions (Atkinson, 2004). Self-advocacy groups began forming in the 1980s. These groups invited those with ID to talk about their lived experiences from a place of empowerment, rather than speaking as a "victim" or a "case" (Atkinson, 2004). This was one of the first occasions on which this population group was given the opportunity to express themselves, demonstrating their unique personal identities, social backgrounds, race, and gender, rather than being treated solely on the basis of their ID diagnosis. Today, as documented by Atkinson and Williams (1990) in their anthology, *Know Me As I Am*, people with ID are increasingly collaborating on research investigations (Atkinson, 2004). Nonetheless, there is always more that can be accomplished and higher standards that can be reached. Atkinson and Walmsley (2010) argue that, despite the challenges that can arise when conducting research collaboratively with people with ID, it remains of the utmost importance and relevance to do so.

5.1.2 Co-research with Adults with Intellectual Disabilities

To undertake high-quality qualitative research with adults with ID, it is important to look at the evidence-based recommendations available. Kaehne and O'Connell (2010) identified four key aspects critical to the planning and conducting of research with adults with ID. These were; the level to which a participant's ID could impair their ability to respond and participate, the use and role of advocators in focus groups, the "overuse" of pre-existing capable groups of adults with ID in research, and the ethical difficulties of obtaining consent. The authors note three attributes required for a successful focus-group discussion amongst adults with ID: the capacity to reflect on their own views and those of other participants, to communicate in an engaging way with one another, and to explore the given topic of the focus group with minimal input from the moderator. An important factor to consider is how the differing levels of ID within the participant group could affect the degree to which they are able to engage in the research. McLean et al. (1996) observe that elements such as age, living conditions, and level of ID can have an impact on how effectively participants can communicate. With communication being at the core of the focus-group methodology, this is a vital aspect to consider. Though there are obvious challenges to overcome, the methodological strengths and weakness within this population are possible to improve upon and can still elicit data (Kaehne & O'Connell, 2010).

In a systematic review examining co-research with adults with ID, Di Lorito et al. (2017) found four barriers to co-research that are common in the existing literature: differing cultural views, the extent to which "full involvement" is defined, increased research costs, and the additional planning time required. Cultural views, such as the notion that adults with ID are unable to think independently or at least not encouraged to do so, can have an effect on the power differentials between participant and researcher (Strnadova et al, 2013). For co-research to take place, it is necessary to change this culture. To ensure inclusivity, co-researchers with ID should be involved for as much of the research process as possible – from the development stage through to the dissemination of the research. However, Di Lorito et al. (2017) identified several issues preventing "full involvement", and these issues will be examined further in the discussion section. Research costs can be an additional barrier to co-research due to the conflicting schedules of researchers and adults with ID, who often have complex day-to-day schedules in residential care, which can add weeks or even months to a project's timeframe (Kramer et al, 2011). Additionally, the creation of research settings that accommodate adults with ID can have a large impact on a project's budget (Burke et al, 2003). Extensive planning is required, not just for the research costs but also for additional practicalities that arise when working with adults with ID, such as the need for transport and assistance from staff and carers throughout the research process (Burke et al, 2003).

Despite these aforementioned limitations, there are numerous benefits of co-research with adults with ID. These include the feelings of empowerment that co-researchers with ID can experience when taking part in research that could have a positive effect on their communities (March et al, 1997), as well as the benefit to the research itself of including the lived experience of the co-researchers (March et al, 1997). In addition, Di Lorito et al. (2017) report that academic researchers may experience a change of opinion due to their experiences of conducting research with adults with ID (Chapman, 2013). Owing to this potential outcome, co-research should perhaps be considered the gold standard of ID research.

5.1.3 Challenges in Intellectual Disabilities Research

Conducting intervention studies for adults with ID has been seen as a challenge (Sigelman et al, 1982, Biklen et al, 1988). Owing to the need for reliance on staff and carers, combined with the rigorous informed consent procedure, researchers are faced with numerous issues when conducting research on this population group (Hamers et al, 2018). A different skill set is required and academics undertaking this research need to be adaptable and able to use environmental solutions to any problems that arise. This may be one reason why intervention studies for adults with ID are sparse – and studies including adults with severe ID even more so (Oliver et al, 2002). This intervention group is in receipt of treatment by the mental health services, which raises ethical challenges when undertaking research. As a result of this, this group have become one of the most widely ignored study populations (Reed, 1997). The framework for Research Governance for Health and Social Care (Department of Health, 2005) defines research as "the attempt to derive generalisable new knowledge by addressing clearly defined questions with systematic and rigorous methods". This is intended to cover all methodologies – from qualitative to quantitative and including mixed method approaches. It can be challenging to undertake high-quality research studies with adults with ID due to ethical issues around the need for informed consent, the potential participants' living conditions, the reliance on professional and qualified staff, and the common challenging behaviours of people with ID that researchers may not have previously experienced first-hand (Hamers et al, 2018).

Additionally, carers and other health professionals, in their roles as "gatekeepers", may act as barriers between adults with ID and the researchers who wish to work with them (Becker et al, 2004). There are numerous methodological challenges when undertaking research within this population group. For example, given the wide range of terms defining this group, identification and sampling methods can make representation a challenge. Usually, it is only adults with mild ID who are included in research (Becker et al, 2004); and there are further challenges in the assessment of mental disorders and the appropriate use and adaption of the assessment tools available.

5.1.4 Study Design

For research into yoga, a mixed methods study design would be beneficial. This is because some aspects of yoga – such as the effects of the relaxation and meditation elements – are difficult to measure quantitatively (Kishida et al, 2018). Since the 1990s, the collection of qualitative data from adults with ID has contributed to understanding of this vulnerable population group's lived experience; and at times, it has put those with ID in the position of a key contributor (Atkinson & Walmsley, 2010). Quantitative data can be gathered from outcome measures such as blood-pressure readings and numerical mood-rating scales, but participants' experiences are best collected via qualitative measures. Until the mid-1990s, others would typically report the lived experiences of those with ID on their behalf, while the people with ID themselves remained silent (Thomas & Ryan, 1998). To understand the experiences of those with ID who take part in the research interventions, it is useful to record the voices of the participants as qualitative data. The lived experiences of those with ID are increasingly being documented, but the experiences of taking part in interventional research studies and the personal experiences of the effects of the consequent interventions have not been as readily reported (Beail & Williams, 2014).

There is a paucity of work investigating how people with ID and associated mental health conditions may benefit from group-based interventions. To implement psychosocial mental-health interventions for adults with ID, high-quality research is needed to evaluate these interventions. Decisions about the interventions to be researched should be informed by feasibility studies (Bowen et al, 2009). Bowen et al. (2009) state that, to ensure feasibility studies reflect the population group they are researching, researchers must work collaboratively with the population group throughout the process. This is in accordance with the recommendations of the UK Research Governance Framework for Health and Social Care

(Department of Health, 2005), which states that adults with ID should be active participants in any research about them.

The Medical Research Council (MRC) guidance for developing and creating complex interventions (Craig et al, 2008) states that feasibility studies to test study procedures and interventions should be conducted prior to any larger study. Feasibility studies can gather important information and recommendations for larger studies, such as likely rates of recruitment and participant retention. Most importantly, they can examine how an intervention is received and how best to implement the intervention for examination by larger studies. Methodological research conducted by Eldridge et al. (2016) found that this crucial preparatory work is often done sparingly. A combination of quantitative and qualitative measures is likely to be required to identify any barriers to participation (Craig et al, 2008). The results of a mixed methods feasibility study may indicate that a series of studies is required to refine the study design prior to conducting a full-scale evaluation of an intervention (Craig et al, 2008).

5.1.5 Qualitative Data and Focus-group Discussions

As mentioned in section 5.1.3, numerous challenges arise when conducting research with adults with ID, and the collection of qualitative data is the most complex of these. For a feasibility study, a mixed methods approach allows the researcher to gather as much initial data as possible and enables the evaluation of various data-collection methods. Though the literature on specific methodological recommendations for qualitative research with this population group sparse, some guidance can be drawn from the available literature. Beail and Williams (2014) found that there are increasing numbers of qualitative studies of adults with ID, though these still make-up a minority of the published papers. Qualitative studies in ID research have examined a wide range of topics; therefore, it is not yet possible to review any particular body of research (Beail & Williams, 2014).

Focus groups are a commonly used qualitative research method, enabling the elicitation of participants' views and experiences of an intervention (Kroll et al, 2007). This method has been developed and refined over the years and is now seen as an integral part of the qualitative-research field (Kitsinger, 2006). As observed by Kaehne and O’Connell (2010), focus groups allow participants to feel empowered, which is of particular benefit to adults with ID, for whom inclusivity in research is of the upmost importance. In line with other elements of ID research, the documentation of focus-group methodology in adults with ID is not as readily available as data pertaining to methodology of focus groups in the general population (Kaehne & O’Connell, 2010). The purpose of focus groups for adults with ID is the same as it is for the general population. As mentioned in section 5.1.2, it is vital to include adults with ID in the research process because research should not be conducted *on* adults with ID, but rather *with* them (Northway, 1998). Ruth Northway (1998) highlights the necessity for a release of control in participatory research, with the introduction of an element of fluidity. For this reason, a focus group is a useful qualitative method for a feasibility study, particularly when working with adults with ID.

Though there is a lack of methodological recommendations, Fraser and Fraser (2008) and Barr et al. (2003) have shown that focus groups are effective for use in research concerning adults with ID. For this reason, they have become the preferred method of data collection for studies of this population group (Llewellyn & Northway, 2008). Kaehne and O’Connell (2010) report that, although data has been collected via focus groups, very few studies report whether the participants' ID had an impact on the efficacy of the method. A rare anomaly in this field is a paper by Penny Llewellyn (2009), which details her work with focus groups in three different settings and compares the impact on that data of the medical and social models of disability.

There are some factors to consider prior to undertaking a focus group with adults with ID. Traditional focus groups usually use audio recordings – and often, video recordings as well (Kroll et al, 2007). For adults with ID, speech difficulties and impediments must be considered, and recording equipment will need to be high quality to ensure the clarity needed for transcribing purposes. The use of video recording should also be discussed with participants, as this can be intimidating or even intrusive, inhibiting the participants' ability to be open and relaxed (Beail & Williams, 2014). Difficulties with maintaining attention and managing fatigue will also need to be considered during the study design phase. Some participants may have trouble focusing on one given topic, and others may find themselves focusing on the semantics of a comment or point of view shared by another participant (Kroll et al, 2007). To address these factors, a high degree of skill is required on the part of the researcher.

In research, regardless of the population under study, a common query is how large the focus group needs to be. Guidelines from exploratory texts on focus groups (Kitzinger, 1995, Morgan, 1998) state that 4-12 participants is ample for a focus-group discussion. However, it might be concluded that, due to the aforementioned challenges, a smaller group of participants is preferable for a focus group with adults with ID. Spending more time with fewer participants could enable participants with ID to feel less intimidated, more relaxed, and better able to open up about their experiences, as well as allowing time for repetition of questions where required. Barrett and Kirk (2000) and Seymour et al. (2003) provide support for this view, stating that focus groups comprising adults with developmental difficulties or cognitive impairments should generally be smaller than other groups. Other factors to consider are the additional time required by this population group (Barrett & Kirk, 2000), the need to manage the fatigue that adults with ID are more likely to experience, and any physical discomfort caused by participants' comorbidities.

5.1.6 Feasibility

A feasibility-study structure was used because the intention was to test the interventions for their acceptability and possible rates of participant recruitment and retention. Methodological research suggests that this essential preparative work is often lacking (Eldridge et al, 2016). The methodology presented in this chapter is not a scale model of a larger study, but it was designed to address the main issues that arose during the research documented in the literature review and both systematic reviews. The main issue was a lack of published research, and further challenges included the need to obtain informed consent and to adapt the interventions to this particular population group. The Medical Research Council’s guide to developing and evaluating complex interventions (Craig et al, 2008) was followed for this study. For the study design, "The Framework of Actions for Intervention Development", as detailed in the 2019 update of the guidelines, was followed (O’Cathain et al, 2019). This framework details the 11 steps of designing a study prior to the commencement of a feasibility study. These steps include reviewing the literature, preferably by use of a systematic review, and drawing on existing theories to identify how the implementation of the intervention would work in the "real world" (O’Cathain et al, 2019).

Additionally, the NICE guidelines on "Mental Health Problems in People with ID: Prevention, Assessment and Management" (2016) were also followed. The guidelines emphasise the need to pay close attention to the communication needs of the participants, and this was incorporated into the study design by adapting the recruitment process to accommodate participants' decision-making capacities. The intervention setting was considered in accordance with the NICE guidelines (2016), with special consideration given to the adaptability of the intervention itself, as detailed below.

In contrast to a pilot study, a feasibility study is iterative and adaptive (Bowen et al, 2009). A feasibility study asks whether something can be done, with the goal of identifying whether it is worth proceeding with the research. A pilot study asks the same question, but a pilot study is part of the design of a future (larger scale) study. A feasibility study can employ a flexible methodology (Arian et al, 2010). Hagen et al. (2011) use the term "kinaesthetic learning" to describe the developmental learning process that comprises a feasibility study. Researchers (Bowen et al, 2009) have observed that the effectiveness of an intervention can be enhanced by conducting careful feasibility studies prior to larger scale randomised controlled trials (RCTs). Bowen et al. (2009) state that feasibility studies are valuable when partnerships within a community need to be established, increased, or sustained. Additionally, when there is limited existing data on the use of a specific intervention – and there are few, if any, published studies – a feasibility study can provide great value. This study addresses aspects of research such as the acceptability of the intervention, participant recruitment and retention, as well as the practicality and adaptability of the intervention for adults with ID.

5.1.7 Recruitment

The National Disability Authority (2019) promotes two core values of research with adults with ID: these are to promote the wellbeing of any participant involved in or affected by the research process and, second, to respect the dignity, autonomy, and equality of all those involved (NDA, 2019). These core values were upheld throughout the research process by an ongoing consent process with the participants, thereby encouraging autonomy. By repeating questions, the researcher was able to ensure the participants' understanding of the study and why they had chosen to take part. To further respect and accommodate the participants, the locations within the facility for the yoga sessions and focus-group discussions were decided the participants. To maximise inclusivity, easy-read documents were used at all times – from the participation form to the consent document.

Respect can be shown to adults with ID by including them in research studies as informants, as opposed to research participants. This collaboration between the researcher and participant can increase the quality of the research, as well as aiding in the recruitment of participants and the obtaining of their informed consent (Pollard, 2002). While numerous studies have evaluated methods of obtaining consent from adults with ID, the recruitment processes used in feasibility studies are rarely discussed in the literature (Swaine et al, 2011). A review by Cleaver et al. (2010) found that enrolment rates were highest when adults with ID were contacted or spoken to directly. In these scenarios, enrolment rates increased by 90%. Some researchers have reported that including staff, family, and carers in the initial discussions around the research study may also reduce some of the barriers to recruitment (Becker et al, 2004). Educating staff, family, and carers about the research design and process can also empower them to answer any questions from the participants with ID (Horner-Johnson et al, 2009).

5.1.8 Ethical Considerations

The best practice for including participants with ID in research studies has been described by the International Association for the Scientific Study of Intellectual Disabilities (IASSID). The IASSID (2003) states that the process of obtaining consent must be fully informed, voluntary, and free from coercion. Section 3 of the Mental Capacity Act (2005) states that researchers must stay alert to any changes in verbal or non-verbal behaviours that may signify the participant's desire to withdraw from the study. Dobson et al. (2008) recommend that potential issues such as these are addressed in any ethics application concerning research with adults with ID. See the Appendix 10.5 for the ethics certificates.

There are two steps to gaining consent. First, the participant takes the decision to consent, and then the researcher makes a judgement on the quality of this decision and identifies whether the participant is able to consent to take part (Dobson et al, 2008). In work with adults with ID, it can be useful to add an additional step that involves asking the participant screening questions (Horner-Johnson & Bailey, 2013). These would be basic questions about the research study, the answers to which would either have been provided in an information leaflet or previously given by the researcher. These screening questions would be asked to gain an sense of the potential participant's level of understanding of the research. This would allow the researcher to make an informed decision about the validity of their decision to consent.

5.1.9 Mental Capacity Act (MCA)

Mental capacity is the ability to make a decision (MCA, 2007). The Mental Capacity Act (MCA, 2005) provides a framework that enables professionals and researchers to make guided decisions about potential participants' ability to consent. There are five main principles of the MCA (2005). The first is that every person should be assumed to have capacity, unless it is proven that they do not. This principle is in line with the NDA core value of inclusivity (NDA, 2019), which allows all adults with ID the opportunity to take part in research and discourages assumptions about their inability to consent. Second, no person should be treated as unable to consent until all efforts have been made to help this person make a decision and no progress has been made. Promotion of autonomy via the use of easy-read leaflets and study materials can aid participants in the decision-making process. Third, even if a person makes an unwise decision, they are not to be treated as unable to make a decision. Respect is given to all participants, regardless of whether they choose to take part in the research study. Another principle is that any decision taken on behalf of someone who cannot consent should be in that person’s best interest. Finally, when someone lacks capacity to take decisions, the person taking the decision on their behalf should identify the least restrictive option for that person and assess whether a decision needs to be taken immediately or if the individual could be assessed for capacity at a later date, prior to taking any decision on their behalf (MCA, 2005). The final principle is upheld via the ongoing consent process detailed below in section 5.3.6.

In the past, an assumption of lack of capacity was the initial stance when working with this vulnerable population group. In contrast, the first principle of the MCA (that one must not assume someone lacks capacity) must be emphasised when conducting research with adults with ID. However, this position is not promoted by section 2 of the MCA (2005a) which states, "a person lacks capacity if he is unable to make a decision because of and impairment or disturbance in the functioning of the mind or brain" (MCA, 2005a). With the DSM-5 defining ID as "a deficit in intellectual functioning*",* it is clear why this assumption that adults with ID lack capacity would be made. However, this group of people deserves high-quality research. Most of the literature reviewed in the previous chapters notes the challenges of undertaking research with adults with ID, but although such challenges undoubtedly exist, it is imperative that inclusive research is done, as discussed in section 5.1.2. We know that adults with ID can be the best commentators on their own experience (Atkinson & Walmsley, 2010), and to deny them the opportunity to collaborate in research about them would be unethical.

MENCAP (2008) and the NICE guidelines for mental health problems in people with intellectual disabilities (2016) provide recommendations for presenting research-related information to potential participants who have ID. Pictorial information sheets and easy-to-read leaflets – such as those used by the NHS (NHS England, 2018) – have been shown to be beneficial; and it is recommended that information is separated into digestible sections. This appears to increase understanding of the purpose of the research studies (Dean et al, 1998; Wong et al, 2000). See Appendix 10.2 and 10.4 for the easy-read documents used in this study.

5.1.10 Acquiescence

Another principle to consider when seeking research consent from adults with ID is acquiescence. Acquiescence is the act of acceptance with protest (Goldsmith et al, 2008). Keywood et al. (1999) and Morris et al. (1993) have discussed this issue, noting that participants felt that they had no choice in their treatments and that their voices would not matter if they changed their mind about participation. Participants from two studies by Arscott et al. (1998,1999) were reported to lack understanding that changing their minds or withdrawing from the study was even an option. The addition of a consent-screening process that asked participants to confirm their understanding of what taking part would entail could reduce the risk of acquiescence among potential participants. In addition, Dye et al. (2007) found that, though some potential participants are confirmed as unable to give consent, they may still wish to take part in the study.

5.2 Method

As shown in the reviewed literature, adults with ID need unique consideration when taking part in research. For this reason, the following section details the step-by-step process of the methodology used for this study. Triangulation was required to combine different approaches and theories for collecting data and analysing the feasibility of the intervention. A mixed methods approach, combining quantitative, qualitative, and personal reflection methods was used, as informed by the literature presented in chapters one and two.

A mixed methods approach was used to gather the maximum amount of data for the feasibility study and enable a fuller understanding of any potential contradictions between the quantitative and qualitative findings. There are five primary styles of mixed methods research design from which to choose: convergent design, explanatory sequential design, exploratory sequential design, embedded design, and multiphase design (Wisdom & Creswell, 2013). A single style or combination of styles can be used, depending on the research questions being asked. For this study, a convergent design was implemented, which involves the collection of both quantitative and qualitative data. The qualitative data tells us about the participants' personal experiences of the interventions, while the qualitative data reveals the impact of the intervention on the outcome measures. This combination of data can help to provide a comprehensive view from which to draw conclusions about the feasibility of the study. A mixed methods design also provides methodological flexibility, which is imperative in a feasibility study.

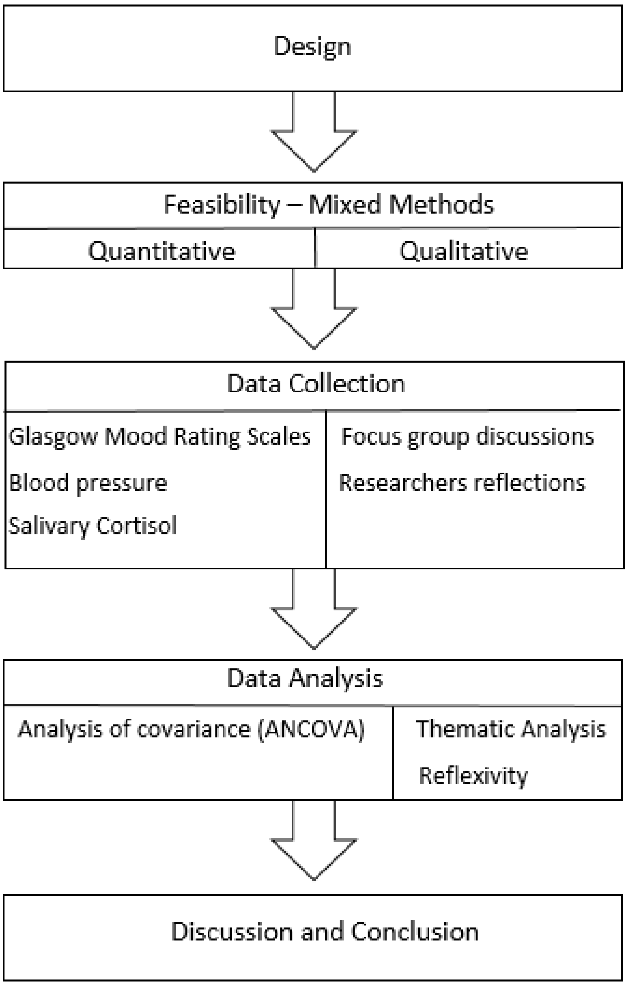

Figure 3: Study design.

5.3 Recruitment Procedure

As part of the recruitment process, posters (Appendix 10.1) were printed and distributed in local community centres and outpatient day centres attended by adults with ID in the southwest region of England. This area was chosen in relation to the researchers' accommodation and was a convenience sample at this stage of the feasibility study. Educational centres that run courses for adults with ID were also approached. Initially, three sites were secured for the study, with each site offering a separate intervention. However, due to logistical challenges associated with scheduling the day-to-day routines of the adults with ID, it was decided that the entire study would take place in one location. Two of the sites could not accommodate the time required to implement a yoga intervention into their timetables. It was stated that this could have been possible with a year's notice for them to schedule it into their academic timetable, unfortunately, this did not correlate with the time scales available for the study. In accordance with NDA core values (2009), the participants of the remaining study site chose the locations within their facility (a day-care centre and residential facility) for the yoga sessions and focus-group discussions.

Potential participants attended a focus-group meeting in which the feasibility study was explained and discussed and easy-read participation information sheets (Appendix 10.2) were handed out and read aloud. Staff and carers were also invited to the meeting and included in this initial focus-group discussion, due to the aforementioned conclusions of Cleaver et al. (2010) and Becker et al. (2004) in section 5.1.7.

Following the UK Research Governance Framework for Health and Social Care (Department of Health, 2005), a collaborative approach was taken throughout the study, right from the recruitment stage. McClimens (2008) states that collaborating with potential participants in this way provides opportunities for shared learning experiences and increases knowledge production and dissemination of the research. This encouragement of participant involvement is now part of mainstream policy (Hodge, 2006). UK charities and improvement agencies such as the Social Care Institute for Excellence (SCIE) require that research conducted with adults with ID is a collaborative process, ensuring that potential participants are involved throughout the entire process and that this is clearly demonstrated (SCIE, 2010). This initial focus-group discussion provided an opportunity for participant involvement right from the beginning of the research process, with participants encouraged to indicate their preferences for the timing and location of the intervention.

5.3.1 Inclusion Criteria

The inclusion criteria were informed by the previous literature. Participants had to be at least 18 years of age and have a clinical and confirmed diagnosis of an ID to be included in the study. Participants with mild, moderate, and severe ID were included. Information regarding the severity of their ID was obtained from their medical and/or social records. Additionally, participants would have to be available for the duration of the 6-week study and at the 4-week follow-up. Due to the aforementioned challenges with diagnosis of this population group, as reported in section 2.5, a formal diagnosis of anxiety and depression was not a requirement to take part in the study. Instead, levels of anxiety and depression were recorded at baseline using the Glasgow mood rating scales adapted for use with adults with ID. To be eligible to take part, participants had to be able to give consent themselves.

5.3.2 Exclusion Criteria

Adults with ID who could not give their own consent were excluded from the study. Of the 37 people who attended the facility, only 14 met this criterion. After the initial baseline measurements were taken, one participant withdrew from the study due to a change in his scheduling. Additionally, adults who had recently faced an acute stressful event or a significant loss of some kind were to be excluded from the study. This is because the effect of extreme variance could affect the results – for example, with skewed blood-pressure readings due to higher levels of stress, as well as increased salivary cortisol levels. Moreover, grieving the loss of a loved one, for example, would likely affect levels of depression and/or anxiety.

5.3.3 Participants

Thirteen participants aged 27-59 years were recruited to the study, with a mean age of 44.8 years old. The participants attended a day-care centre and residential facility for adults with ID in the southwest region of England. Most were male (10, 76.9%) and three (23.1%) were female. As this was a feasibility study, a large group of participants was not critical. This study was designed and undertaken to demonstrate the feasibility of the study design and merits of the LY intervention and to identify whether recommendations could be made for further studies with larger participant cohorts. All participants in the study had a clinical diagnosis of an ID, ranging from mild to severe, as defined by the DSM-5 (American Psychiatric Association, 2013). Five participants had a mild ID, four had mild to moderate ID, three had a moderate ID, and one participant had a severe ID. Two of the 13 participants had a diagnosis of Down's syndrome, six had autism, two had cerebral palsy, and one had Fragile X syndrome (Table 27). All adults attending or living in the residential centre must have a confirmed diagnosis of an ID. Therefore all participants included in the study were screened and confirmation was given in the form of their diagnostic records that they had an ID. Participants receiving daily medications were included in the study as long as there were no significant changes to their medication dose during the 10-week duration, as this could have affected their responses to the intervention.

Table 23: Participant demographics.

Participant	Group	Age	Sex	Diagnoses
1	Laughter Yoga	54	M	Moderate LD + Cerebral Palsy
2	Laughter Yoga	27	F	Severe LD + Autism
3	Laughter Yoga	48	M	Mild – Moderate LD + Autism
4	Laughter Yoga	38	M	Mild – Moderate LD + Cerebral Palsy
5	Vinyasa Yoga	59	M	Mild LD + Autism
6	Vinyasa Yoga	53	M	Moderate LD + Autism
7	Vinyasa Yoga	51	M	Mild LD + Autism + Acute and Transient Psychotic Disorder
8	Vinyasa Yoga	31	M	Mild – Moderate LD + Autism
9	Control Group	53	M	Mild LD
10	Control Group	37	F	Moderate LD + Downs Syndrome
11	Control Group	40	F	Mild – Moderate LD + Downs Syndrome
12	Control Group	46	M	Mild LD + Fragile X Syndrome
13	Control Group	46	M	Mild LD + Autism

5.3.4 Participant Allocation

The 13 participants were randomly allocated to one of three groups: *laughter yoga, vinyasa yoga,* or *the control group*. The names were written on folded paper, and a carer at the facility selected them in turn for assignation to a group. Due to the nature of the intervention, it was not possible to blind the participants to the intervention itself.

5.3.5 Ethical Approval

The research protocol was approved by the Coventry University ethics board. All participants completed the written informed consent form. Being a registered nurse as well as the researcher, the Nursing and Midwifery Council (NMC) code of conduct (NMC, 2018) was also followed. All stages of the study – from recruitment to dissemination of the results – were underpinned by ethical frameworks. The core values were those of the NDA (2009), described in section 5.1.7. These values involve promoting the wellbeing of any participant involved in or affected by the research process, as well as respecting the dignity, autonomy, and equality of all those involved (NDA. 2009). From the point of recruitment onwards, the participants' wellbeing and dignity was prioritised above all other elements of the research design. The following sections show how continued consent practices ensured the ethical participation of all individuals in the study.

5.3.6 Informed Consent

A considerable effort was made to ensure participants knew that participation in the study was voluntary and that there would be no negative consequences of choosing not to take part. This was done to reduce the risk of acquiescence. Participant information sheets (Appendix 10.2) and consent-screening questions (Appendix 10.3) were developed in accordance with the MENCAP (2008) easy-reading leaflet advice. Participant information sheets were pictorial, with easy-to-read text in a large font, as were the consent forms. These sheets were also given to staff and carers to be read and discussed at the initial focus-group discussion, and staff were briefed about the research. Prior to the consent forms being signed, seven consent-screening questions were asked of each participant to ensure they had a full understanding of what would be involved in taking part in the study and what would be required of them as a participant. At this stage, the potential participants read the participation form by themselves and then it was read aloud by me, and they were then asked the seven consent-screening questions. If they answered correctly, giving answers similar to those listed below, or demonstrated an understanding of the study, they were then given the consent form to sign. If they showed little to no comprehension of the study, they were excluded from participation.

Examples of consent-screening questions to verify potential participants' understanding:

Question – *“What type of yoga might you be doing as part of this study?”*

Correct answers – *“Laughter yoga or vinyasa yoga”, or, “Two different types of yoga”.*

Question – *“What can you do if you decide you no longer want to take part?”*

Correct answers – *“I can tell you”,* or, *“I can stop attending the yoga sessions”,* or *“I don’t have to do it if I don’t want to”.*

Question – *“What do I want to measure?”*

Correct answers – *“Blood pressure”,* or, *“My feelings/mood”,* or, *“You want to put a band on my arm to measure something”,* or, *“You want a saliva sample”,* or, *“You want some of my spit”,* or, *“You want to ask me easy questions about my mood”,* or, *“You want me to write down how I feel”,* or, *“You want to ask me if I’m happy or sad or worried”.*

All participants showed comprehension of the study and no potential participants were excluded at this stage. The ability to consent was assessed throughout the study in case comprehension changed for any participant. When the researcher believed that a participant's ability to consent may have changed, the researcher asked them the consent-screening questions again to assess this. Where this occurred, any data collected after this point was have been discarded. Signed, individual, informed consent forms were obtained from all participants in the study. The participation information sheets and consent forms were approved by the Coventry University ethics board (Project reference number: P67972). This project did not require approval from the NHS RECs ethical board or the Integrated Research Application System (IRAS) (Appendix 10.6). A form was completed on the Health Research Authority (2021) website (www.hra.nhs.uk), which resulted in the confirmation that NHS RECs and IRAS was not required. There were various reasons for the decision, including the fact that this study is not clinical and does not concern a medicinal or intrusive product. Equally, the study did not take place on an NHS site nor does it involve the use or storage of bodily material such as organs or the bodies of the deceased.

5.4 Study Design – Mixed Methods Feasibility

The initial focus-group discussion held prior to the commencement of the study was crucial to the study design. The participants were asked about the day and time they would prefer for the intervention, and they were invited to indicate the location in the building in which the intervention should take place. In line with the collaborative approach, it was imperative to build a rapport and engage in dialogue with the potential participants to ensure they felt comfortable voicing their preferences for the research design. Due to consent having not been attained at this stage, this initial discussion was not recorded. This feasibility study invited the participants to take part in either a weekly, 45-minute yoga class. While the participants were randomly assigned to the LY class, the VY class, or the control group, it was not possible to blind the participants to their treatment group. As this was a feasibility study and the first study of its kind on adults with ID, a weekly class was used for the intervention.

Table 24: Study schedule.

Study Dates										
April – June 2019										
G	**F/G**	**C/S**	**Wk 0**	**Wk 1**	**Wk 2**	**Wk 3**	**Wk 4**	**Wk 5**	**Wk 6**	**Wk 10**
LY	03/04/2019	11/04/2019	11/04/2019	18/04/2019	25/04/2019	02/05/2019	09/05/2019	16/05/2019	23/05/2019	20/06/2019
VY	03/04/2019	11/04/2019	11/04/2019	18/04/2019	24/04/2019	02/05/2019	09/05/2019	16/05/2019	23/05/2019	20/06/2019
CG	03/04/2019	11/04/2019	11/04/2019	18/04/2019	24/04/2019	02/05/2019	09/05/2019	16/05/2019	23/05/2019	20/06/2019

G = Group, F/G = focus group, C/S = consent session, LY = laughter yoga, VY = Vinyasa yoga, CG = Control group. Wk 0 – baseline, Wk 10 – follow-up.

The control group continued their treatment as usual and their normal daily activities. Most studies of yoga have an average intervention period of 6 weeks (Garfinkel et al, 1998; Tran et al, 2001), ranging from anywhere between 4 and 12 weeks (Sherman et al, 2005; Kirkwood et al, 2005). For this reason, the intervention ran over 6 weeks, with a 4-week follow-up at week 10. A sticker record sheet (Appendix 10.8) was given to each participant, and after each session, the participants were given a sticker for participating in the yoga class, as well as a sticker for each outcome measurement (i.e., blood-pressure, questionnaire completion, and salivary cortisol). At the end of the study, this sticker record was given to the participants to keep.

5.4.1 Procedure

This study had a total duration of 10 weeks: 6 weeks of once-weekly yoga and a 4-week follow-up at week 10. All outcome measures were recorded at baseline, and saliva samples and blood pressure were taken before and after each session. The Glasgow mood rating scales for anxiety and depression, the Glasgow anxiety rating scale (GAS-ID), and the Glasgow depression rating scale (GAD-ID) were completed by each participant at baseline, week 3, week 6, and week 10. Though 6 weeks may not show significant mental of physical health changes, it would give answers to the main research feasibility questions in regards to evaluation of the recruitment process as well as acceptability of the intervention and response to data collection methods. These are the main questions to be answered prior to a larger study.

5.4.2 Intervention

As the solo researcher in this study, I worked alone to implement the yoga interventions. This could have introduced the potential for bias, which is explored further in the discussion chapter. However, using set yoga sequences for each of the interventions (Table 30 and Table 31) incorporated some rigour into the intervention, leaving less room for bias.

Yoga teachers who have completed 200 hours of training are accredited by the Yoga Alliance, which upholds strict standards and promotes ethical practices. A professional yoga teacher is qualified to choose the yoga practice most appropriate for the unique abilities and interests of individual class attendees. As the researcher I am qualified 200-hour Yoga Alliance *hatha* and *vinyasa* yoga teacher (Appendix 10.11). Additionally, I had undertaken the required two-day LY leader training and the five-day LY teacher training (Appendix 10.10), which qualified me to lead the intervention in a professional manner. This qualification is accredited by the official founder of LY, Dr Madan Kartaria, and his University of Laughter.

Although numerous studies have assessed the effects of yoga, few have compared two styles of yoga, and none have specifically compared LY and VY. In a broad review of yoga research, Tiffany Field (2016) concludes that differing styles of yoga should be compared in this way, as it is possible that one particular style may have more benefits than another for a specific condition. LY is considered the most accessible and adaptable form, alongside VY, which is known for its accessibility to all skill levels (Fields, 2016).

Table 25: Study timeline and yoga-session scheduling for the duration of study, from baseline (week 0) to follow-up (week 10). Outcome measures and focus-group discussions included for the required dates.

Date	Week	Session	Measurements
11/04/2019	Week 0 – Baseline	Laughter Yoga 45minutes Vinyasa Yoga 45minutes Control group – measurements only	Glasgow mood rating scales Saliva samples Blood pressure
18/04/2019	Week 1	Laughter Yoga 45minutes Vinyasa Yoga 45minutes Control group – measurements only	Saliva samples Blood pressure
25/04/2019	Week 2	Laughter Yoga 45minutes Vinyasa Yoga 45minutes Control group – measurements only	Saliva samples Blood pressure
02/05/2019	Week 3	Laughter Yoga 45minutes Vinyasa Yoga 45minutes Control group – measurements only	Glasgow mood rating scales Saliva samples Blood pressure Focus group discussions
09/05/2019	Week 4	Laughter Yoga 45minutes Vinyasa Yoga 45minutes Control group – measurements only	Saliva samples Blood pressure
16/05/2019	Week 5	Laughter Yoga 45minutes Vinyasa Yoga 45minutes Control group – measurements only	Saliva samples Blood pressure
23/05/2019	Week 6	Laughter Yoga 45minutes Vinyasa Yoga 45minutes	Glasgow mood rating scales Saliva samples Blood pressure

		Control group – measurements only	
20/06/2019	Week 10 – Follow-up	Laughter Yoga 45minutes Vinyasa Yoga 45minutes Control group – measurements only	Glasgow mood rating scales Saliva samples Blood pressure Focus group discussions

5.4.3 Laughter Yoga (LY) Intervention Protocol

The 45-minute LY session consisted of three parts. Part one involved clapping and breathing exercises, while saying, “Ho ho, ha ha ha”, or, “Very good, very good, yay!” in sync with the clapping movements. This was done to prepare the participants for part two and give them a clear signal to return to between laughter exercises. Part two of the session consisted of 11 LY exercises (Appendix 10.9), and – to ensure the continuity and rigour of the research – these were of the same length and duration each week, across the entire study. Part three began with a laughter meditation and ended with a relaxation meditation.

5.4.4 Vinyasa Yoga (VY) Intervention Protocol

The 45-minute session began with breathing exercises, followed by 18 yoga *asanas* (postures). Each movement was linked with an inhale or exhale. The session concluded with a relaxation meditation.

5.4.5 Control Group Protocol

The control group continued their treatment as usual and did not partake in any yoga intervention. They continued whichever activity they would usually be doing at that time. However, they did attend before and after the yoga interventions to have their outcome measurements taken. To eliminate external variables and avoid skewing the results, the study participants in all groups were encouraged not to practise yoga outside of the intervention times for the duration of the study. This restriction was implemented, as if the participants were to have each undertaken different quantities of the intervention by partaking in additional yoga sessions outside of the study, an unbiased examination of the results would not have been possible. However, the day to day activities that the control group took part in whilst the yoga interventions were taking place were not recorded. Though it was confirmed that it was not yoga, it could not be ruled out that other activities such as recreational sport or crafts could have been taking place and have potentially had an impact on results. At the time of recruitment, no participants had previously practised yoga.

5.4.6 Yoga Session Sequences

Unfortunately, previous studies of yoga have tended not to provide details of the yoga postures used in the interventions. However, the meditation or relaxation element at the end of the yoga session has been shown to be beneficial (Patwardhan, 2016). For this reason, this element was included in both the LY and VY classes.

Table 26: Vinyasa yoga (VY) sequence.

Vinyasa Yoga – 45 minute session	
Deep breaths – 2 minutes	4 deep breaths
Deep breaths with arm raises – 1.5 minutes	4 deep breaths, raising arms when inhaling and lowering arms when exhaling
Inhale/Exhale and Shrink/Expand – 1.5 minutes	Inhale and expand body and arms to be as big as possible. Exhale and shrink body to be as small as possible.

Head circles – 1.5 minutes	Rotate the head round in a circle, ear to shoulder, chin to chest, ear to other shoulder. Repeat other way round.
Slow wide armed waves – 1.5 minutes	Arms out in front, stretched in a straight line, slow waving motion with the hands.
Wide clap and stretch – 1.5 minutes	Arms stretched out either side, draw arms slowly to the centre, slowly clapping palms together, repeat.
Circle shoulders – 1.5 minutes	Raise shoulders up to ears and rotate backwards, dropping shoulders down, repeat.
Small to big arm circles – 1.5 minutes	Arms stretched out either side, arms being to make smalls circles increasing to big circular movements.
Twists with hands behind head – 1.5 minutes	Place hands behind head, hips facing forward, twist torso side to side.
Banana stretch – 1.5 minutes	Arms up above head, palm to palm with hands, stretch to one side making curve with the side body. Repeat on other side.
Hands on back backbend – 1.5 minutes	Hands rest on lower back, hips gently forward for lower back bend.
Trikonasana – 1.5 minutes	Legs straight, arms out, one arm reaching forward one arm reaching behind, facing side of room. Repeat on other side.
Forward fold – 1.5 minutes	Legs and feet together, bend at hips, reaching arms down towards the floor.
Tall on toes – 1.5 minutes	Stand tall on tip toes, arms reach above head towards ceiling.
Warrior I – 1.5 minutes	Front leg in lunge, back leg straight, facing forward, arms reaching upwards in line with ears. Repeat on other side.
Warrior II – 1.5 minutes	Front leg in lunge, back leg straight, arms reaching arms out, one arm reaching forward one arm reaching behind, facing side of room. Repeat on other side.
Reverse Warrior – 1.5 minutes	Front leg in lunge, back leg straight, front arm reaching towards ceiling, back up resting on back thigh. Repeat on other side.

Tree pose – 1.5 minutes	Balancing on one foot, other foot placed on balancing leg, ankle, below knee or above knee. Repeat on other side.
Seated Knee Twist – 1.5 minutes	Sit down with one leg straight and one knee raised, twist torso in opposite direction to bent leg. Repeat on other side.
Seated Eagle leg twists – 1.5 minutes	Sit down with crossed legs, twist torso in opposite direction to top leg. Repeat on other side.
Eagle arm stretch – 1.5 minutes	Place one arm under the other, arms meeting at the elbows, bend at the elbows and join hands. Repeat on other side.
Meditation – 13 minutes	Relaxation and body scan

Table 27: Laughter yoga (LY) sequence.

Laughter Yoga – 45 minute session	
3 reasons – 2 minutes	Brief description of the 3 reasons why we practice Laughter Yoga.
Clapping warm up – 1.5 minutes	Palm to palm clapping.
“ho ho ha ha ha”- 1.5 minutes	Say “ho ho ha ha ha” in clapping rhythm.
“very good, very good, yay!” – 1.5 minutes	Say “very good, very good, yay!” while clapping and reaching arms up towards the ceiling on “yay!”.
Throat Laughter – 30 seconds	Place fingers on throat and say “he he he”, feel for vibration.
Heart Laughter – 30 seconds	Place hands on heart and say “ha ha ha”, feel for vibration
Belly Laughter – 30 seconds	Place hand on belly and say “ho ho ho” feeling for movement of breath
Handshake Laughter – 2 minutes	Shake hands and laugh
One Metre Laughter – 2 minutes	Measure a metre with your arms and laugh with fully extended arms.

Zip Up Laughter – 2 minutes	Inhale and zip up the body from waist to neck, laugh on the exhale
Mobile Phone Laughter – 2 minutes	Pretend to hold a phone and laugh
Prod and Jump Laughter – 2 minutes	Gentle prop someone with your finger, jump and laugh when prodded.
Milkshake Laughter – 2 minutes	Pretend to hold two glasses of milk and fruit, mix them up and laugh on the exhale when pretending to drink the milkshake.
Soup Laughter – 2 minutes	Take in turns to throw in vegetables to the soup mixture, mix it up and pretend to splash it on one another laughing.
Lion Laughter – 2 minutes	Place your hands as claws beside your face, sit out your tongue, stretch your face and laugh.
Laughter Mediation – 8 minutes	Laughter meditation
Meditation – 13 minutes	Relaxation and body scan

5.4.7 Measurement Tools

Both quantitative and qualitative measurement tools were employed to gather data in this feasibility study. In the following sections, each outcome measure is described, along with the tools used to assess them.

5.4.8 Quantitative Measures

5.4.9 Systolic Blood Pressure

A clinically validated, battery-operated blood-pressure monitor (Omron, M2, HEM-7121-E) was used to assess the participants' blood pressure before and after the yoga sessions and in the control group. The monitor meets the provisions of the European Committee Council Directives and Standards (Appendix 10.13). A manual sphygmomanometer was made available as a back-up, for use if the electronic model failed to work effectively, but this was not ultimately required. The British and Irish Hypertension Society performed a validation of the blood-pressure monitor. They produce the only independent, peer-reviewed list of blood-pressure monitors not governed by commercial interest. To be added to the list, monitors much comply with the European Society of Hypertension International Protocol for validation of blood-pressure measuring devices for adults (O'Brien et al, 2002). As the blood-pressure monitor works automatically, it must be re-calibrated at least once every two years. To ensure the most accurate results, the monitor was purchased just prior to the study commenced, which ensured that it had recently been calibrated.

Strandbreg and Pitkala (2003) state that systolic blood pressure should be considered the most important component of blood pressure. Epidemiological and treatment studies support this, recommending that systolic blood pressure be the focus of antihypertensive therapies (Strandberg & Pitkala 2003). Additionally, Blood Pressure UK (www.bloodpressureuk.org) state that systolic blood pressure is more important than diastolic blood-pressure, as blood-pressure of 160/80mmHg is less healthy than blood pressure of 150/90mmHg. As reported by Sever (2009), as age increases, the systolic pressure reading becomes a more accurate determinant of future cardiovascular events. For this reason, systolic blood pressure was documented and is analysed in the results of this paper. All blood-pressure readings were taken from the left arm of the participant while they were in the standardised seated position. One reading was taken pre-intervention and another post-intervention, as the participants requested that no others be taken.

5.4.10 Glasgow Mood Rating Scales for Intellectual Disability (ID)

The Glasgow mood rating scales (Mindham & Espie, 2003) adapted for adults with ID were used to measure the participants' levels of anxiety and depression. Self-report measures are important in the field of ID research, as they allow participants to play an active role in the data collection. They allow participants to document their emotional responses to – and perspectives of – the intervention. The accessibility of the self-report questionnaire is vital, and this needs to be given particular consideration when working with adults with ID.

Hermans et al. (2012) concludes that the Glasgow mood rating scales for anxiety and depression are the most reliable option (section 2.17.1). The scale consists of 20 items (GDS-ID) and 27 items (GAS-ID), with a three-tier answering scale, from 0 to 2 (0=*no*, 1=*sometimes*, 2=*a lot*). The assessment time is 5-10 minutes. There were prompts available for each question, if needed to help the participant to answer. For example, in the Glasgow depression scale, one question asks, "*Have you enjoyed doing things?*" For this, the prompt is, "*Have you had fun?"*

The Glasgow anxiety and depression scales (GAS, GDS) have shown satisfactory methodological quality, with strong reliability and validity (Mindham & Espie, 2003). As seen in Table 3 (section 2.17.1), the GAS-LD and the GDS-LD have good test-retest reliability (GAS-LD r=0.95, GDS-LD r=0.97) and internal consistency (GAS-LD r=96,GDS-LD r=0.90). Furthermore, only the Glasgow mood rating scales have been studied for sensitivity and specificity in comparison with qualified psychiatric diagnoses (Hermans et al, 2012). The GAS and GDS self-report forms were administered face-to-face with each participant at baseline,

week 3, week 6, and the 10-week follow-up. When possible, carers and staff assisted the participants with the completion of the questionnaire, utilising the given 'prompts' on the mood rating scales if required (Appendix 10.7).

5.4.11 Salivary Cortisol

Salivary cortisol was collected in the form of saliva samples from the participants of the LY and VY group before and after each yoga session. The control groups saliva samples were taken prior to the LY session and after the VY session. During this time they continued with their normal scheduled daily activities. The samples were collected in plastic Salivette tubes (Cat No. 51.1534, Sarstedt, Germany). The process involved chewing on a cotton swab for up to one minute and then placing this back into the Salivette tube. Participants were given the option of spitting in the tube if they preferred. After collection, the samples were immediately placed into a freezer at -20°C, ensuring all samples were analysed together on the same assay. They were later thawed, and the cortisol was measured with a salivary cortisol enzyme-linked immunoassay kit (Salimetrics, Item no. 1-3002-5, State College, PA, USA).

To test the hypothesis that LY could reduce levels of anxiety, depression, and stress in adults with ID, the participants' salivary cortisol and blood pressure were measured at baseline, one week before the study commenced. They were then sequentially measured before and after each of the six yoga sessions and at the follow-up. The Glasgow mood rating scales for anxiety and depression were completed at baseline, week 3, week 6, and the week-10 at follow-up, 4 weeks after the cessation of the study.

5.4.12 Qualitative Data Collection

There is little qualitative data exploring the effects of psychosocial interventions on mental health in adults with ID. An attempt was made to gather additional qualitative data from this population group via the group discussions. This was tremendously beneficial, providing a greater understanding of the participants' first-hand experiences of the yoga intervention.

Qualitative studies begin with a research question, so are no different in that respect to quantitative research and indeed feasibility research. The research question to be addressed by the qualitative data was '*what is the feasibility and scientific benefits of laughter yoga as a psychosocial intervention for adults experiencing depression and anxiety secondary to ID?'* The questions asked to participants were seeking to gain information to aid in answering this.The discussions were held after the yoga sessions and in the control-group measurement sessions at week 3 and week 10 (follow-up). N=8 participants took part. The discussions were held in a conversational manner, while the participants were waiting their turn for their outcome measurements to be taken. The qualitative data collection design was influenced by the literature reviewed in section 5.1.5. The participants were asked similar – though not identical – questions pertaining to their experiences, feelings, and views in relation to the study and the interventions themselves. The discussions were informal in nature, and participants were made to feel comfortable about contributing as much or as little as they wished. This was achieved by not repeatedly questioning participants who were less engaged. In addition, as the discussions occurred alongside the collection of the outcome measures, the participants could feel free to decide whether to engage or to just wait quietly for their blood pressure to be taken.

One of the difficulties with qualitative research is that it lacks a clear definition; it lacks a specific theory or paradigm, as well as a unique set of methodologies or practices (Denzin & Lincoln, 2011). There are several ways to collect and analsye qualitative data, with Glaser and Strauss's (1967) grounded theory being one of the most popular frameworks for analysis. They state that theoretical concepts should emerge from the data, untainted by what has gone before. For this reason and due to this being a mixed methods feasibility study, a grounded-theory approach was not possible as prior literature had already been reviewed in order to aid in the development of the research question and study design. Glaser and Strauss (1967) state that prior relevant literature only be read during the sorting phase, and it should be regarded as additional data to code and compare with what has already been coded from the qualitative data.

Consequently, after the initial transcription of the group discussions and familiarisation with the qualitative data, the Braun and Clarke (2006) method of thematic analysis was applied. Thematic analysis is used to systematically identify key recurring themes and concepts (Popay et al. 2006). The Braun and Clarke (2006) thematic analysis method is a six-step process. Step one is to transcribe and become familiar with the data by reading it through several times. Step two is to undertake coding of the data by highlighting reoccurring areas of discussion. Step three is to condense these codes into core themes. Step four requires reviewing the themes and step five is to define those themes. Step six is the action of writing up the results. Extracts of the transcribed data can then be used to reflect each theme in the results chapter, and the perceived relevance of the themes can be explained in the discussion chapter. Additionally, Braun and Clarke (2014) have reported that thematic analysis is a theoretically flexible technique that can be utilised broadly in health and wellbeing research.

5.4.13 Reflexivity

As recommended in the MRC guidance for complex interventions (Craig et al, 2008), a personal reflective diary was kept. The Gibbs reflective model was used (Gibbs, 1998). This model includes several stages (description, feelings, evaluation, analysis, conclusions, and personal action plan), allowing the researcher to compartmentalise aspects of their learning and experience. They slow down the thought processes and prevent conclusions being reached too quickly. Equally, as this feasibility study was the first to implement LY and VY interventions for adults with ID, it was important to document the process as comprehensively as possible, including the researcher’s own experience. This reflective journal could then be used as additional qualitative research data and examined alongside the other findings on feasibility. Though the Gibbs reflective model has not previously been used in a research process, it was shown in a recent study by Ibrahima et al. (2020) to enhance academic performance and increase "visual" thinking abilities in fourth-year biology students. As a feasibility study depends on a flexible research process, any reflective tool that promotes visual or flexible thinking can be valuable. Additionally, many solely qualitative studies also reflect the degree to which the researcher influences the shaping of the study and the findings. A primary tool in qualitative research is reflexivity (Beail & Williams, 2014), and a reflective tool would thus be beneficial for a mixed methods feasibility study. Personal and epistemological reflections are drawn upon in the results section, and this reflective journal is included in the analysis in the results chapters. Additionally, a reflection on the entire process of undertaking the PhD research is provided at the end of the thesis (section 8.4).

5.4.14 Statistical Analysis

Salivary cortisol was initially analysed using a salivary cortisol enzyme-linked Eliza immunoassay kit (Salimetrics, Item no. 1-3002-5, State College, PA). Prism was then used to analyse the preliminary cortisol level results. Further analysis was performed by SPSS. Analysis of covariance (ANCOVA) was employed to analyse the data. ANCOVA was conducted using SPSS to analyse all the quantitative data – including blood pressure, Glasgow mood rating scales for anxiety and depression scores, and salivary cortisol. The data did not violate normal distribution. A P value of less than 0.05 was considered significant. Skewness and kurtosis values were calculated to ensure the data was approximately normally distributed.

The questions asked of the data were whether there had been changes over time and if there were any differences between the groups in their respective levels of anxiety, depression, salivary cortisol, and systolic blood pressure. A repeated measures ANCOVA was conducted to identify any statistically significant differences between the three groups.

5.4.15 Thematic Analysis

With the participants' consent, the focus-group discussions at week 3 and week 10 were recorded using a voice recorder app on a phone, with the files transferred and held in a secure data file, in accordance with Coventry University data-storage policy. These discussions were then transcribed verbatim by the researcher. The qualitative data was transcribed using the aforementioned Braun and Clarke (2006) thematic analysis method. The transcriptions were read repeatedly and annotated. The codes were developed and then condensed into five main themes.

A thematic analysis is not usually recommended when there are fewer than five interviews (Fugard & Potts, 2015), but Braun and Clarke (2013) suggest that, for small studies, it is sufficient to have 6-10 participants for interviews or 2-4 for focus-group discussions. As the focus-group discussions included participants – and the study was seeking to examine feasibility – a thematic analysis was carried out and the findings are presented later. Each focus-group discussion was analysed in turn and gathered into a summary table (table 37), with the codes and themes highlighted.

To promote rigour in the qualitative data analysis stage, member checking was undertaken informally throughout the data collection process. There are a variety of member checking methods such as informally during the data collection, checking for understanding and clarification on answers as it goes along. Or, more formal member checking during follow up interviews or meetings. Member checks are also a way in which to involve participants in a collaborative data analysis process. Stevenson (2013) carried out member checking with young people with Down syndrome. Typed transcribed data was given to the co-researchers and they underlined what they found interesting or important. They worked alongside a university-based researcher who analysed part of the data using thematic analysis and the co-researchers participated in the iterative cycles of reflexivity in the thematic analysis process. When the ethics application was submitted for this study, no formal agreement was written in for me to access the participants again after cessation of the study at the data analysis stage. Therefore member checking could only happen informally at the time of data collection.

The results of the study are examined in the following chapter, beginning with the quantitative results (section 6.1), the qualitative results (section 6.2) and the feasibility results (section 6.3). These results are followed by a discussion chapter to consider their implications. Chapter 7 then presents a broader discussion of the mixed methods feasibility results collectively.

Both the quantitative and qualitative data analysis was conducted using a deductive approach. Prior literature reviewed in chapters two and three showed that yoga has shown benefits for mental health, due to LY being a form of yoga, following deductive reasoning, it can be thought that LY will have benefits for mental health. Though due to LY being in its research infancy and the population group being adults with ID, it could be argued that an inductive approach be used. Although an inductive approach requires less data initially, so far there is still too few observations or patterns drawn from the current available data on LY. Yet for other styles of yoga in for the general population there is plentiful. For this reason, though predominantly a deductive approach is used, as is the nature of scientific research, there is a slight interchange between deductive interpretation and inductive interpretation during analysis.

6. Results

This chapter presents the results derive from the quantitative, qualitative and feasibility data collection methods as described in the previous methodology chapter.

6.1 Quantitative Data Results

The Glasgow mood rating scales for anxiety and depression were used to assess levels of anxiety and depression amongst the participants. ANCOVAs were used to evaluate salivary cortisol levels and blood pressure over the 10-week study. ANCOVAs were additionally carried out on the Glasgow mood rating scores.

As explained in the methodological chapter, measurements were taken from all three groups in week 0, week 3, week 6, and week 10. The table below presents the comparative mean data on the participants' ages and outcome measures at baseline (week 0).

Table 28: Mean and standard deviation baseline data for all participants within each group, including age and outcome measures (blood pressure, anxiety, depression, and salivary cortisol).

Measurements at baseline					
Group	Age *M ± SD*	Systolic Blood Pressure (mmHg) *M ± SD*	Anxiety Scores *M ± SD*	Depression Scores *M ± SD*	Salivary Cortisol (nmol/l) *M ± SD*
Laughter yoga (n=4)	42 ± 10.30	160 ± 19.12	18.3 ± 9.47	9.6 ± 3.84	6.40 ± 1.70

Vinyasa yoga (n=4)	54 ± 3.40	122 ± 11.70	19.6 ± 13.71	8.5 ± 6.94	9.13 ± 1.84
Control (n=5)	44 ± 5.54	117 ± 17.46	11.2 ± 3.97	7 ± 4.43	8.52 ± 3.51

Shapiro-Wilk normality testing was carried out for each outcome measure in each group, and this showed that the vast majority of the groups were normally distributed. Skewness and kurtosis values were also calculated and indicated that the data was approximately normally distributed. Therefore, the assumptions of parametric testing were met and data analysis commenced with an analysis of covariance (ANCOVA). Covariates are commonly used as control variables. The baseline measurement was used as a covariate to control for initial group differences due to variability in the baseline scores. Adding in a covariate averaged the baseline data for the outcome measures. Additionally, box plots indicated that the data was approximately normally distributed (Appendix 10.15).

Levels of salivary cortisol and blood pressure readings were taken from baseline, post week-3, and post week-6 yoga classes, and at week 10 following a 4-week cessation of the yoga practice. This was in keeping with the schedule of completion for the Glasgow mood rating scales at baseline, week 3, week 6, and week 10.

Table 29: Mean data and standard deviation for remaining duration of study. Mean scores of the outcome measures (blood pressure, anxiety, depression, and salivary cortisol) and week 3, week 6, and week 10 (follow-up) are shown.

Measurements at week 3, week 6 and follow-up (week 10)												
Group	Systolic Blood Pressure (mmHg) *M ± SD*			Anxiety Scores *M ± SD*			Depression Scores *M ± SD*			Salivary Cortisol (nmol/l) *M ± SD*		
	Week 3	Week 6	Week 10	Week 3	Week 6	Week 10	Week 3	Week 6	Week 10	Week 3	Week 6	Week 10
LY (n=4)	102 ± 4.12 *	95 ± 3.11 **	108 ± 13.33	12.5 ± 6.42	14.8 ± 5.51	13.5 ± 2.61	9.8 ± 3.49	12.5 ± 5.59	7.5 ± 2.31	9.61 ± 0.76	10.13 ± 1.86	10.46 ± 1.33
VY (n=4)	115 ± 1.71	123 ± 9.91	131 ± 8.95	17 ± 10.7	20.6 ± 15.17	8 ± 8.51	6 ± 4.54	5 ± 6.81	4.6 ± 3.68	12.01 ± 2.13	7.83 ± 2.20	11.03 ± 1.11
C (n=5)	127 ± 17.72	115 ± 15.31	119 ± 18.55	11.6 ± 3.51	12.4 ± 5.64	9.8 ± 6.71	9.2 ± 3.81	4.4 ± 3.2	3.2 ± 2.71	7.88 ± 5.75	13.10 ± 7.22	9.69 ± 6.66

*LY = laughter yoga group; VY = vinyasa yoga group; C = control group; * significantly different to C at week 3, p =.049; ** significantly different to VY at week 6, p =.030.*

6.1.1 Blood Pressure

The baseline covariate for blood pressure was 132.2mmHg. A significant interaction between group and time was found for systolic blood pressure (*F*(6, 24) = 2.658; *p* =.040). Post hoc pairwise comparisons were then performed between groups using a Bonferroni adjustment, but no differences were revealed (all *p* >.05).

A less conservative approach was then applied to the post hoc pairwise comparisons (least significant difference method), and this revealed a significant difference in systolic blood pressure between the control and LY groups at week 3 (mean difference = 26 [95% confidence interval 0-51] mmHg; *p* =.049). Furthermore, at week 6, a significant difference in systolic blood pressure was revealed between the VY and LY groups (mean difference = 28 [95% confidence interval 4-53] mmHg; *p* =.030).

There was a main effect for time and a main effect of groups, with the LY group showing the greatest decrease in systolic blood pressure and a sustained decrease at the follow-up (week 10) measurements. No other differences were revealed in the pairwise comparisons using the least significant difference method (all *p* >.05). Figure 5 shows the effects of group and time for systolic blood pressure.

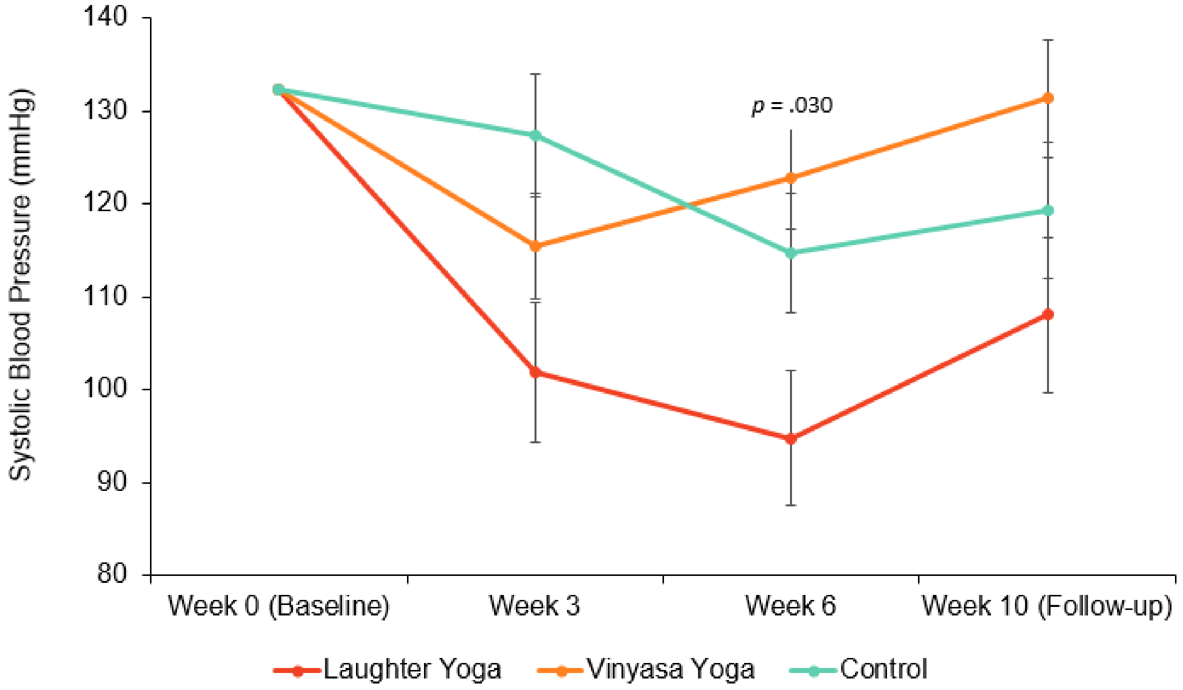

Figure 4: Systolic blood pressure (mmHg) readings from week 0 (baseline) to week 10 (follow-up). Data analysis using an ANCOVA. The baseline covariate for blood pressure was 132.2mmHg. There is a significant interaction between group and time F*(6, 24) = 2.658;* p *=.040). There was a significant difference in systolic blood pressure between the control and laughter yoga groups at week 3 (mean difference = 26 [95% confidence interval 0-51] mmHg;* p *=.049). Another significant difference in systolic blood pressure is seen between the vinyasa yoga (VY) and laughter yoga (LY) groups at week 6 (mean difference = 28 [95% confidence interval 4-53] mmHg;* p *=.030).*

6.1.2 Anxiety

The scores on the Glasgow mood rating scale for anxiety demonstrate a baseline covariate of 16.35, as calculated by ANCOVA. A GAS score of 15 or over indicates anxiety (Mindham & Espie, 2003). All groups begun the study with indicated anxiety, and all groups were below this at the time of the follow-up (week 10) measurements. No significant interaction between group and time was found for anxiety (*F*[6, 24] = 1.311; *p* =.290). Similarly, no significant main effect of group was found for anxiety (*F*[2, 8] =.352; *p* =.714).

However, there was a significant main effect of time found for anxiety (*F*[3, 24] = 4.369; *p* =.014). Post hoc pairwise comparisons were then performed between time points using a Bonferroni adjustment, which revealed a significant difference in anxiety between weeks 6 and 10 (mean difference = 5 [95% confidence interval 0-10]; *p* =.028). No other differences were revealed in the pairwise comparisons (all *p* >.05).

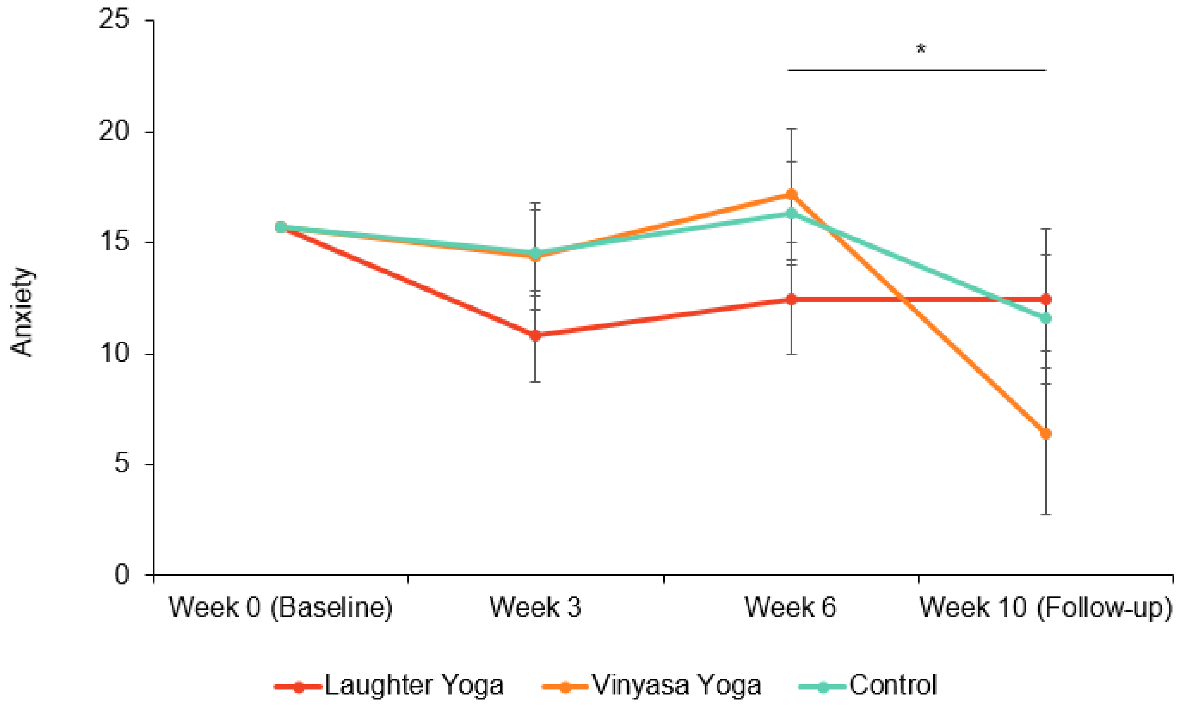

*Figure 5: Glasgow anxiety scale (GAS) for intellectual disability scores from week 0 (baseline) to week 10 (follow-up). A baseline covariate score of 16.35 was calculated by the ANCOVA. No significant interaction between group and time was found (*F*[6, 24] = 1.311;* p *=.290). No significant main effect of group was found (*F*[2, 8] =.352;* p *=.714). A significant main effect of time was found for anxiety (*F*[3, 24] = 4.369;* p *=.014). Post hoc pairwise comparisons using a Bonferroni adjustment revealed a significant difference in anxiety between weeks 6 and 10 (mean difference = 5 [95% confidence interval 0-10];* p *=.028). No other differences were revealed in the pairwise comparisons (all* p *>.05).*

6.1.3 Depression

For the depression results, the ANCOVA calculated a baseline covariate score of 8.37. There was no statistically significant interaction between groups or over time for levels of depression, (*F*[6, 24] = 1.340; *p* =.278). Similarly, no significant main effect of group was found for depression (*F*[2, 8] = 2.241; *p* =.169), and no significant main effect of time was found for depression (*F*[1.636, 13.088] = 3.030; *p* =.090).

A Glasgow depression scale score of 13 or over indicates depression (Cuthill et al, 2003). All groups were below this level at time of the follow-up measurements. At no stage was depression indicated in any of the groups. However, all groups had either a decrease in score or had returned to baseline measurements at the end of the study. Figure 7 shows the effects of group and time for depression.

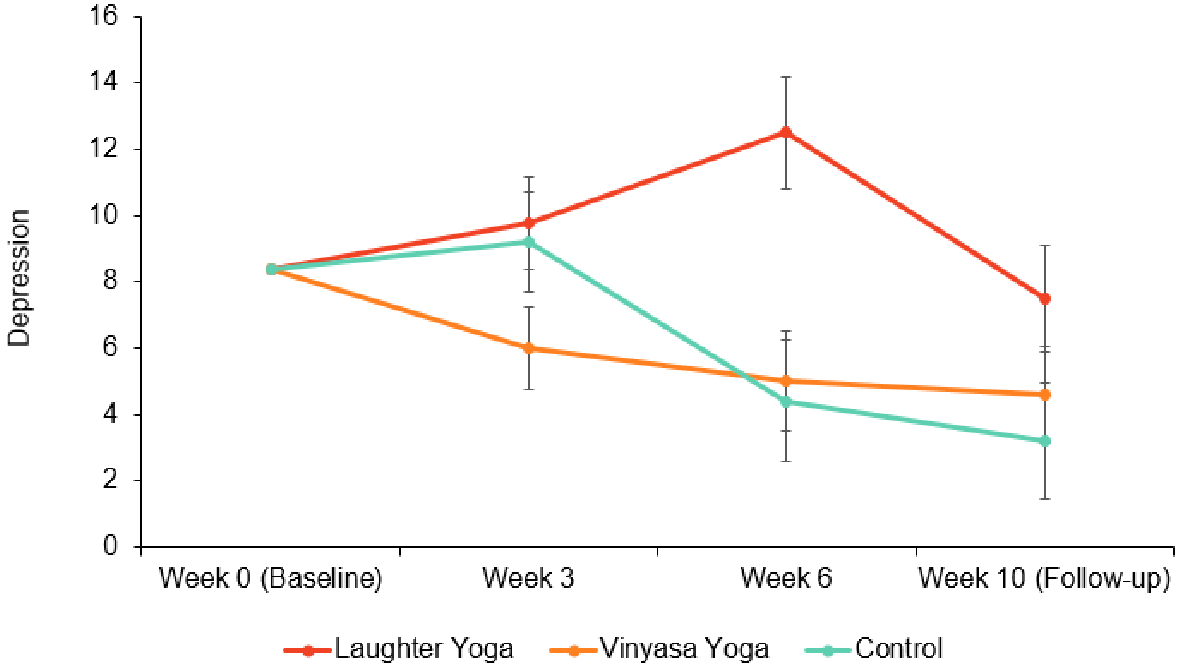

*Figure 6: Glasgow depression scale for intellectual disability scores from week 0 (baseline) to week 10 (follow-up). An ANCOVA baseline score of 8.37 was calculated. No statistically significant interactions were seen between groups or over time, (*F*[6, 24] = 1.340;* p *=.278). No significant main effect of group was found (*F*[2, 8] = 2.241;* p *=.169). No significant main effect of time was found (*F*[1.636, 13.088] = 3.030;* p *=.090).*

6.1.4 Salivary Cortisol

This section presents the data collected on participants' salivary cortisol levels. Figure 8 below presents the results obtained from the analysis of salivary cortisol. The covariate produced by the ANCOVA for this outcome measure at baseline was 8.07 nmol/l. As with levels of depression, there were no statistically significant interactions between groups or over time for salivary cortisol (*F*[6, 18] = 1.364; *p* =.281). Similarly, no significant main effect of group was found for salivary cortisol (*F*[2, 6] =.002; *p* =.998), nor was any significant main effect of time found (*F*(3, 18) = 1.108; *p* =.372).

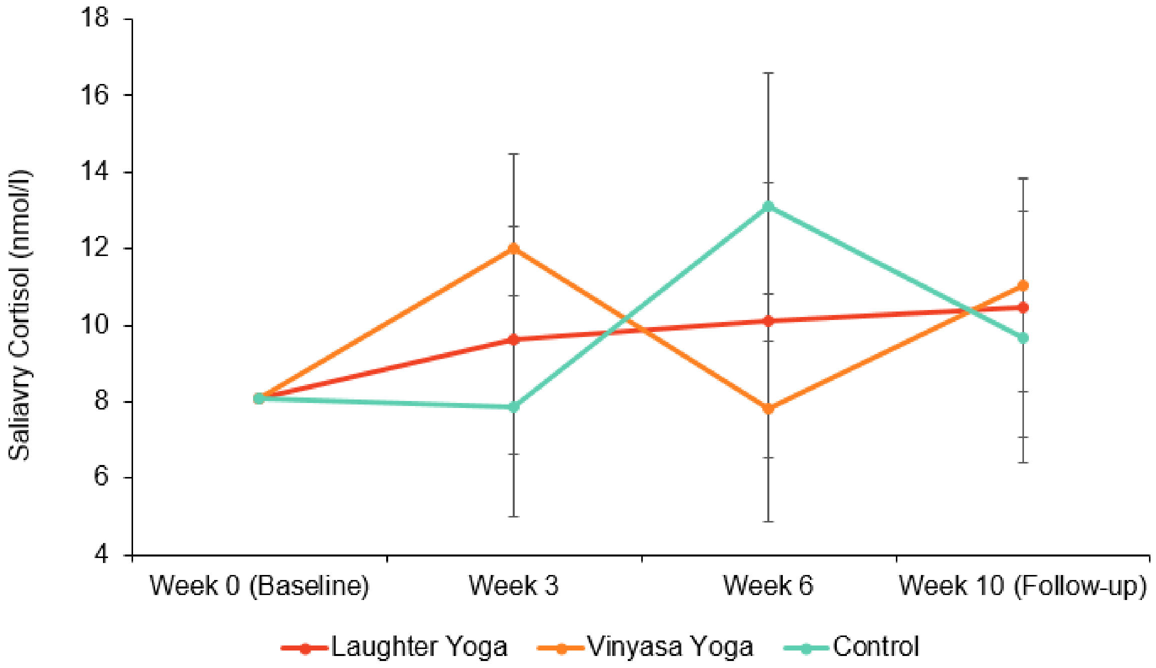

*Figure 7: Salivary cortisol measurements calculated via an ANCOVA from week 0 (baseline) to week 10 (follow-up). A baseline score of 8.07mmo/l was calculated. No statistically significant interaction between groups or over time was found (*F*[6, 18] = 1.364;* p *=.281). No significant main effects of group (*F*[2, 6] =.002;* p *=.998) or of time (*F*[3, 18] = 1.108;* p *=.372) were found.*

6.1.5 Effect and Sample Sizes

P-values are typically used in hypothesis testing to see if the difference between two groups is statistically significant. While a p-value can determine whether or not a statistically significant difference exists between two groups, an effect size can determine the magnitude of that difference (Zach, 2021). Cohen's *d* population effect size estimates are based on sample averages which overestimate the true population effect (Thompson, 2008), especially for small samples (*n* < 20) (Lakens, 2013). For data analysis in this study, Hedge's *g*, as a correction for this bias, was used (Hedges & Olkin, 1985).

Table 36: Effect sizes (Hedge's g)

	Effect sizes (Hedge's *g*)			
	Systolic Blood Pressure (mmHg)	Anxiety Scores	Depression Scores	Salivary Cortisol (nmol/l)
LY vs Control	1.70	0.42	1.84	0.53
VY vs Control	0.61	0.76	0.12	0.93

The results show medium to large effect sizes for LY vs control for both blood pressure and depression scores. The data included in the effect size calculations were taken from post intervention (week six) time point. This gives evidence that the study findings have practical significance, though due to the small number of participants these results should not be given too much strength. Also worthy of note are the calculated sample sizes. Post-hoc sample size calculations for each outcome measure were calculated using the method of Rosner (2011). The value of alpha (probability of a type 1 error) was set at .05 and the value of beta (probability of a type 2 error) was set at .20, hence study power was 80%. Mean and standard deviation values pre and post-intervention were entered and an enrolment ratio of 1:1 was used for the laughter yoga group and the control group. It was determined that participant sample sizes of 9, 87, 2, and 93 would have been needed for the outcome measures of blood pressure, anxiety, depression, and cortisol, respectively. The mean and the median of these values is 48 participants.

The results presented here, indicate that, over time, LY significantly decreased the participants' systolic blood pressure (mmHg) measurements.

6.2 Qualitative Data Results

As part of the mixed methods feasibility study design, discussions were held with the participants. The aim of these discussions was to collect and analyse data that would not be presented numerically. The original desired aim was to use focus-group methodology for the qualitative data collection, though due to only having access to the participants for an allotted amount of time pre and post yoga sessions, it was only possible to conduct discussions whilst the quantitative outcome measures were being taken. In future studies provisions should be made to ensure enough time for focus group discussions to take place without any external distractions. As this was a feasibility study, qualitative data collection was attempted to identify whether this could be recommended for future studies. Specifically, these discussions, though not strictly structured like focus-groups, were an opportunity to test the validity of qualitative data collection when working with adults with ID. The evaluation of this was an ongoing process, and conversations from the discussions were transcribed and a thematic analysis undertaken (Arain et al, 2010). For each of the three groups (LY, VY, control) the discussions took place following the week-3 yoga session and at the time of the follow-up measurements in week 10. The participants engaged in conversation while waiting for their blood pressure and saliva samples to be taken. The duration of each discussion lasted between 10-15minutes as this is how long it took for the quantitative outcome measures to be collected from each group. The LY group was most engaged in discussion, with four participants (n=4) taking part in both week 3 and week 10. The VY group also took part in both week 3 and week 10 discussions. However, only two (n=2) participants from the control group took part in the week-3 discussion.

The primary intention of a feasibility study is to identify which data-collection methods would be most acceptable for the chosen population group and whether the interventions and procedures would be effective and feasible (Bowen et al, 2009). For this reason, it was important to attempt the collection of qualitative data for analysis. This qualitative data was valuable for addressing the research question regarding the experiences of the participants in the yoga intervention. This verbal data from the population group documented the first-hand experience of the participants themselves. Though only a small sample of qualitative data was gathered, it is invaluable due to the challenges faced when attaining it.

6.2.1 Thematic Analysis

After transcribing the discussions and qualitative data familiarisation (Appendix 10.12), the Braun and Clarke (2006) method of thematic analysis and coding was applied.

Table 37: Thematic analysis codes and themes and prevalence of participants' experience.

Codes	Themes
Detailing and separating of certain elements of the yoga sessions.	Understanding of the separate components that make a yoga class.
Positive descriptors and reinforcement.	Positive views of the intervention.
Opinion of outcome measure.	Opinions of outcome measures.
Acknowledgement of level of difficulty.	Evaluation of levels of difficulty of intervention.
Reflecting on emotional state.	Reflections of emotional state.

Five main themes were identified from the thematic analysis:

1. Understanding of the separate components that comprise a yoga class
2. Positive views of the intervention
3. Opinions of the outcome measures
4. Evaluation of the difficulty of the intervention
5. Reflections on emotional state

Due to the small amount of data, it became a challenge to fully complete some of the steps in the thematic analysis process. This was due to not having enough data to warrant codes and to then group codes into themes. Table 36 presents the codes which, due to the small data sample, have directly become themes, as can be seen from the similar terminology. By using this approach, step five, of defining the themes, is skipped as the codes themselves have become the core themes. It was important to still use the thematic analysis process as systematically as was possible, even on a small data sample, as it was worth gaining understanding of the feasibility of transcribing data and finding patterns worth noting in the conversations of adults with ID about the study. The six steps in Braun & Clarkes (2006) thematic analysis process is not strictly linear. Movement back and forth between steps may be required, perhaps numerous times, particularly if working with a lot of data.

Theme 1 – Understanding of the separate components that comprise a yoga class

Discussions of the yoga poses in the VY sessions or the exercises in the LY sessions were not particularly prominent in the transcribed data. However, there was a clear understanding of the separation between the outcome measures and aspects of the yoga sessions, such as the difference between the exercises and the relaxation.

LY group discussion extract (week 3):

Researcher	*“Good, I am glad. So, what was your favourite part of laughter yoga?”*
C3	*“Oh, it was very good actually, the exercise, very good, yeah.”*
Researcher	*“What’s your favourite part?”*
C3	*“Oh, erm, this bit…”* *claps twice and says "*yay*"*

LY group discussion extract (week 10):

Researcher	*“Have you enjoyed it, C4? Would you do it again? What did you like about it most?"*
C4	*“Of course. I like holding the phone with the music.”*

Researcher	*“You liked holding the phone with the music. What about the laughter? Did you like that?”*
C4	*“Yeah, I liked the music.”*

VY group discussion (week 3):

Researcher	*“What’s your favourite part of doing yoga?”*
B1	*“The relaxation.”*

Theme 2 – Positive views of the intervention

A recurrent theme in the discussions was the sense that participants were eager to take part in the interventions and curious about them. These positive views were expressed by most of the LY group and some of the VY group.

LY group discussion extract (week 3):

Researcher	*“Did you enjoy the laughter yoga?”*
C3	*“I did, yeah, I did.”*
C4	*“We did, very much, yeah.”*
Researcher	*“Are you enjoying the laughter yoga?”*
C3	*“Yes, I am, yeah I do, I really enjoy it, yeah.”*
Researcher	*“Do you like the laughing?”*
C3	*“Yeah, I do like laughing, yeah, he he he."*
Researcher	*“I like that bit, too. Are you looking forward to doing yoga today?”*
C3	*“I am yeah, yeah. Yeah, it’ll be nice for a change.”*

VY group discussion extract (week 3):

Researcher	"*So, how did you find that class?"*
B3	*"I said it already, I found it all right, anyway."*
Researcher	*"Good."*
B3	*"Perfect, again, in my case, anyway."*
Researcher	*"You found it perfect?"*
B3	*"Even more so than that, I found it marvellous and perfect."*

Theme 3 – Opinions of the outcome measures

Themes 2 and 3 (positive views of the intervention and opinions of the outcome measures) reoccurred throughout the transcribed data more than the other themes. Concerns were expressed about the saliva sampling. These views surfaced mainly in relation to the process of chewing the cotton swab.

Control group discussion extract (week 10):

Researcher	*"What do you prefer, chewing or spitting into the tube?"*
A3	*"I prefer spitting; otherwise, I could choke on it."*

LY group discussion extract (week 3):

Researcher	*"C, how do you find the saliva sample?"*
C4	*"Boring. Oooo."*
Researcher	*"C1, what was it that you didn't like about the saliva sample?"*
C1	*groans*

Researcher	*“Do you not like the texture or the taste?”*
C1	*“The taste”*
Researcher	*“How do you find doing the saliva sample?”*
C3	*“It’s like a sweet, isn’t it? Chewing a sweet. Tastes horrible. Eurgh, it’s disgusting. Eurgh, horrible, but it’s all done. It’s horrible, but see, I can do it.”*

The control group shared neither positive nor negative opinions about taking part in the study. They gave only gave a brief – often non-verbal – comments on their opinions about the saliva samples and blood-pressure measurement process. Issues surrounding non-verbal responses from adults with ID will be expanded upon in the following discussion chapter.

Control group discussion extract (week 10):

Researcher	*“When you chew on the saliva sample cotton, do you find it easy?”*
A2	*nods yes*
Researcher	*“Was that a yes? You find it easy?”*
A2	*nods yes*
Researcher	*“Do you mind having your blood pressure taken?”*
A2	*nods yes*

Theme 4 – Evaluation of the difficulty of the intervention

On three occasions, as shown in the extracts below, participants described their views of the difficulty or ease of taking part in certain aspects of the study. On two of the three occasions, this was done without prompting. The question asked was open-ended and about the experience in general, but they chose to answer with reference to the ease of the process.

LY group discussion extract (week 3):

Researcher	*How did you find the yoga today, C3?”*
C3	*“Very easy, yeah. Very good actually, yeah.”*

VY group discussion extract (week 3):

Researcher	*“Did you find it okay, the questionnaire? Was it easy or hard to fill out?”*
B3	*“Easy to fill out in my case, rather than hard, but thanks for all that. Cheers, also, as well, anyway, Louise.”*
Researcher	*“How do you find doing the saliva sample?”*
B3	*“Easy, as well, anyway.”*

Theme 5 – Reflections on emotional state

Most of the statements on this theme were made by participants in the LY group.

LY group discussion extract (week 3):

C3	*“Didn’t want to cry. Yeah, I’m very happy now. Yeah. I quite enjoyed that, yeah.”*
Researcher	*“Do you feel happier afterwards?”*
C3	*““I do, yeah. I’m happy now. I’m joyful. Do you enjoy life?”*
Researcher	*“Yes, I do enjoy life, very much so. What about you?”*

C3	“I think I do, yeah. *You gotta enjoy life really, don’t you? Gotta be happy and that. Gotta enjoy it.”*

LY group discussion extract (week 10):

Researcher	*“How are you feeling after laughter yoga? Do you feel in a good mood?”*
C1	*“Yeah.”*
C4	*“Yeah, of course I do.”*

As the examples above show, the qualitative data was limited; and when examined at a micro level, the quality of the conversation detected is low due to the lack of lack of free flowing discussion. The data transcribed follows a more question and answer format. Even after some verbal encouragement, there was few expansions on the participants' initial answers of "yes" or "no". Recommended methods for addressing this issue will be discussed in chapter 8. The full transcription and thematic analysis are presented in Appendix 10.12.

Aside from the themes, the qualitative data also highlights possible examples of acquiescence. The extract below illustrates how a nonverbal participant nodded "yes" to each question that was asked of them. This extract could provide evidence of "yes-saying" and acquiescence in ID research, as discussed in section 5.1.10.

Control group discussion (week 10):

Researcher	*“So, A1, how do you like the saliva sample? Do you find it easy to chew on?”*

A1	**NO REPLY**
Researcher	*"When you chew on the saliva sample cotton, do you find it easy?"*
A1	**nods yes**
Researcher	*"Was that a yes? You find it easy?"*
A1	**nods yes**
Researcher	*"I like that bit, too. Are you looking forward to doing yoga today?"*

In addition, another participant illustrated the limitations of the group discussion format in their answers. The dialogue below shows the participant using the most recently suggested answer as their own, when asked if they did not like the texture or taste of the saliva-sampling process. The participant may have just been repeating the last word they heard, and if given no options for an answer, they may have not responded at all.

LY group discussion (week 3):

Researcher	*"C1, would you want to give a saliva sample?"*
C1	*"No."*
Researcher	*"What is it that you don't like about it?"*
C1	*"I don't know."*
Researcher	*"Is it the texture or the taste?"*
C1	*"Taste."*
Researcher	*"Are you enjoying the laughter yoga?"*
C1	*groans* *"What are we doing today?"*

Researcher	*“Laughter yoga. Do you enjoy it?”*
C1	*“Yeah.”*

This extract above shows the participant choosing not to answer one question ("Are you enjoying laughter yoga?") and choosing, instead, to ask an unrelated one ("What are we doing today?"). Examination of these qualitative results should be cautious, as there may be insufficient qualitative data from which to draw sustainable conclusions. Thus, the impact of any acquiescence – and the possibility that participants were merely repeating words given to them in place of their own answers – cannot be confirmed. The possibility of bias and the challenges with collecting qualitative data from partially nonverbal participants will be discussed in Chapter 7.

A final extract to draw attention to shows the engagement between a carer and participant in a discussion. This extract suggests that a carer’s presence could be important for achieving a higher engagement rate from adults with ID. The participant answers the question for themselves first and then they ask the same question of the carer, both continuing the discussion and taking on the role of leading it.

LY group discussion (week 3):

Researcher	*“Do you like the laughing?”*
C3	*“Yeah, I do like laughing, yeah, he he he. How’s it go D (carer)? He he he he. Ha ha ha ha ha. Yeah, very good, yeah.”*
Researcher	*“Do you like laughing?”*
C3	*“I do like laughing, yeah. What about you D (carer), did you like it?”*

D (carer)	*“Yeah, I did like it, I’d never heard of it before.”*
C3	*“Didn’t want to cry. Yeah, I’m very happy now. Yeah. I quite enjoyed that, yeah.”*
Researcher	*“Do you feel happier afterwards?”*
C3	*“I do, yeah, what about you, D (carer)? Do you feel happier?”*
D (carer)	*“Yeah, I do, yeah.”*
C3	*“I’m happy now. I’m joyful. Do you enjoy life?”*
Researcher	*“Yes, I do enjoy life, very much so. What about you?”*
C3	*“I think I do, yeah. What about you, D (carer), do you enjoy life?”*
D (carer)	*“Yeah, my life’s really good.”*
C3	“*You gotta enjoy life really, don’t you. Gotta be happy and that. Gotta enjoy it.”*

The carer in this scenario was just waiting in the room for a participant and was not taking on the role of advocate. Thus, they were not speaking on behalf of the participant, but rather engaging in conversation *with* them. The limitations of advocacy in qualitative data collection will be discussed in the following chapter.

6.3 Feasibility Results

This section presents the results of the 10-week feasibility study detailed in the previous chapter. As informed by a synthesis of feasibility study literature by Orsmond and Cohn (2015), there are five main objectives of a feasibility study, which are also in accordance with the MRC guidelines. See table below. In Orsmond and Cohn (2015) paper titled "The Distinctive

Features of a Feasibility Study: Objectives and Guiding Questions", five major objectives of feasibility studies that focus on social and behavioural interventions were found. These objectives are cited in most feasibility study papers published throughout 2020 and into 2021 (SAGE Journals, 2021). The primary purpose of a feasibility study is to answer the question, "Can this intervention work?" (Orsmond and Cogn (2015).

Table 38: The five objectives of a feasibility study, as identified by Orsmond & Cohn (2015).

Objective 1	Evaluation of recruitment capability and resulting sample characteristics.
Objective 2	Evaluation and refinement of data collection procedures and outcome measures.
Objective 3	Evaluation of the acceptability and suitability of the intervention and study procedures.
Objective 4	Evaluation of the resources and ability to manage and implement the study and intervention.
Objective 5	Preliminary evaluation of participant responses to intervention.

The feasibility study results will be examined in relation to these five objectives, and the discussion will draw on the reflective journal kept throughout the study. This section will test the hypothesis that LY could be a feasible intervention for reducing levels of anxiety, depression, and stress in adults with ID.

6.3.1 Objective One – Evaluation of recruitment capability and resulting sample characteristics

The core question to address is whether appropriate participants can be recruited. Extracts from the reflective journal demonstrate the challenges that arose with recruitment:

> *Recruitment was a challenge within this population group. The schedules for adults with ID are complex and have rigid timings. To permeate this structure and find time to deliver an intervention was challenging. I arranged and had in-person meetings with three gatekeepers at their locations (a wellbeing centre, a learning facility for adults with ID, and a residential home/day centre). At one point, I had all three sites involved and was planning to deliver the intervention at two of these, using the third site for the control group. However, two sites dropped out due to timetabling issues, leaving me with just one (the residential home/day centre). I used this site alone to recruit all participants for the study.*

As evidenced in these reflections, three sites were initially contacted for recruitment purposes. Based on the review of the previous literature, it was predicted that response rates would be low for this population group. Due to the low literacy rates amongst this population, face-to-face recruitment was used. An original pool of 170 adults with ID was available across three study sites, before two of the three potential study sites had withdrawn. This withdrawal was due to scheduling clashes that left no time available in their timetables for the intervention. As a result, the pool was reduced to just 28 potential participants in the residential home/day centre. Of this group, 13 adults with ID were able to give consent to take part in the study, 14 were unable to consent, and one participant was unavailable due to timetabling clashes. Stopping recruitment at 13 participants was not the aim, however, due to time limitations of a PhD project and the recruitment process explained prior, 13 participants within the South West area became all that was available. Due to this being the first study of its kind, it felt appropriate to commence the study with just 13 participants. Furthermore, reviewed literature showed previous feasibility studies within the field of LY to have a low number of participants (Tanaka et al, 2018 n=13, Dolgoff-Kaspar et al, 2012 n=6, Flint, 2004 n=4, Fukuoka et al, 2016 n=6, Wagner et al, 2013 n=14)

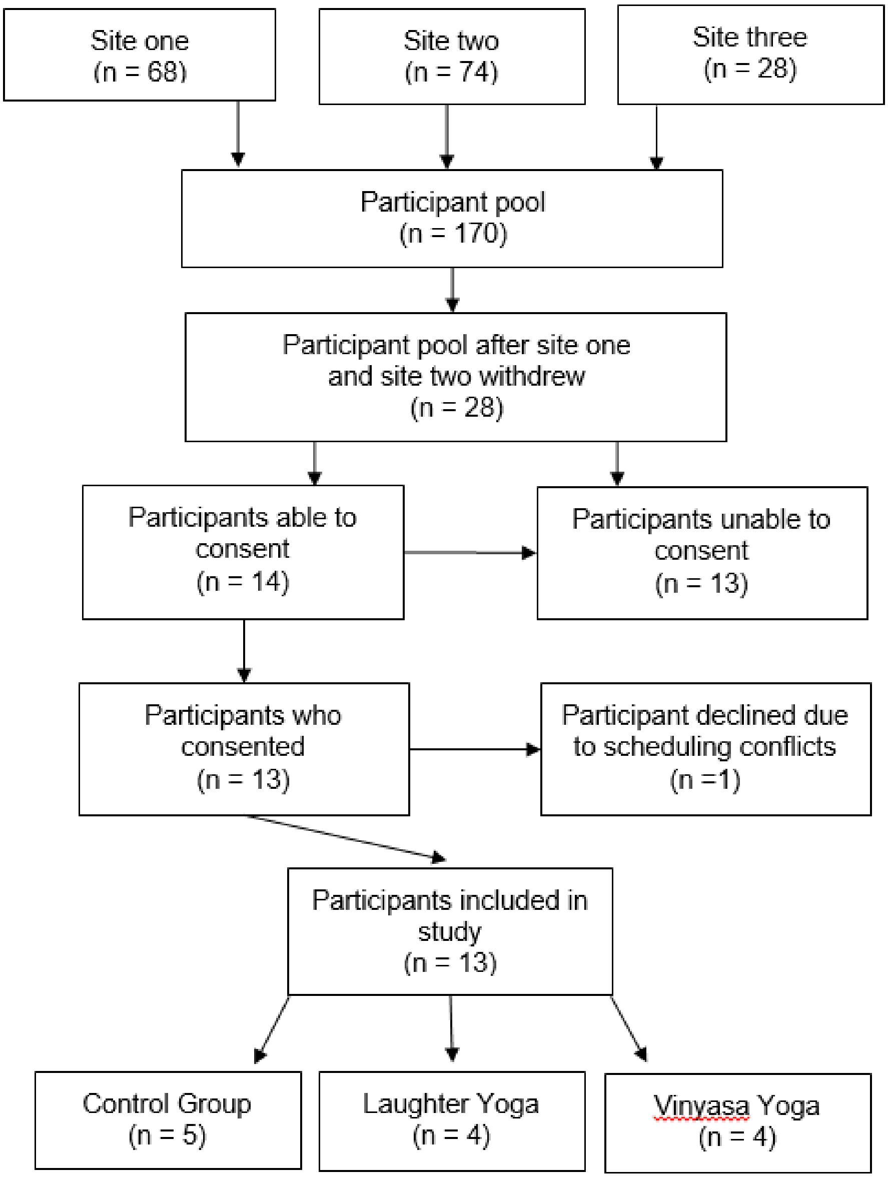

Figure 8: Participant flow diagram.

All adults who consented to take part in the study had a diagnosis of ID, ranging from mild to severe. Extensive efforts were made to protect the identity of participants. For this reason, no identifiable information is provided, and only a basic general description of the participants' demographics is given, including gender and age data (Table 33 below).

Table *39*: Participant demographics.

Participant	**Group**	**Age**	**Sex**	**Diagnoses**
1	CG	53	M	Mild ID
2	CG	37	F	Moderate ID + Downs Syndrome
3	CG	40	F	Mild – Moderate ID + Downs Syndrome
4	CG	46	M	Mild ID + Fragile X Syndrome
5	CG	46	M	Mild ID + Autism
6	LY	54	M	Moderate ID + Cerebral Palsy
7	LY	27	F	Severe ID + Autism
8	LY	48	M	Mild – Moderate ID + Autism
9	LY	38	M	Mild – Moderate ID + Cerebral Palsy
10	VY	59	M	Mild ID + Autism
11	VY	53	M	Moderate ID + Autism
12	VY	51	M	Mild ID + Autism + Acute and Transient Psychotic Disorder
13	VY	31	M	Mild – Moderate ID + Autism

CG = Control Group, LY = Laughter Yoga, VY = Vinyasa Yoga, ID = intellectual disability.

There was no evidence that rates of ability to consent differed between the gender, age, and ID type or severity groups. None of the participants had significant yoga experience. Additionally, none of the potential participants had any medical contraindications that left them unable to take part. No participants were reported as suicidal at baseline, and all were non-smokers and had no issues with alcohol or substance abuse. All participants were White British. Currently, robust data on ID and associated mental health conditions in Black and minority ethnic groups is lacking. Though statistics reported by adult psychiatric morbidity survery (McManus, 2016), such as "black ethnic groups are four times more likely to experience psychosis than white people", suggest that they may experience the same issues at potentially an even higher prevalence. This is discussed further in section 8.2.

It was reassuring that consent was obtained for just 13 of the 28 potential participants, as a 100% consent rate would have raised the alarm about possible coercion or acquiescence. It was not possible to identify why some of the adults in the residential home/day centre had declined. Similarly, it was not ethically possible to collect participant demographics for the purposes of comparing participants with those who had declined. The following extract from the reflective journal ponders reasons for some participants’ reasons to decline.

> *New activities can bring about feelings of anxiety. So, giving participants plenty of time to hear about the study and ask as many questions as they liked was a necessity. People have different priorities. So, it was important to remember that taking part in my study may not be a priority in some people’s lives. Therefore, it was necessary to be as accommodating as possible in the study design, including for the duration and location of the intervention.*

To enable as many people as possible to partake in the study, the inclusion and exclusion criteria were widened to include all levels of ID – from mild to severe. An original inclusion criterion was a formal diagnosis of a mental illness, anxiety, or depression. However, this information was not readily available, therefore rates of anxiety and depression were recorded at baseline by using the aforementioned Glasgow mood rating scales. Participants were included in the study irrespective of how high or low they scored on these. A determination of ID remained a strict inclusion criterion, as this information was provided in the participants' case notes and primary care records. Only adults with ID who were able to consent were permitted to take part. Participants excluded for their inability to consent were thus deprived of the opportunity to actively participate in research and, potentially, of access to beneficial interventions. The ethical planning for this study was approved by the Coventry University ethics board for consenting participants to take part only.

An extract from the reflective journal summarises the feasibility of participant recruitment within this population group.

> *Due to the time constraints of a PhD, the option of a lengthy prior planning would have been a challenge to instigate. For future study of larger preparations, giving 18 months or more for planning and preparation would not be an overestimate. For future studies I will allocate more time for recruitment. Planning a lot further in advance to allow for adequate preparation for scheduling and timetabling. By doing this I believe that a larger amount of participants would be recruited into the study.*

It was anticipated that recruitment would be a challenge, but the extent of the challenge was nonetheless underestimated.

6.3.2 Objective Two – Evaluation and refinement of data collection procedures and outcome measures

The main question to be asked regarding data collection and outcome measures is whether they are appropriate for use with this population group.

Glasgow Mood Rating Scales

The Glasgow mood rating scales adapted for adults with ID were used to assess levels of anxiety and depression. The extract below from the reflective journal describes the experience of using these scales.

> *Some of the outcome measures – such as the questionnaire – took a lot longer than planned. They were adapted for people with ID to be able to complete on their own. However, the participants were unable to use them in this way. Each participant required approximately 10 minutes of one-on-one assistance. With a total of 14 people, this took quite some time.*

The Glasgow mood rating scales for anxiety and depression were chosen because they were reported in previous literature as having the greatest validity and reliability amongst self-report mood rating scales for adults with ID (Hermans et al, 2012, Mindham & Espie, 2003). Mindham and Espie (2003) developed the GAS-ID and tested it on adults aged 17-69 years with mild (n=36) to moderate (n=6) ID. Cuthill et al. (2003) tested the GAD on 12 adults with mild (n=8) and moderate (n=4) ID.

> *Doing a practice questionnaire with an adult with ID prior to commencing the study could have been beneficial, as this would have shown how long it would take. Some carers were available to assist, but for some of them, it was their first time assisting someone in filling out a questionnaire. So, it was a new experience for them too. I decided that, due to the time required, the questionnaires would only be filled out four times during the study – and not before and after every session. I think, for future studies, I will run a training session for carers on using the questionnaires. Prior experience and having seen the questionnaires beforehand could help to speed up the process of completing them, thereby allowing more to be filled in and providing more data.*

As noted in the reflective journal entry, some participants required additional time and one-to-one support to complete the questionnaire. Only two of the 13 participants were able to complete the questionnaire independently. Some participants benefited from hearing the questions read aloud, as well as being given prompts. Below is an extract from a transcribed focus-group discussion regarding a participant's personal experience of completing the questionnaires.

Researcher	*"How did you find the questionnaire?"*
B3	*"Really good, also, as well, anyway."*
Researcher	*"Did you find it okay, the questionnaire? Was it easy or hard to fill out?"*
B3	*"Easy to fill out in my case, rather than hard, but thanks for all that. Cheers, also, as well, anyway."*

This participant had assistance from a carer in completing the questionnaire, but they comment that they found the process “easy”, which is a positive.

The qualitative data gathered from the focus-group discussions was as important as the quantitative data derived from the questionnaires because, to fully assess the feasibility of this study, it was necessary to assess the participants' experiences of the outcome measures.

> *This week was positive, as I felt the filling in of the Glasgow mood rating scales was a lot more streamlined than usual. The participants were beginning to get familiar with the questions, with a couple of participants even being proactive and attempting to fill out the questionnaires themselves.*

This extract of a journal entry written in week 3 notes that the participants began to complete the questionnaires more efficiently as they became more familiar with them.

Saliva Sampling

Four of the participants expressed concerns about the saliva-sampling outcome measure. These views surfaced mainly in relation to the process of chewing the cotton swab.

Control group discussion extract (week 10):

Researcher	*“What do you prefer – chewing or spitting into the tube?”*
A3	*“I prefer spitting, otherwise I could choke on it.”*

LY group discussion extract (week 3):

Researcher	*“C, how do you find the saliva sample?”*
C4	*“Boring. Oooo.”*
Researcher	*“C1, what was it that you didn’t like about the saliva sample?”*
C1	*groans*
Researcher	*“Do you not like the texture or the taste?”*
C1	*“The taste.”*
Researcher	*“How do you find doing the saliva sample?”*
C3	*“It’s like a sweet, isn’t it? Chewing a sweet. Tastes horrible. Eurgh, it’s disgusting. Eurgh, horrible, but it’s all done, it’s horrible, but see, I can do it.”*

The control group shared neither positive nor negative opinions on the saliva sampling, giving only brief and often non-verbal responses.

Control group discussion extract (week 3):

Researcher	*“When you chew on the saliva sample cotton, do you find it easy?”*
A2	*nods yes*
Researcher	*“Was that a yes? You find it easy?”*
A2	*nods yes*

The following extract from the reflective journal documents how one participant no longer wished to provide saliva samples.

> *One participant no longer wanted to give saliva samples. This was due to him forgetting why we were taking them – but not how: he had full comprehension of how to give one, but no longer understood why. Therefore, I did not take any more samples from him. This suggested that perhaps each week I should give a brief reminder of the "why" behind all the outcome measures, as I had done at baseline and week 1 – rather than just indicating how to give them.*

Further extracts from the journal express ideas for how this issue could be avoided in future studies.

> *Involving the carers and allowing them to become familiar with the outcome measures prior to data collection could have been beneficial. A more in-depth explanation of the equipment used and the rationale for these choices could have been a benefit for them and not just the participants. I feel this would be beneficial, as the participants are becoming more curious as the study goes on. They quite often ask the same questions numerous times, and if the carers had more knowledge, they would be able to answer these questions when I was not at the study site. I think, for future studies, an hour*

> *dedicated to educating carers more in depth about the outcome measures and when, why, and how we would use them would be prudent.*

Blood Pressure

Little data was collected about participants' views of having their blood pressure taken. One member of the control group gave non-verbal confirmation that they were content with the process.

Researcher	*"Do you mind having your blood pressure taken?"*
A2	*nods yes*

The following extract from the reflection journal highlights one participant's curiosity about the sphygmomanometer.

> *They like to press the buttons on the blood-pressure machine and undo and look intensely at the saliva sample kits.*

6.3.3 Objective Three – Evaluation of the acceptability and suitability of the intervention and study procedures

An essential part of a feasibility study is assessing the acceptability and suitability of the intervention itself and the procedures within the study. This study had a 100% retention rate throughout the study and at follow-up, four weeks after the cessation of the intervention. Though this cannot be held as a strength of this study due to the small amount of participants. The qualitative data obtained from the transcribed group discussions – as well as extracts from the reflection journal – will be used to clarify participants' experiences of the intervention.

Researcher	*“Good, I am glad. So, what was your favourite part of laughter yoga?”*
C3	*“Oh, it was very good actually, the exercise, very good, yeah.”*

Researcher	*“Did you enjoy the laughter yoga?”*
C3	*“I did, yeah, I did.”*
C4	*“We did, very much, yeah.”*
Researcher	*“Are you enjoying the laughter yoga?”*
C3	*“Yes, I am, yeah I do, I really enjoy it, yeah.”*
Researcher	*“Do you like the laughing?”*
C3	*“Yeah, I do like laughing, yeah, he he he."*
Researcher	*“I like that bit too. Are you looking forward to doing yoga today?”*
C3	*“I am yeah, yeah. Yeah, it’ll be nice for a change.”*

Researcher	“*So, how did you find that class?”*
B3	*“I said it already, I found it all right, anyway.”*
Researcher	*“Good.”*
B3	*“Perfect again, in my case, anyway.”*
Researcher	*“You found it perfect?”*
B3	*“Even more so than that, I found it marvellous and perfect.”*

As can be seen from these quotes, the participants' experiences of taking part in the LY and VY sessions were positive. In addition, an extract from the reflective journal also provides evidence of the control group's positive experiences.

> *Upon arrival, the control group participants were ready and waiting for me. They seemed very eager to have their outcome measurements taken. They were asking me lots of questions about how the study was going so far and shared their happiness at being able to be part of it.*

Building a rapport between researchers and participants is crucial for the acceptability of the intervention (Bollard, 2003). The use of focus groups has previously been advocated (Bollard, 2003) as a method of promoting dialogue between researchers and adults with ID. A high level of skill is required for researchers to conduct themselves in ways that make them approachable. While adults with ID are the best commentators on their own experiences, valuable qualitative data can only be derived when researchers understand the power differential between themselves and the participants.

> *I've learnt that familiarity is paramount for this population group. The longer the study goes on, the more enthusiastic and proactive they are about taking part. For example, they are sharing their excitement about the following week's yoga sessions. Additionally, something that came as a surprise was that the control group are just as enthusiastic and happy about taking part.*

It was apparent that the participants' enthusiasm increased each week during the study, as they became more familiar with me. This is noted in the reflection journal in week 2, week 3, and week 5.

Week 2 –

> *At this stage, the participants have met me four or more times and it feels like they are more trusting and welcoming of me. This is beneficial for the study, as they are all happy and willing to be taking part and have more interest and curiosity as the weeks go on.*

Week 3 –

> *At this stage, the participants are familiar both with me as the researcher and with the materials used for the outcome measures. There is more enthusiasm about giving saliva samples and blood-pressure readings. Additionally, there is more curiosity, as the participants ask more questions about the materials – such as the cotton swabs in the salvia sampling kits.*

Week 5 –

> *I feel that adults with ID love to be included in research about themselves. They enjoy learning new things that are completely different to their day-to-day activities and schedules. They enjoy holding the music player during relaxation. They like to press the buttons on the blood-pressure machine and to undo and look intensely at the saliva sample kits.*

At this stage of the feasibility evaluation, it is noted that there were no adverse side effects to participating in the yoga sessions.

6.3.4 Objective Four – Evaluation of the resources and ability to manage and implement the study and intervention

Objective four asks whether the researcher or research team had sufficient resources and ability to run and manage the intervention. As this feasibility study was part of a PhD, as the researcher, I worked alone. However, it is noted in the reflective journal that more than one researcher would be required for a larger study.

> *If I were to undertake this exact study again, I would enlist the support of an assistant to help facilitate the data collection of the outcome measures, as this was often the most time-consuming aspect. I thoroughly enjoyed the process of collecting the data, but this would benefit the participants (rather than me, as the researcher). It would decrease the time that the participants had to wait for me to finish with each person's blood-pressure readings. With two or more people doing this, the process would move a lot faster. A ratio of one researcher for every five participants would be ideal.*

The reflective journal also details the recommendation for future studies to include educational training for carers, allowing them to support the participants when the researchers were not around.

> *In future studies, I will run training sessions for the carers, providing explanations of the questionnaires. Prior experience and having seen the questionnaires beforehand could speed up the process of completing them, thereby allowing more to be filled in and providing more data.*

This was an unfunded study, so the required qualifications (such as the LY teacher training) were obtained at the expense of the researcher. The residential home/day centre where the study took place already had access to several yoga mats, so these were not a required purchase. The Salivettes and Elisa kits for salivary cortisol analysis were purchased, as was the validated blood-pressure machine. The Glasgow mood rating scales are available as a free online download, thus only printing resources were required. As this feasibility study included only 13 participants, it was a manageable project for one researcher. However, for a larger scale study, it would be prudent to establish a research team to ensure a sufficient amount of skilled resource people are available.

To deliver the intervention in accordance with the ethics application certified by Coventry University, it is necessary for the leader of the intervention to be officially trained in the two styles of yoga under study. Training and certificates in both VY and LY were required. As the researcher, I also ran interventions. I had previously attained the VY teacher qualification, and the LY teacher qualification was undertaken just prior to beginning the intervention, leaving sufficient time for some practice sessions beforehand. As a qualified nurse, I am trained in first aid and basic life support, as well as having a current disclosure and barring service certificate. These are all elements to take into consideration when hiring an individual to lead the interventions in future studies.

Objective four also addresses the management of resources. In this study, a total of 183 saliva samples had to be labelled and frozen, thus it was necessary to obtain access to a freezer facility maintained at -20°C. In addition, the 13 signed consent forms and 52 completed Glasgow mood rating scales had to be stored securely in accordance with the ethical guidelines, thus accessible and lockable storage was needed.

Overall, the scale of this study was manageable for one researcher. However, for larger studies, more resources would be required, including a greater researcher-to-participant ratio, access to a larger freezer for the increased quantity of saliva samples, and a larger intervention space to accommodate yoga sessions for more participants.

6.3.5 Objective Five – Preliminary evaluation of participant responses to intervention

It is essential to consider whether this intervention could potentially be successfully implemented with the population group. It must also be asked whether the preliminary data collected indicates a possible benefit to the participants' mental health. To address these questions, section 7.2 presents a breakdown of the qualitative data collected and the thematic analysis of this. Additionally, a statistical analysis of the quantitative data derived from the Glasgow mood rating scales, blood-pressure measures, and salivary cortisol testing is given.

By collecting quantitative and qualitative data, it is hoped that it would allow for triangulation of data. In this case no significant new information was found via data triangulation. The quantitative and qualitative results show separately, the same as what they show together, that LY had no adverse effects and was it was a feasible and accepted psychosocial intervention for adults with ID. Elements of qualitative data that evidence participants enjoyed the LY practice could be paired with the lower blood pressure as a reason for lower levels of anxiety within the LY group. But due to the small sample sizes within this study the current data is not generablisable. The next chapter discusses these results in more detail and in relation to the wider research area to consider their implications.

7. Discussion

This chapter will discuss the findings derived from the quantitative, qualitative and feasibility data collection methods. Due to the methodological challenges and limitations of ID research outlined previously in the literature review, there are no prior studies of LY or VY for adults with ID with which to compare the results. For this reason, the quantitative results will be discussed in comparison with those concerning the general population, as these are the only findings available at this time. Though, specifically for qualitative data, there was no qualitative data available on the experiences of adults with ID with any other style of yoga, so it was not possible to make comparisons with results drawn from the general population, as these are not generalisable to the experiences of people with ID.

7.1 Quantitative Data

The aim of this feasibility study was to identify whether the LY sessions were an acceptable psychosocial intervention for adults with ID. In addition, the study evaluated the effect of LY on rates of anxiety and depression in this population group. Mood rating scales such as the GAS and GDS have been used as outcome measures in the field of yoga and anxiety research, along with measurements of blood pressure and salivary cortisol. All previous studies in this area examined only adults in the general population, with no research on LY for adults with ID; thus, it was difficult to generalise the results of these previous studies to develop a hypothesis for the current study. However, nonetheless inspired by prior research findings, the hypothesis here was that engagement with LY sessions would reduce levels of anxiety and depression in adults with ID.

In contradiction to our hypothesis, there was no significant interaction between group or time for anxiety, depression, or cortisol levels. However, a significant effect between groups and time can be seen for blood pressure, with the LY group showing a decrease in systolic blood pressure over time and a sustained decrease at follow-up.

7.1.1 Comparison with Previous Research

Blood Pressure

The LY interventions had a significant effect on systolic blood pressure over time. This result is consistent with the findings of Nagendra et al. (2007), showing that blood-pressure of 200 IT professionals in Bangalore was significantly reduced when they took part in seven LY sessions over 18 days. Additionally, Nagoor and Dudekula (2015) observed a decrease in systolic blood pressure in healthy males and females immediately following a LY session, with a mean difference of 5.37mmHg. However, Dolgoff-Kaspar et al. (2012) note a small increase in systolic blood pressure (3%-23%) of patients awaiting organ transplantation after partaking in LY sessions. None of these studies include follow-up measurements, thus it is not possible to confirm the sustained effect of LY on systolic blood pressure seen in this feasibility study.

Unlike in previous studies, VY was not associated with a decrease in systolic blood pressure. At week 6, a mean difference of 28 mmHg was seen between the LY group and VY group. In contrast, the systematic review of the effectiveness of yoga for hypertension by Hagins et al. (2013) notes that all 17 studies in the review document a small but significant decline in systolic (-4.17mmHg) and diastolic (-3.26mmHg) blood pressure. Field (2016), in another systematic review of the effects of yoga for hypertension, found that 11 of the 17 RCTs note a significant reduction in systolic blood-pressure.

Papp et al. (2013), in their pilot study on *hatha* yoga’s effects on blood pressure and heart-rate variability, comment that specific yoga postures appear to have different effects on blood pressure. Where LY uses laughter exercises, VY uses *asanas* (postures). Papp et al. (2013)

report that significant effects on blood pressure were seen immediately after the standing poses, as opposed to following the lying down or seated *asanas*. This is important to highlight, as most of the LY intervention took place while participants were standing, while the VY intervention had a larger number of seated and supine postures.

In all styles of yoga, the practising of the *asanas* alongside controlled breathing exercises commonly leads to a calm and meditative state. This calm state is usually associated with physical characteristics such as improved respiratory function and a steady heart rate, alongside increased positive emotions (Tyagi & Cohen, 2014). Most of the aforementioned studies, like this feasibility study, show a decrease in systolic blood-pressure. It would seem that the mechanism by which this predominantly happens is the yoga's activation of the neuro-endocrine axis, which aids in the management of stress. This reduces the stress response, while increasing parasympathetic activation and changing baroreceptor activity (Tyagi & Cohen, 2014).

Though the studies discussed here conclude that most styles of yoga typically reduce blood pressure, the yoga interventions used in the studies vary by style, duration, and frequency, making it difficult to compare the effectiveness of the interventions.

Anxiety and Depression

Prior to this feasibility study, there was only one other study examining the effects of yoga on adults with ID. Hawkins et al. (2012) used VY as their intervention, but their paper provides no outcome measures evaluating the effects on anxiety or depression. Furthermore, the insufficiencies of the existing body of literature mean that the comparisons that can be made between previous research and this study are limited, as all previous studies were undertaken with participants from the general population.

Another element of this feasibility study to note is the participants' lack of official diagnoses of anxiety or depression. The GAS-ID and GDS-ID were used at baseline to assess the mental health of participants. All three groups in the study began with indicated anxiety, as shown by their baseline GAS-ID scores; and at week 10, all groups had fallen below the indicated score for anxiety. A significant main effect of time was found for anxiety, with a significant difference in anxiety between week 6 and follow-up (week 10). It is interesting to note the further decline in anxiety levels once the interventions had ceased, as this could be due to participants relaxing as their familiar schedules resumed.

None of the three groups had indicated levels of depression at baseline. There were mild fluctuations throughout the study, but all groups either saw a decrease in score or had returned to baseline measurements by the end of the study. There was no indication of depression (defined as a score above 13 on the GDS-ID) at any time during the study. All previous studies of the effects of yoga on depression and anxiety within the general population have recruited participants with clinical diagnoses of anxiety or depression. As discussed in the literature review, gaining diagnosis of anxiety or depression in adults with ID is an ongoing task. Therefore the fluctuating consistency with previous findings in the literature with the ones presented in the previous results chapter from this study were to be expected.

In a systematic review, Bressington et al. (2019) considered three studies assessing the effects of LY on anxiety and depression, with a fourth study examining depression as an outcome measure. Inconsistent results were reported across the four studies. Shadidhi et al. (2010) demonstrated a significant (*p*<0.001) improvement in depressive symptoms immediately after older women with depression took part in an LY session, showing a significant large effect compared to the control group of -0.78 (CI -1.43,-0.014). Similarly, Yazdani et al. (2014) document that nursing students experienced a significant (*p*=0.002) reduction in depression immediately following the LY session, as well as at 1-month follow-up (*p*=0.001), with a significantly large effect of -1.06 (95% CI -1.75, -0.38) and -1.15 (95% CI -1.85, -0.46). Weinburg et al. (2014) conducted a single-group study that found a non-significant reduction in depression after just one LY session. In contrast, Bennett et al. (2015) report a non-significant increase in depression immediately post intervention. Though the results of the feasibility study presented in the previous chapter are not consistent with those of the aforementioned studies, it would not be prudent to draw conclusions from this, as no other study to date has been undertaken on the effects of LY on adults with ID.

Anxiety and depression are often paired together as outcome measures, as in the case of Bennett et al. (2015), Weinburg et al. (2014), and Yazdani et al. (2014). Findings on the influence of LY on anxiety vary significantly. Weinburg et al. (2014) and Yazdani et al. (2014) found a decrease in levels of anxiety in post-intervention measurements. Weinburg et al. (2014) had a significant (p=0.019) reduction in anxiety levels, with a non-significant smaller ES of -0.22 (95% CI -0.64, 0.20). Yazdani et al. (2014) found a significant (*p*=0.02) decrease in anxiety at both post intervention and one-month follow-up (*p*=0.04), with effect sizes of -0.78 (95% CI -1.44, -0.12) and -0.57 (95% CI -1.22, 0.08). Bennett et al. (2015) document a non-significant (*p*>0.05) increase immediately following the intervention. In contrast to the current study, previous studies have shown LY to have its strongest impact on depressive symptoms. Additionally, the literature includes little reporting on the sustainability of the results, with only one study (Yazdani et al, 2014) undertaking a follow-up measurement one-month post intervention. This provided valuable data showing a continued significant decrease in depression but not anxiety. This is not consistent with the results of the current study, in which anxiety saw a sharp decrease from post intervention to follow-up in the LY group.

It is important to consider the specific effect of the laughter in the LY on anxiety and depression. Telles et al. (2009) examined the effect of a practical yoga session versus a yoga theory session on anxiety symptoms. The participants who took part in the practical yoga practice showed a significant decrease (14.7%), while the yoga theory group only saw a much smaller reduction (3.4%). In that study, the yoga practice group engaged in physical postures (*asanas*) and breathing techniques (*pranayama*), whereas the yoga theory group only learnt about the theory of yoga in a lecture-style setting. This demonstrates that specific aspects of yoga have differing effects. Studies have reported that practising yoga reduces anxiety, and this seems to be due to the slow deep-breathing exercises increasing the parasympathetic tone (Kaushik et al, 2006). The choice to use VY as a comparison intervention thus seemed appropriate due to its inclusion of *pranayama*.

The VY group showed a significant main effect for time (p=0.014), which is consistent with findings of previous studies. Laughter has also been discussed as a yogic breathing technique, as an increase of oxygen is derived through the inhalation and exhalation that occurs during laughter, which can induce endorphins (Woodbury-Farina & Rodriguez Schwabe, 2015). Weinburg et al. (2014), in their study of anxiety amongst members of an LY group, conclude that the reduction in anxiety seen in their study could be due to the physiological changes associated with laughter. Laughter has been shown to induce muscle relaxation, reduce the heart rate, and improve circulation (Mora-Ripoll, 2010), all which can alleviate symptoms of anxiety. However, although the physiological effects of the laughter in LY could reduce anxiety symptoms, they may be insufficient to relieve the more complex symptoms of depression.

Salivary Cortisol

There is little data reporting the effect of LY on cortisol levels. However, there is some evidence that spontaneous laughter induced by humour lowers salivary-cortisol levels (Berk et al, 1989, Hubert et al, 1993, Bain et al, 2015). In contrast, Hamilton and Meston (2011) reported an increase in salivary cortisol levels after female participants watched a comedy film. It has also been shown that laughter can induce positive physiological and psychological stress (Yim, 2016). As mentioned in chapter two (section 2.18.1), stress stimulates the HPA axis, which increases the secretion of cortisol into circulation. Cortisol levels can be tested via saliva samples or blood samples – as in Berk et al. (1989), examined “mirthful laughter” amongst participants watching a comedy film.

For this feasibility study, saliva samples were taken as a less invasive method of collecting the required data from the participants with ID. As seen in the results – and contrary to previous studies – there was no significant interaction between group and time in levels of salivary cortisol. This could be due to the shorter duration of the study or because only pre- and post-intervention measurements were taken, rather than various samples at different times of the day.

Berk et al. (1989) first reported that laughter could reduce cortisol levels. In their study, 16 healthy male participants had blood samples drawn before watching a humorous video. They were then drawn four times during the video and three times afterwards. In the anticipatory phase before the humorous video was played, their cortisol levels were shown to already be decreasing. These novel findings provided evidence that even the anticipation of laughter can lower stress hormones (Berk et al, 1989). Similar findings could be found in a longer study with the implementation of an increase in cortisol sampling. The effects of stress could be mitigated by the use of laughter to lower the stress-making hormones in the bloodstream (Farifeth et al, 2014).

The largest effect seen in the results is that of the reduction in systolic blood-pressure in the LY group. These results provide preliminary evidence that practising LY once a week can reduce blood pressure in adults with ID. Though the differences between groups in levels of anxiety, depression, and salivary cortisol were not statistically significant, the small changes reported suggest that these tendencies may show greater significance in a larger sample.

It should be noted that the intensity levels of exercise for each participant as they partook in the yoga classes was not recorded and could have impacted the qualitative results, for example, changes in blood pressure could have been influenced by higher or lower exercise intensity levels. To control for this in future studies heart rate monitors could be utilised by participants during the yoga sessions as well as the completion of a perception of physical exercise scale, such as The Eston-Parfitt curvilinear RPE scale that was used in Hawkins et al’s (2012) study to rate the participants' perceptions of their experiences of the exercise.

7.2 Qualitative Data

Mixed methods research is increasingly being used to explore alternative therapies such as yoga. For this feasibility study, it was important to gather qualitative data and evaluate the process of data collection via focus-group discussions. The evaluation of the feasibility of this qualitative research method was discussed in section 5.2. The use of a qualitative approach when researching yoga can enable a comprehensive interpretation of some of the elements that may be more challenging to quantitatively measure, such as participant experience. As this is the first study of its kind to research the effects of LY on adults with ID, there was no prior qualitative data with which to compare the results of the current study.

In 2014, Beail and Williams produced a critical reflection on all qualitative data published in the *Journal of Applied Research in Intellectual Disabilities* over the previous 25 years. The authors identified numerous methodological issues that required further exploration (Beail & Williams, 2014). These issues were used to influence the study design for this current study, such as the lack of reporting of which qualitative approach was utilised by researchers (Beail & Williams, 2014). For this reason, it was imperative within this study to clearly detail the qualitative data collection methods used (section 5.4.12) alongside the participant demographics (table 27). Beail & Williams (2014) also state within their paper that Braun & Clarke's (2013) thematic analysis is more suited to discovering the understanding a group of participants has about an intervention being researched. Consequently, thematic analysis was chosen within this study as opposed to a grounded theory (section 5.4.12). Another issue highlighted within Beail & Williams (2014) paper was that researchers had reported how interviewers who asked questions within their studies could have had an impact on the answers received. Beail & Williams (2014) report that researchers have suggested being prudent in the way questions are formulated to ensure they are not too leading and equally not too open-ended, as some adults with ID could face difficulty in generalising their experiences of an intervention (see the end of section 6.2.1 for a comment on the questions asked within this study). Continuing to gather high quality evidence of the methods that work best could ensure high quality future research to demonstrate what interventions and services are most effective and acceptable to people with ID. This is an area of national priority, as explained in the NHS long-term plan (2019).

Focus groups have both advantages and disadvantages. They are a valuable way of gathering data from people such as those with ID who may struggle to document their thoughts in writing (Kitzinger et al, 1995). However, focus groups can be particularly challenging for adults with ID. Though, the fluidity and flexibility elements of the focus-group method means that it is well-suited to research with adults with ID. The focus group in this study elicited limited qualitative data and therefore indicates an area where recommendations for further research are required. The focus-group discussions were undertaken at the same time as the quantitative data collection, with participants engaged in conversation while waiting their turn for the salivary-cortisol and blood-pressure measurements to be taken. A strength of this approach is that it limited the risk of participants becoming fatigued, as the time-consuming tasks were combined. However, a weakness is that some participants may have felt distracted by the other activities going on around them.

Some issues arose during the focus-group discussions that are important to draw attention to, as they are only rarely reported in the currently available literature. One issue was some of the participants having limited capacity for verbal contributions. Documenting successful interviews with adults with ID, Hollomotz (2017) states that, providing the researcher pays close attention to each participant's own communication style and preferences, adults with ID who have expressive language are able to participate successfully in qualitative interviews. This does mean that those with less expressive language skills are arguably less able to participate in qualitative research. Some adults in this study frequently used non-verbal communication, as seen below.

Control focus-group discussion extract (week 3):

Researcher	*"When you chew on the saliva sample cotton, do you find it easy?"*
A2	*nods yes*
Researcher	*"Was that a yes? You find it easy?"*
A2	*nods yes*
Researcher	*"Do you mind having your blood pressure taken?"*
A2	*nods yes*

Choosing not to collect qualitative data from those members of this population group who, at times, use non-verbal communication would create bias and significantly limit the number of research participants. Valerie Sinason (1992) concludes that, given the time and resources to express their views, even adults with severe ID have the ability to contribute to qualitative data collection. However, Cambridge and Mc Carthy (2001) dispute this, stating that, in their experience, adults with severe ID are unlikely to be able to adequately participate in focus groups, due to their complex needs and communication difficulties. In this current study, there was just one participant with severe ID who was unable to participate in the focus-group discussion. This individual was present at the time of discussion but entirely non-verbal. However, the experiences of one participant in a feasibility study are not a sufficient basis on which to base conclusions about adults with severe ID and their ability to participate in qualitative research. Thus, while many researchers assume that the more severe the level of ID, the less able an individual will be to participate, there is currently no evidence of this, beyond these researchers' opinions (Kaehne & O’Connell, 2010).

The participants' demographics are presented in Table 27 (section 5.3.3), including their respective levels of ID. Kaehne and O’Connell (2010) observe that most studies fail to document this important and likely relevant information. It is widely acknowledged that communication difficulties are the biggest barrier to participation in qualitative research for people with ID (Kiernan, 1999). Fraser and Fraser (2001) conclude that focus groups are a useful means of encouraging focused discussion between adults with ID, though they do tend to be more akin to one-to-one interviews than group discussions. As a result, they do not usually achieve the true aims of a focus group. This current study had a similar limitation, as the discussions were more in the style of interviews than authentic conversational dialogue (Appendix 10.12).

Due to the aforementioned challenges of conducting research on ID, it is common for the same groups of people to be approached for participation numerous times (Kaehne & O’Connell, 2010). Self-advocacy groups and other pre-existing groups for adults with ID are often seen as an easier sources for recruitment, but this can result in the over-representation of already articulate members of the ID community (Kiernan, 1999). Additionally, the overuse of these groups can taint the data derived from studies that aim to elicit information about the community as a whole.

A strength of the focus-group discussion in this study, was the fact that this was the participants' first experience of doing research. Due to it being the participants' first experience of taking part in research, they did not express the dissatisfaction reported by others who have previously taken part in such studies. Kaehne and O'Connell (2010) found that adults with ID who had participated in numerous research projects were disheartened when policy changes did not manifest. It is important for researchers to be as transparent as possible with participants about the impact the research is likely to have and to manage their expectations accordingly. In contrast, though it may not be possible to exert a significant impact on policy, partaking in qualitative research such as focus-group discussions can empower adults with ID and give them opportunities to engage in activities that may otherwise not have been available to them (Northway, 2010).

Another strength was the lack of potential bias brought in by advocates. The use of advocates in qualitative research in adults with ID has been criticised by some authors. Llewellyn (2009), who is an advocate for focus groups and states it is her preferred method of data collection, reports in her paper (2009) that they have shown to be particularly useful when working with those who have traditionally lacked authority and influence. However, Llewellyn (2009) does reflect on the notion that research undertaken with adults with ID and other facilitators – where there is a strong power differential – could have the potential to reflect more the opinions of the advocate than those of the participants. In contrast, Fraser and Fraser (2001) explain that the use of advocates was an advantage in their study, where advocates such as the participants' carers were able to interpret the participants' responses that were not comprehensible to the researchers. As with most of methodology behind qualitative methods, more research is required to determine whether interaction between participants with ID and their advocates has a meaningful effect on research outcomes.

Hollomotz (2017) notes the possibility for error and bias when undertaking qualitative research with adults with ID. The researcher's techniques may contribute to errors such as acquiescence and unresponsiveness (Hollomotz, 2017). This issue arose in the current study. The extract below could potentially be removed from its context and used to recommend an LY practice; but in reality, the qualitative data has the potential for significant bias, with the researcher potentially leading the participants responses by providing them with options to choose from (e.g., "easy or hard" or "texture or taste").

Researcher	*“Did you find it okay, the questionnaire? Was it easy or hard to fill out?”*
B3	*“Easy to fill out in my case, rather than hard, but thanks for all that. Cheers, also, as well, anyway, Louise.”*
Researcher	*“B2, would you want to give a saliva sample?”*
B2	*“No.”*
Researcher	*“What is it that you don’t like about it?”*
B2	*“I don’t know.”*
Researcher	*“Is it the texture or the taste?”*
B2	*“Taste.”*

Previous researchers have reported that techniques such as open-ended questions can help to elicit discussion with participants with ID (McVilly et al, 2008). However, Booth (1996) report that this is not without its own challenges, as some participants have difficulty comprehending the open-ended question format. As documented by several researchers (Merriman & Beail, 2009, Gjertsen, 2019), participants may fear giving a "wrong" answer or sharing a negative opinion. This practice of "yes-saying" could not be confirmed in the qualitative data from this current study, but it would perhaps be more prominent on a larger scale. However, as a laughter yoga teacher who also undertook the qualitative data collection, when asking questions such as “did you enjoy the laughter yoga?’ there is potential that my own views of laughter yoga may have influenced the language used when asking questions and additionally a less obvious version of “yes-saying” could have occurred. Finlay & Lyons (2002) has stated that people with ID may feel the need to say "yes" or share solely positive opinions, which could lead to the generation of inaccurate data, but other researchers have questioned this. Gjertsen (2019) state that clear and concise guidelines can enable the participation of adults with ID who have prominent communication difficulties.

In the current study, thematic analysis was undertaken of the transcriptions from the focus groups. A thematic analysis (Braun & Clarke, 2013) may be seen as a more inclusive approach, as it is less interpretive than the grounded theory model (Beail & Williams, 2014). Thematic analysis takes data at face-value and could be a more appropriate method of identifying a group's view of an intervention. In qualitative research, validity is often referred to as "trustworthiness" (Beail & Williams, 2014). A thematic analysis stays close to a participant's words and can thus enable better participant validation than a more interpretive style of analysis. Though it may not be possible for the participants themselves to carry out this qualitative data analysis, researchers must be aware that by including adults with ID in the research process, that they do not end up feeling partly excluded by the possible inability to partake in the analysis stage of research (Townson et al, 2004).

Beail and Williams (2014) found that qualitative data interviews with participants with ID tended to be shorter than those conducted with the general population. This finding is supported by the qualitative data outcomes of this study, which include a relatively small quantity of qualitative data (Appendix 10.12). This is to be expected from a feasibility study and further compounded here by this research having been undertaken with adults with ID. However, it is important to consider whether this may have affected the richness of the data. "Richness" has been defined in the literature in reference to the quantity of themes in the data (Smith & Osbourn et al, 2008). This study produced five themes (section 6.2). It has yet to be explored whether study participants having ID affects the number of themes derived from the qualitative data. The only way to measure this would be to undertake the same study in both the ID population and the general population, yet what could be considered as more necessary at this stage, is whether the qualitative data that is derived from adults with ID contributes to our knowledge.

The lack of reporting on previously applied qualitative methodologies, as well as the limited participant demographic information available for adults with ID, has made progress in this field relatively slow. The results of this current study further highlight the need for more concise reporting of methods. Publications by Nind (2014) and Walmsley and Johnson (2003) bring together information about the process of co-research with adults with ID; and Nind and Vinha (2013) produced a report on this topic for the National Centre for Research Methods. Their report highlights the common challenges faced by researchers in the ID field when partaking in co-research and concludes that investigations of qualitative co-research methods would provide researchers with more time to produce significant, high-quality data (Nind &Vinha, 2013).

Focus groups are popular in research primarily, as they are thought to generate data easily, rapidly, and cheaply (Fontana & Frey, 1994). However, it is these same perceived benefits that could conceal the additional requirements of ID research. Researchers who undertake focus-group research with adults with ID need to be acutely aware of the aforementioned challenges and be willing to educate themselves in the skillset required to effectively utilise this methodology.

The validity and reliability of the qualitative data presented in this study is not of sufficient strength to support firm assumptions or recommendations. However, Holomotz (2017) recommends that the researcher should be flexible in their approach to collecting qualitative data, working collaboratively with the participants with ID to identify their prefer communication style, whether this be verbal, non-verbal, or a combination of both. Professionals in the field of ID research often prefer to focus their efforts on service planning and development, rather than the emotional experiences of those with ID (Arthur, 2003). It could be said that researchers experience their own disability when it comes to fully understanding the communication methods of adults with ID. A high-quality skillset is needed to undertake qualitative research with adults with ID.

7.3 Feasibility Data

The main aim of this study was to assess the feasibility of LY as a psychosocial intervention for adults with ID. The secondary aim was to identify the effect of LY on participants' associated mental health conditions (anxiety and depression). Qualitative and quantitative data was collected to address the latter aim. The feasibility results presented in the previous chapter enable evaluation of all aspects of the study (from recruitment onwards), as well as permitting a preliminary evaluation of the participants' responses to the intervention. First, it is essential to understand the different components of a scientifically valid research study. In line with the MRC guidance for developing and evaluating complex interventions (Craig et al, 2008), it was judged that a feasibility study was needed to identify whether the LY intervention would be feasible for adults with ID, as well as to test the feasibility of specific aspects of the study (such as the recruitment process, ethics, and data-collection methods). The MRC guidance (Craig et al, 2008) highlights that this type of imperative preparatory work is often not done. Feasibility studies allow any core uncertainties arising from a thorough search of prior literature to be examined and evaluated.

This discussion of the feasibility results is presented in relation to the core five objectives of a feasibility study laid out by Orsmond & Cohn (2015). These five objectives represent the core components of any high-quality feasibility study (Table 32).

7.3.1 Recruitment and Consent in Intellectual Disabilities (ID) Research

It is difficult to draw comparisons between the recruitment process and resulting sample characteristic of this feasibility study, as only one other study has researched yoga and adults with ID and this included only two participants (Hawkins et al, 2012). A group of Australian researchers published a report showing the outcomes of each stage of their recruitment process across a multi-site study (Lennox et al, 2005). This report details numerous difficulties, such as limited access to potential participants with ID, challenges with obtaining consent, and general apprehension about and unfamiliarity with the research by participants (Lennox et al, 2005). Similar barriers were noted in this feasibility study, including the limited access to potential participants and the scheduling and timetabling clashes that limited potential participants' availability. Barriers to recruitment prevent adults with ID from taking part in research.

In their study, Swaine et al. (2011) sought consent from both the participants themselves and their guardians. They documented this as an additional step in their recruitment process, as their ethics required the guardians' consent only. Thus, this additional step promoted the self-determination and independence of adults with ID. The current study followed the advice of the UK Research Governance Framework for Health and Social Care (Department of Health, 2005), which promotes research *with* adults with ID – as opposed to research *on* or *about* them. The work to directly obtain consent from the participants was an important feature of this study. For this purpose, prior literature was used as a guide as to what could work. Cleaver et al. (2010) reviewed the studies completed over a period of 20 years to identify how previous researchers had made contact with adults with ID to invite them to partake in research. They found that enrolment rates were highest when the adults with ID were contacted directly, resulting in consent rates over 90%, except where the studies were invasive. This is consistent with the recruitment in the current study, as 13 of the 14 participants able to consent also chose to take part. Although working with gatekeepers to provide direct access to those with ID is of benefit, future studies should seek to accommodate lengthy recruitment periods to ensure large sample sizes.

When gaining consent from this population group, the consent forms and participation information sheets must be accessible for adults with ID to read and understand. In accordance with recommendations from previous studies (Wong et al, 2000, Fisher, 2003, Dunn et al, 2006), easy-to-read information sheets and consent forms were used (Appendix 10.2, 10.4). This also follows the best practice described by the IASSID, who assert that consent procedure must be fully informed and free from acquiescence (IASSID, 2003). The additional step of posing consent-screening questions (section 5.3.6) was incorporated into this study to confirm participants' understanding of the research and why they were taking part. Fisher et al. (2006) discovered that understanding the purpose of the research was often more challenging for adults with ID than understanding the research procedures. The participants in this study were asked consent-screening questions (Appendix 10.3) about both the procedures and the purpose of the research. If at any stage in the study, the participants were found to lack this understanding, they were withdrawn from that aspect of research. For example, during the study, it was found that one participant no longer understood why they were giving the saliva sample, so their saliva samples were no longer collected from that point on.

In an ideal world, all adults with ID invited to participate in research would be able to provide informed and voluntary consent. However, the exclusion of those who cannot consent may be depriving them of the chance to partake in beneficial interventions (Shepherd et al, 2019). As no adverse side effects were reported in this present study, it could be argued that those unable to consent could potentially take part in future studies of the same intervention.

Previous studies have noted sample-specific characteristics, such as males experiencing greater peer pressure to take part in yoga practice than female participants (Conboy et al, 2013). Due to the small sample size in this study – and owing to the residential site on which it was held – it was not possible to assess the differences between the genders or their respective experiences of taking part in the intervention. Additionally, as the sample for this study was derived from a residential site, it does not represent adults with ID who are unknown to the services. This is a significant challenge that future researchers should seek to overcome.

To do research *with* adults with ID – as opposed *about* them – it is necessary to build a degree of rapport between the researcher and the participant (Bollard, 2015). As reflected in the reflective research journal, "*familiarity is paramount for this population groups of adults with ID*"*.* The relationship built with participants when first attending the site for the information and consent session, led to a more inclusive and participatory approach to the LY and VY sessions and data-collection sessions with the control group. Numerous studies have considered the ability of adults with ID to consent to research (Fisher, 2003, Fisher et al, 2006, Horner-Johnson et al, 2009), but few have stated explicitly what the best method is to invite them to participate in the first place. Future studies should present data on the procedures used to access and invite this vulnerable population group to participate in research. This would allow researchers to evaluate their own methods more critically and provide a valuable contribution to knowledge of research recruitment for adults with ID. From single handily undertaking the recruitment for this feasibility study, it is advised that researchers have a full understanding of the additional time and resources that will be required to recruit larger sample sizes within this population group of adults with ID.

7.3.2 Data Collection and Outcome Measures in Intellectual Disabilities (ID) Research

The second core aim of a feasibility study is to evaluate the data-collection procedures used and the suitability of the outcome measures chosen. A key role of mental health professionals who work with adults with ID is to limit their clients' distress and enhance their quality of life (NHS England, 2015). For this reason, the outcome measures were chosen to be as stress-free as possible. Crawford et al. (2011) advise that the chosen outcome measures should be direct, relevant and appropriate, while Coster et al. (2013) highlight numerous factors to consider when choosing outcome measures for adults with ID – such as practicality, affordability, efficiency, and applicability.

The accessibility of the outcome measures is of the upmost importance when working with adults with ID. Many adults with ID have difficulty reading and understanding text (Van Den Bos et al, 2007). Mencap (2008) and the Department of Health (2010) have both published guidance for producing easy-read documents for use by adults with ID. As noted in the methods chapter, these guidelines were followed when creating the participant and consent forms for this study.

For its outcome measures, this study used saliva samples to measure cortisol levels, a sphygmomanometer to read blood pressure, and the Glasgow mood rating scales adapted for ID. In the most recent search of the literature (June 2021), there was no data pertaining to the collection of saliva samples or taking of blood pressure in adults with ID. While cortisol levels can also be read via blood sampling, saliva sampling was chosen here as the less invasive option. There are, however, guidelines published by PHE (2017) titled, "Blood tests for people with learning disabilities: making reasonable adjustments" should future studies implement this outcome measure. Guidance for use of other data-collection methods would be valuable, as commentary by researchers on experiences of collecting saliva samples and blood pressure in adults with ID is limited.

Until approximately 40 years ago, ID research showed a preference for using simple yes/no questions in self-report measures (Sigelman et al, 1980). However, in recent years, there has been a shift towards using Likert-type self-report scales. These scales ask participants to rate the extent to which they agree or disagree with each statement listed (Mindham & Espie, 2003). This change in outcome measure could be due to the previously documented challenges that many adults with ID have when faced with yes/no questions (Sigelman et al, 1980, 1983). As Likert-type scales have better reliability and validity among adults with ID than yes/no scales (Mindham & Espie, 2003), the Glasgow depression scale (GDS-ID) and the Glasgow anxiety scale (GAS-ID) were chosen for this study, as both have been adapted for use by adults with ID. The GDS-ID and the GAS-ID also include "prompts" (Appendix 10.7) for researchers and carers to use to aid understanding of the statements.

Several researchers have commented on the time required to complete the GDS-ID and the GAS-ID. Mindham and Espie (2003) state that an assessment time of 5-10 minutes is adequate, whereas Cuthill et al. (2003) state that 5-15 minutes would be preferable. The latter is more consistent with the experiences of using the Glasgow mood rating scales in this study.

The extra time needed to complete the forms in this study could have been due to the reliance on a single researcher, and the availability of more support could potentially reduce this completion time. (However, this inter-administrator reliability could be a benefit of this study, as the same researcher administered the GDS-ID and GAS-ID throughout the duration of the project, a feature not assessed in other studies.) Cuthill et al. (2003) report that some adults with ID may, in rare occasions, need numerous attempts to complete the Glasgow mood rating scales. Though this was not the case in this study, participants did require close to the maximum of 15 minutes each to complete the scales. In a study by Conboy et al. (2013), some of the participants complained about question repetition. Although the GDS-ID and GAS-ID include similar questions in both scales (Appendix 10.7), there were no complaints about repetition from the participants in this study.

Mileviciute et al. (2013) found that adults with ID who had higher IQs reported lower levels of depressive symptoms via their self-reported questionnaires than those with lower IQs did. The sample size of this study is too small to identify any correlation with these findings, but this could be taken into consideration in future studies. Additionally, in the general population, women report a greater prevalence of depression than men do (Kessler, 2003), though, again, such findings could not be observed in the small sample of this feasibility study.

As reported in the literature review (Table 3), there are numerous instruments with which to measure anxiety and depression amongst adults with ID. However, rather than producing more self-report scales, it would be preferable for the current scales to be assessed and further refined for use for adults with ID. Self-report measures such as the GDS-ID and the GAS-ID used in this study are important in the field of ID research, as they allow participants to take an active role in the research. This allows ID research to be undertaken *with* adults with ID and not simply *on* them.

7.3.3 Intervention and Control-group Design

It is unethical to place burdensome demands on adults with ID who are participating in research. For this reason, and due to this being a feasibility study, the intervention consisted of just one session per week, for both the LY and VY groups. It is known that yoga can be a beneficial adjunct approach to other mental health treatments, but there is not yet sufficient high-quality research showing how all aspects of yoga practice can help (Forfylow, 2011). As detailed in chapter two (section 2.12), yoga is an ancient Eastern practice, but most research data on yoga has been published in the last 23 years (McCall, 2014). No studies from this small pool of research examine the use of yoga for mental health in adults with ID. Additionally, there is a significant lack of literature on the specifics of implementing a yoga intervention.

This lack of standardisation in yoga studies may be due to the variety of styles of yoga (Hanson, 2016). Yoga is a holistic practice that focuses on the body, mind, and spirit, thus some studies have focused on the physical aspects of the yoga postures (*asanas*), whereas others have focused on the *pranayama* (breathing exercises). As explained in chapter two (section 2.13), VY was chosen as a comparison with LY, as they both focus on the breath, but VY does so through breathing in sync with the movement from one *asana* to another, while LY does so through the use of simulated laughter. VY and LY are parts of the branch of *hatha* yoga that is comprised of the third and fourth limbs (*asana* and *pranayama*). In contrast to the other eight limbs, *hatha* yoga focuses on the movement of the body and flow of the breath, much like exercise, while the remaining six limbs are concerned with moral values and spirituality. Though the participants of this study could not comment on the physiological changes that may have occurred as an effect of taking part in either of the yoga interventions, the qualitative data derived (section 6.2) could justify further examination of the interventions as beneficial for reducing mental health conditions experienced by adults with ID.

A small handful of studies in ID research note the potential therapeutic benefit of the group experience alone, regardless of the specific intervention (Kahya et al, 2017. Prior research has indicated that interventions that have significant elements of social interaction are more likely to have a positive effect on the mental wellbeing of the participants (Supekar et al, 2014). This is likely due to the increased sense of connectedness that adults with ID may experience when taking part in these intervention groups with others.

This feasibility study also mitigated some of the barriers that people with ID may experience when wishing to take part in yoga, by providing the required knowledge and a group of other people with whom to practise alongside. As in the study by Stanish et al. (2012), where adults with ID took part in an exercise intervention, three elements were included to remove the barriers that adults with ID could face when attempting yoga. First, the participants had the support of their peers with ID. Second, the study took part in an inclusive setting (the participants' own residential centre); and third, the participants received expert guidance during the yoga sessions from a fully certified and experienced yoga teacher. In line with the Stanish et al. (2012) study of exercise and adults with ID, the researcher in the current study also noticed enhanced engagement between participants throughout the study, and this is noted in the reflective research journal (Appendix 10.17).

The study design incorporated two comparison groups – the VY group and the treatment-as-usual control group. Control groups that incorporate treatment-as-usual or a wait-list are the most common form (Kinser & Robins, 2013). In the Kinser and Robins(2013) study of control-group design, it was found that researchers in some studies give considerably more attention to their intervention groups than they do to their controls, with some intervention groups enjoying an additional 20 hours of interaction. Sharma et al. (2006) used an active control group (similar to the VY group in this study), but they developed a “fake” activity that was similar to the movements and stillness of yoga. Unfortunately, their reporting of the details of their yoga group and “fake” activity control group was limited. Shadhidi et al. (2010) were the first to control for attention and time in their control-group design. They incorporated an exercise control group with the same number of sessions and same duration of time as the LY group in their study. The use of VY as a comparison to LY in this study also enabled consistency of attention and time between the interventions, though the treatment-as-usual control group received less time and attention. This study was not of sufficiently long duration to judge whether the attention given to participants in each group by the researcher had an effect of any of the outcome measures, but this should be evaluated in future longer studies. A strength of this study was its use of a VY comparison group and a control group. In a longer study, this research design could be maintained to show whether the intervention itself produced an effect or if the primary cause was the extra time and attention given to the participants. Continuing the use of active control groups in ID research design could lead to data reporting that they may even be a positive intervention in and of themselves due to the positive effects of receiving time and attention from members of a research team whilst providing data for the outcome measures.

The purpose of the current study was to determine the feasibility of LY as a psychosocial intervention for adults with ID and their associated mental health conditions (anxiety and depression). The quantitative and qualitative results derived from a feasibility study should be interpreted cautiously, due to the small sample size. Results from future studies may be difficult to predict, as recruitment response rates and sample size may be significantly affected when scaling up the size of the study. This is the first study to research the effects of LY on adults with ID. It is also the first to compare the practice of LY with that of another style of yoga by both those with ID and the general population. The following chapters present the quantitative results (chapter 6) and quantitative discussion (chapter 7). Chapter 8 presents the qualitative results and a qualitative data discussion is given in chapter 9. Chapter 10 presents an evaluation of the strengths and limitations of the current study, as well as proposing directions for future research.

8. Conclusion

This chapter will examine the strengths and limitations of the current study as derived from the previous discussion. First, the eight strengths within this study will be addressed, then the four identified limitations will be discussed concluding in an overall summary of findings and future directions.

8.1 Strengths

This study had eight main strengths. First, its greatest strength is that it is the first feasibility study to examine the effects of LY as a psychosocial intervention for adults with ID on their associated mental health conditions. Second, only one study on VY for adults with ID had been previously undertaken (Hawkins et al., 2012), and only had two participants, both of which were young adults aged 21 and 22. Third, this is the first study working with both the ID population and the general population to compare two yoga styles as separate interventions. While there have been a number of studies in the field of yoga concerning the impact on the general population, there is substantial heterogeneity in the study designs and yoga styles researched, such as restorative yoga for metabolic syndrome (Anderson and Taylor, 2011), *Iyengar* yoga for schizophrenia *(*Cabral et al, 2011), and *kundalini* yoga for anxiety disorders (Krisanaprakornkit et al, 2006). Furthermore, most of these studies have been of poor methodological quality and of short duration, with small sample sizes (Cramer et al, 2018).

As covered in section 6.3, feasibility studies are designed to answer an overarching question of, “Can it work?” As discussed in the feasibility results (chapter 6) and discussion (chapter 7), the fourth strength of this study is that all the main objectives of a feasibility study have been addressed and examined thoroughly, from assessment of recruitment capability through to the preliminary evaluation of the participants' responses to the intervention. Quantitative and qualitative research styles were combined to create a mixed methods approach, which was another strength of this study. It was important to identify which outcome measures and data-collection measures could work for adults with ID. To have gained preliminary data from these is a bonus within a feasibility study. A mixed methods approach is beneficial as it provides participants with choices for how to share their experiences of the interventions (Shorten & Smith, 2017). While the data collected was of good quality and had been produced via validated research tools, there was a limit on how this data could be generalised due to the small sample size of the study. A fifth strength of this study is that, with its mixed methods approach, it enabled the collection of both physiological data (blood pressure, cortisol readings) and psychological information (Glasgow mood rating scales, focus-group discussions). This enabled greater understanding of their experiences of the intervention.

The sixth strength of this study is its inclusion of a control group. Prior yoga studies have tended not to include control groups in their methodologies (Cramer et al, 2018). The most recent study of LY was by Bressington et al. (2019), and this examined the effect of LY on depression symptoms in outpatients. In their discussion, they note that the lack of an active comparison group or a control group created a risk that the positive effects of LY may have only related to non-specific group effects. Their advice was taken into consideration in the current study, underpinning the decision to incorporate an active comparison group and a control group. It has been observed (Field, 2016, Monro et al, 2015) that no studies have previously compared different yoga styles. Many studies that have lacked an adequate comparison group have been unable to confirm the aspects of the LY sessions that led to the reported positive effects, such as increases in subjective wellbeing scale scores (Weinburg et al, 2014). Weinburg et al. (2014) suggest that it is difficult to select an appropriate comparison group for LY because it is such a unique activity. They state that a suitable comparison activity should be similar in all aspects to LY, i.e. group-based, emphasis on the breath, with the exception of the specific practice of LY (Weinburg et al, 2014).

The seventh strength of the current study is the depth of knowledge about yoga that I had as the researcher. (Despite being a strength, this may also be a limitation, as discussed further in section 8.2.) Based on an understanding of the theory of yoga and the different styles, it was judged that VY would be the ideal comparison for LY, as VY incorporates all the same elements of yoga as LY, with the exception of the laughter. A depth of knowledge is required when researching yoga to ensure that logical conclusions are reached and appropriate comparison groups are chosen. The incorporation of the VY group in this study removed a significant limitation present in previous studies. The importance of a full understanding of all elements of yoga is expanded on in the future directions (section 8.3).

A review by Tiffany Field (2016) of studies concerning yoga and its effects on mental health highlights a number of common limitations. These limitations were addressed during the development of the research design for the current work, and this was a strength of this resulting study. One of the most common limitations reported was the lack of detailed descriptions of the components of the yoga sessions, as well as a lack of information on the duration of the postures and other elements of the yoga classes. For this reason, the step-by-step process of the yoga sessions was documented so the LY and VY sessions could be replicated exactly in the future (Appendix 10.9). This would enable a preliminary examination to parse the effects of the separate components that make up the yoga sessions, such as the individual LY exercises, individual *asanas* in VY, or the meditation sections.

Tiffany Fields (2016) also notes the lack of physiological measures for mental health research. They recommend blood-pressure and cortisol outcomes measures, both of which were used in the current study. In adults with ID, more so than in the general population, psychological and physiological data are of equal importance because the latter allows researchers to gain insights into the effects of an intervention, without relying solely on participants with ID being able to voice their experiences. However, qualitative data is equally important and should not be underestimated, even in small quantities. This mixed methods study provided the participants with the opportunity to express themselves in relation to their experiences of the interventions. The fact that participants had the opportunity to share their opinions is of more importance than the quality of the data. The only other study to date examining the impact of yoga on young adults with ID (Hawkins et al, 2012) did not collect any qualitative data. The researcher strongly suggests that all future studies do so.

Smith et al. (2011) made used of an observer during the yoga sessions in their study. The yoga teacher/researcher did not know they were being observed and the observer did not know the hypothesis of the study. The observer was able to assess any differences between the delivery of the intervention between groups and over time. Weinburg et al. (2014) note that they were unable to control the exact structure of the LY sessions, thus the interventions were not identical in each session. In contrast, an eighth strenght of this current study was a firm, set structure (Appendix 10.9) for both the LY and VY sessions in this study. This structure was followed consistently in the interventions each week. Most yoga studies have not specifically documented the yoga exercises or *asanas* used and in which order they were held or for how long (Vorkpoic, 2017). The absence of this information makes it impossible to reproduce the results of these studies. However, the session outlines for LY and VY used in this study are included (section 5.4.3 and section 5.4.4), which allows for replication.

8.2 Limitations

This study has four limitations to be considered. First, it is a feasibility study with a small sample size and recruitment took place in one location. The blinding of participants was not possible, which prevented the placebo effect, as participants were aware that they were taking part in the yoga interventions. Studies with small samples sizes cannot usually be generalised to a larger population group. This study had 13 participants – more than the two in the Hawkins et al. (2012) study, but nonetheless, generalisation of the results is not possible. Most studies of yoga so far have had small sample sizes, with those in the literature review all having fewer than 100 participants. Studies with much larger populations would produce more generalisable results.

The participant demographics were also limited due to the final recruitment taking place in a single location in southwest England. All participants were aged 27-59 years, all were heterosexual, and all of White ethnicity. These demographics are not representative of the entire ID population. There is no current data on the ethnicity of adults with ID (Daniels, 2012). However, as outlined by Parmalee et al. (2011) and Riolo et al. (2005), both gender and race have been shown to influence the prevalence of depression. O'Hara (2003) conclude that males with ID who are from a Black or minority ethnic (BME) background experience "double jeopardy", while females in this group experience "triple jeopardy", referring to the levels of discrimination these groups face. Additional factors such as social and economic disadvantage are another catalyst for poor mental health. As mentioned in the methods chapter (section 5.1.3), there are numerous barriers to recruitment of adults with ID in research, and these may disproportionally affect females from BME communities. The current study only had three female participants, while 10 males took part. Another limitation related to participant demographics is the unequal gender distribution in each of the intervention and control groups. The control group had more females than other groups, and the interventions groups had more males.

Second, the short duration of this study could be seen as a limitation. In Hanson's (2016) review on yoga for mental health, the average duration of a yoga study was 4-12 weeks.

Though conclusions can be drawn after a short intervention, further effects may take significantly longer to present. Equally, extending follow-up periods to greater than four weeks would be prudent to identify the sustainability of the results. Further studies could also incorporate two groups engaging in the same intervention over different durations, as in the Maddux et al. (2017) study, where 90 participants were assigned to either a 16-week or a 8-week yoga group.

Rachel Hanson (2016), in her systematic review of yoga for anxiety and depression, concludes that yoga interventions ought to be taught by an experienced yoga teacher, preferably certified by the Yoga Alliance, the governing body for yoga teachers worldwide. While it is a strength of the current study that as the researcher I am also qualified yoga teacher, it could be seen as a limitation that I was also the leader of the interventions. This meant that it was not possible to be blinded to the study groups. Additionally, with the same person leading the intervention and evaluating the results, the participants may have felt unable to give negative feedback during the focus-group discussions. Employing a yoga teacher external to the research team may have enabled a higher quality evaluation of the reliability of the intervention. Additionally, my own data, as the researcher, was collected via the quantitative outcome measures (Appendix 10.14) to identify the effects of the intervention. For this study it was preliminary data only and it had large potential for external influence due to not having any restrictions placed on myself as the researcher, regarding a yoga practice outside of the study. However, if the yoga teacher were detached from the rest of research process, this could provide another useful piece of data to examine.

The fourth and final limitation of this study was is only *hatha* yoga (the physical element of yoga) was examined. LY and VY do not incorporate the additional six limbs – concerning morals and values – and it would be interesting to explore whether these could have a beneficial effect on adults with ID. It is also important to note that yoga originated in East Asia long before the Western world began to explore the therapeutic effects through scientific research. The lack of strong and consistent findings in the field of yoga research could be due to a clash between the *outcome*-driven methods of Western research and the *process*-led practice of yoga (Hanson, 2016). Yoga is seen as a spiritual practice, as well as physical and behavioural intervention. As explained in chapter two (section 2.12), yoga is a multifaceted practice, consisting of not only *asanas* and *pranayama* but also *yama, niyama, pratyahara, dharana, dhyana,* and *samadihi*, which comprise the eight-limbed path of yoga. Some yoga practitioners have hypothesised that reducing yoga to just physical poses and breathing makes it impossible to garner any strong scientific data for yoga as a holistic practice.

The current study has numerous strengths and limitations. In particular, the study's small sample size and short duration make generalisation of the quantitative and qualitative results impossible. Second, a lack of relevant literature on the impact of yoga on adults with ID has prevented comparison of these results with others. Despite these limitations, a strength of the work is the flexibility that the feasibility study method allows. This permits the refinement of methodologies employed in previous studies, such as the incorporation of an active comparison group and control group and the addition of a 4-week follow-up period. The next section will present recommendations for future research directions.

8.3 Future Research Directions

Though the preliminary positive results of this feasibility study suggest that the intervention is ready to be tested immediately in a full-scale study, a new set of feasibility questions should be asked at this stage. This section presents recommendations for future studies that would build on the current findings. A common direction after the completion of a feasibility study is the assessment of whether the treatment under study would be appropriate for another demographic subgroup. In this case, it would be appropriate to ask whether this intervention would be feasible for adults with a range of ID – from mild to severe. As reported in the feasibility results (section 6.3), only one adult with severe ID took part in this intervention and this person did not provide any qualitative data, therefore no conclusions can be drawn regarding the value of the intervention for this ID subgroup. Research with adults with severe ID is particularly limited, but interventions for this group need to be tailored to them, as some adults with severe ID are non-verbal. Researchers undertaking these studies should have expertise in severe ID; they should engage carers and family members close to the participants to promote inclusivity and aid inclusion; and they must use appropriate outcome measures. If the collection of qualitative data from non-verbal adults with severe ID is not possible, further non-invasive quantitative methods – such as an adapted quality of life scale – could be considered.

A key recommendation for future studies is the use of a larger sample size that is more representative of the ID population. As presented in section 6.1.5, the sample sizes of 9, 87, 2, and 93 would have been needed for the outcome measures of blood pressure, anxiety, depression, and cortisol, respectively. The mean and the median of the sample sizes was 48 participants and is the recommend sample size for any intial future studies. A broader range of participant demographics (e.g., race, gender, severity of ID) could be more accurately represented by a larger sample. The study must be repeated for a larger population group with a more diverse pool of participants, if the results are to be generalised. As seen in the participant table (Table 27, section 5.3.3), seven of the 13 participants had autism spectrum disorder (ASD). Haigh et al. (2018) conducted a study comparing 76 adults with ASD and 64 adults from the general population and found that participants with ASD had significantly lower processing speeds. Results from the ADOS communication and reciprocal social interaction scale show the largest difference of results between groups, providing evidence that the slower processing speeds of adults with ASD affect their social and communication skills. Future studies should take into consideration the dual diagnoses of some participants with ID and how these may affect how interventions are received. There is minimal evidence of the impact of yoga on people with ASD, and most of the available publications concern children with ASD (Radhakrishna, 2010, Semple, 2018).

Additionally, as reported by the JCPMH (2013), we know that BME people are four times more likely to experience psychosis than White people and are more commonly prescribed high doses of medication (JCPMH, 2013). For these reasons, amongst others, it is imperative for further research to consider racial and gender differences and the barriers that affected populations face when seeking to access treatment support or take part in beneficial research for the ID population. A culturally aware research team should explore the needs of adults with ID from BME communities, as well as examining their own beliefs and assumptions to further develop inclusive research models for adults with ID in wider communities.

As reported in section 8.2, a limitation of this study is the lack of diversity amongst its participants. Further studies should recruit from multiple sites, across multiple geographical areas, both rural and urban. As the current study took place at a residential centre, it is more representative of adults with ID who have the same living conditions. Several ID research studies have considered the living conditions of participants with ID (Arscott et al, 1999, Fisher et al, 2006, Dye et al, 2007), but failed to examine the effects of this factor. Prior researchers (Dean et al, 1998) who have considered this conclude that adults with ID living in residential homes have fewer opportunities to make decisions for themselves, due to gatekeepers. Additionally, adults with ID who live alone have less access to support with deciding whether to take part in research (Goldsmith & Skirton, 2015). There are currently no studies examining gender, race, or living conditions in relation to adults with ID and the possible effects of these characteristics on their experiences of yoga as a psychosocial intervention. Future studies should consider these areas and implement recruitment procedures that enable greater diversity amongst participants.

A key limitation in yoga research has been the lack of standardisation of the interventions. As discussed in section 8.1, a strength of this current study is its documentation of the intervention structures. Future studies should also report the specific *asanas* and breathing exercises employed in their interventions (Appendix 10.9), as well as the orders and durations of each *asana*. This would enable researchers to identify the specific aspects of the yoga practice that produced any effects seen in the participants. The standardisation of the intervention would enable accurate comparisons between studies.

There are several questions that could be considered in future feasibility studies, such as whether incorporating all eight limbs of yoga into the intervention would alter the effects, if there is a specific dose-response relationship with a yoga intervention, and if yoga teachers in a healthcare setting should have a healthcare background. As previously mentioned, as the researcher in this study I am also a qualified nurse. If yoga teachers were leading sessions with the goal of decreasing symptoms of anxiety and depression, it would be interesting to note whether a class led by a dual-qualified healthcare professional and yoga teacher produced different results to a similar class led by a yoga teacher with no healthcare background.

For LY interventions, it is imperative that a trained LY teacher lead the intervention; and the onus is upon the researcher to ensure they are qualified in LY and not "laughter therapy". The results of the literature search in the systematic review revealed that the mislabelling of laughter therapy as LY is extremely common. When LY is mislabelled in this way, standardisation of the practice becomes challenging. Mora-Rippol (2010) reports that simulated laughter needs to be learnt and practised to produce any therapeutic effects. Practical guidelines for running sessions should be followed, and LY teachers should complete the official, internationally recognised LY teacher training (Laughter Yoga University, 2017). Providing healthcare professionals and carers who support adults with ID with the correct skills and techniques would give them a clearer understanding of the benefits.

Most yoga research to date has focused on the physical therapeutic benefits of yoga (Tran et al, 2001). Few have considered the spiritual aspects of yoga (Bell, 2000). The field of yoga research lacks an overarching theory of yoga (Patwardhan, 2016). However, researchers undertaking yoga research must have fundamental knowledge of all eight limbs of the yoga practice and how each element can garner different results. Yoga is a traditional lifestyle practice, originally used for spiritual reasons. However, so far, only its physical elements have been researched (Rao et al, 2013). Future studies should examine all elements of yoga and amend the interventions accordingly to incorporate these. Patanjali first described yoga as a tool to prepare the body and mind for spiritual development (Ross et al, 2012), but this claim cannot be tested in research unless a holistic yoga intervention is examined. This absence of a spiritual component to yoga research conflicts with the origins of the practice, which may be due to yoga's adaption in recent years to the Western world. Concepts of medication or chanting may be culturally unfamiliar, but as understanding of the eight limbs of yoga grows in the Western world, this should be incorporated into future research studies. Yoga research has shown that the practice of *asanas* and *pranayama* deliver positive results for mental health, similar to those of exercise interventions, due to the physical movement and breathing elements (Smith et al, 2011). However, a holistic approach to yoga could derive even more positive results. Future studies could compare *hatha* yoga (physical yoga) to the more comprehensive eight-limbed practice.

Another consideration in relation to the practise of yoga for mental health conditions is the notion of yoga as a body-mind *interaction*, where the classification of mental illness is based on body-mind *dualism* (Rao et al, 2013). It may be challenging to gather scientific data on these yogic concepts, but this should not prevent research from being undertaken in this area. Due to the holistic nature of the eight-limb model and the spiritual aspects of the mind that are incorporated, qualitative methods are likely to be most suitable for this evaluation. Alternatively, a mixed method approach could be taken, as in the current study.

The delivery of mental health services for adults with ID varies across the UK. There are currently no formal guidelines for a set approach or procedure. Additionally, a mixture of interventions are being tested and there is no one-size-fits-all approach to service provision (Royal College of Psychiatrists, 2020). Thus, further research on the experiences of adults with ID as to which service models are most accessible and feasible is required. This knowledge would improve the interventions offered to adults with ID, as well as helping to inform care provider decisions and to improve participant outcomes. This is an area of national priority laid out in the NHS long-term plan (2019). In the absence of a national policy, numerous service models have been developed, but future research would likely benefit from a focus on just a few core interventions. As advised by Mindham & Espie (2003) in reference to the use of Likert-type scales for adults with ID, it would be more valuable to increase the strength of the existing research than to produce more low-quality research in a broader range of interventions and outcome measurements.

The mixed method approach should be used for the procedure and outcome evaluation of the LY interventions. The incorporation of observation and video recording equipment could further facilitate the evaluation of intervention reliability between studies and the determination of a standard or set procedure (Craig et al, 2013). This research study could be further refined, and any pilot studies undertaken should take into consideration the recommended directions for future work. Once sufficient evidence has been collected and examined, the gold standard approach of an RCT could be conducted, ideally covering a larger geographical area and wider participant demographic. Furthermore, the inclusion of a longer-term follow-up period would provide more data on the sustainability of results. In research, a period of 12 months or greater is usually described as "long-term" (Harris et al, 2018). Some studies have even used follow-up periods of 2-4 years (Harris et al, 2018), which, if incorporated, could provide data on the effectiveness of yoga as a preventative intervention for adults with ID and associated mental health conditions.

To summarise – based on the aforementioned strengths, limitations, and proposed future directions – the following recommendations are made for future studies on yoga for mental health in adults with ID:

- Larger sample sizes and the recruitment of more adults with severe ID
- Greater diversity amongst participants, with a range of ethnicities, races, and genders
- Each element of the yoga and the structure of the intervention documented for replication and standardisation purposes
- LY incorporated as the intervention (as opposed to "laughter therapy", which is a different method)
- Enhanced knowledge of yoga theory and an examination of all eight limbs of yoga practice
- A mixed methods approach to gather as much data as possible
- Refined and developed feasible outcome measures for this population group
- Greater inclusivity by involving carers and family members of those with ID

To influence future studies, plans for dissemination of this study include publication in the Journal of Intellectual Disability Research**.** Two manuscripts were being prepared at time of thesis submission, one feasibility study paper and one systematic review. The abstract for this current study was presented at the International Association for the Scientific Study of Intellectual and Developmental Disabilities (IASSIDD) international conference in Glasgow and was thereafter published in the IASSID journal (Gates et al, 2019).

8.4 Reflection

As this was a mixed methods study it was worth noting that many qualitative approaches also consider the extent to which the researcher contributes in the shaping of the study and the findings. What follows is a brief personal statement from myself, the researcher, for consideration of how my positionality may have effected results, as well as a description of my journey throughout the PhD. The most obvious way bias could have occurred, is that by being a university educated researcher, I live a different lifestyle and have very different experiences to the participants within the study. Though as a nurse who follows the NMC code of conduct, I like to think that the NMC principles of *'listening to people and responing to their preferences and concerns*', as well as '*acting in the best interest of individuals at all times'* and *'treating people as individuals and upholding their dignigty*' has enabled me to be opened minded and empathetic to responses and results seen from a yoga intervention that may have been different to my own experience.

I found this PhD opportunity having completed a MSc at Kings College London, researching the effects yoga had on women with breast cancer and their associated health conditons, such as lymphodema and poor mental health. Though I had been teaching yoga for many years, the specific style of Laughter Yoga was new to me. As an intervention, I had no prior strong views as to wether it would be feasible or of benefit to adults with ID. In the first year of my PhD I undertook both a two day laughter yoga leader training, as well as a five day laughter yoga teacher training. This enabled me to have some prior experience of teaching and leading laughter yoga sessions before my study commenced the following year.

On reflection, recruitment proved to be the most challenging experience for me personally during the field research. There was a roller coaster of emotions that played out as I intially had access to three sights in the South West with a potential pool of over 100 participants, which then, due to reasons outside of my control, very quickly became just one site with 13 participants. I was fortunate though, to have commenced my field research pre 2020.

When the Covid pandemic hit I received many comments from family and friends stating how lucky I was that my writing up phase of my PhD had fallen within a period of global lockdown. That I would have “no distractions”. However, my personal experience was rather different. As a nurse, I felt called to offer my services at my local hospital by working one shift a week to ease the pressure within the NHS. I was also enlisted to work at the Nightingale hospital in London where I undertook training. Though I did not work at the Nightingale (it shut down shortly after), the emotional effects of what I’d seen and being in practice, even if just one day a week at my local hospital, weighed heavy on me. Having depression and obsessive compusive disorder, I know my tools to manage and have succeeded at doing so the majority of the time. Though due to the isolation I felt in lockdown from living alone, to the pressure of writing up my thesis, my mental health took a hit. It was at this time my director of studies left his position at Coventry Univeristy and I was given a new director of studies. This change came as a shock and did bring with it some unease, however I built a fantastic working relastionship with my new director of studies, Laurence, who I thank tremendously for helping me over the finish line of my PhD.

The impact of this change on my work did not go unoticed however. In academia we all have our areas of expertise, as well as individual preferences for research and writing styles. At times, this difference in styles between supervisors became a challenge to attain conistency in the reccomendations for the structure and write up of my completed thesis. As a quantitative and qualitative researcher will have differing views. However, I embraced this challenge and was proud of the day I could click ‘submit’ on my finished thesis. When the viva came round I was incredibly nervous and yet excited to experience a once in a lifetime experience. A moment of which I’ll never forget of being called Dr Gates and congratulated on the outcome of the viva.

As can be expected, a celebratory break was required before my work on thesis corrections began. I was grateful for the corrections and felt they have all been appropriate reccomendations to improve the overall quality of my work. Though the process of amending the thesis has been incredibly difficult, its been an opportunity to reflect how far I have come throughout the PhD journey. I endeavour to continue my career as a researcher and have commenced seeking employment in this field.

8.5 Summary

The aim of this PhD was to answer the research question, ‘*What is the feasibility and scientific benefits of laughter yoga as a psychosocial intervention for adults experiencing depression and anxiety secondary to ID?’* First, a review of the literature was presented in Chapter 3, highlighting the deficit of current research in this area and emphasising why this vulnerable population group deserves more research to improve the quality of their lives. Second, a rigorous systematic review (Chapter 4) enabled a closer inspection of the interventions and procedures previously used to explore mental health conditions in adults with ID. An additional review (4.9) cited the results of a study examining the effects of yoga on young adults with ID (Hawkins et al, 2012), though that study involved only two participants and the outcome measures did not assess mental health symptoms. The methodology was then detailed (Chapter 5), with explanations for the decisions taken to ensure an evidence-based process. The results were presented in Chapter 6 followed by a discussion in Chapter 7. The feasibility results discussed in Chapter 6 were supported by the researcher’s reflective journal alongside a discussion of the quantitative results and qualitative results (Chapter 7). Chapter 8 concluded by providing a discussion of the strengths and limitations of this work and proposed some future directions for research. This format was identified as appropriate for this mixed methods feasibility study. The feasibility results are what can lead to an answer to the studies aims and objectives. The collection of preliminary data is valuable, but the main aim of the study was to identify whether the chosen intervention and outcome measure were feasible. As established by homeostasis theory, the main aim of this feasibility study was to examine the accessibility and acceptability of LY as an adjunct approach to ease symptoms of anxiety and depression in adults with ID. Due to the small sample size, the results are preliminary and all the findings require further exploration in larger scale studies.

This study was a novel project, studying two interventions (LY and VY) that had not previously been studied in relation to adults with ID. The study also identified ways of engaging this population group in research, such as using sticker collection sheets (Appendix 10.8) and inviting them to have a say in the research process through the focus-group discussions. This thesis is not a detailed discussion of all issues faced in ID and yoga research, but it provides a high-level overview of the gaps in the literature that have a direct, practical bearing. There is a paucity of research in this area – as revealed by the literature review (Chapter 3) and systematic reviews (Chapter 4) – and further research is urgently needed.

Improving the mental health of adults with ID is a core objective of mental health commissioning services (JCMPH, 2013). This population group is high risk of experiencing poor mental health and good mental health is essential to increase their quality of life (Moss et al, 2009). The shared objectives of the JCPMH (2013) are that "more people with mental health problems will recover, have good physical health" and “have a positive experience of care and support". Taking these objectives into consideration, a holistic approach – such as yoga – could enhance recovery from the debilitating symptoms of anxiety and depression. Engaging in a regular yoga practice could help with the effective and rapid management of symptoms, while physical fitness interventions could also ensure good physical health. The inclusivity of LY and VY enables carers and family members to take part alongside adults with ID, thereby enriching feelings of care and support for those suffering with poor mental health.

The existing literature documents that undertaking research with the ID population is challenging. However, this is not a reason to avoid doing so. Previously mentioned issues – such as ethical challenges, reliance on gatekeepers to access adults with ID, living conditions, and busy schedules filled with additional activities – can all make it difficult to implement interventions for this population. But the onus is on the researcher to overcome these obstacles and document their processes to facilitate the growth of this research field. Although it can be difficult to obtain data through outcome measures, and research can be hindered by partcipants challenging behaviours (Oliver et al. 2002, Hamers et al, 2018), research is this area in not impossible and researchers should be aware of and prepared to face these challenges. The benefits of research for adults with ID far outweigh the additional burdens for researchers. The IASSID (2003) detail that best practice is to include individuals with ID in research, and this should be done to ensure that this population group gets the high-quality research they deserve. While feasibility studies can seem to be slowing down the research process, it is vital to take the time to improve the interventions and data-collection methods (Orsmond and Cohn, 2015), as this preparatory work invariably produces higher quality results.

Despite its limitations, this feasibility study contributes to the existing body of knowledge on yoga for adults with ID. This study has provided initial, albeit tentative results on the effectiveness of LY as intervention for reducing symptoms of anxiety and depression in adults with ID. These results now require validation in a larger scale study. Due to the growth in popularity of and interest in yoga, it would be useful to explore the use of yoga as an adjunct approach or complementary treatment for anxiety and depression in adults with ID. Further research on yoga practice for this population group is required.

LY is a non-pharmacological intervention that does not require any specialist equipment, is not prohibited by cost, and is easily accessible (Mora-Ripoll, 2010, Ko & Youn, 2011). It provides the opportunity for adults with ID to enjoy themselves, have fun, and be involved in a low-intensity physical movement in a safe and accessible way. Studies undertaken over the last 20 years have shown that yoga is a valuable therapeutic tool for anxiety and depression (Rao et al, 2013). Yoga also has a distinctive advantage over pharmacological treatments, as is it entirely safe and devoid of any negative side effect (Rao et al, 2013).

In conclusion, this feasibility study gathered evidence for LY as an adjunct approach for adults with ID and associated metal health conditions, but there is work to be done to transform this evidence into practice. For LY to be recognised as an evidence-based treatment for anxiety and depression, further development and evaluation is required, with more rigorous testing to be carried out before any intervention is put into practice. This study has provided some baseline evidence on which to build.

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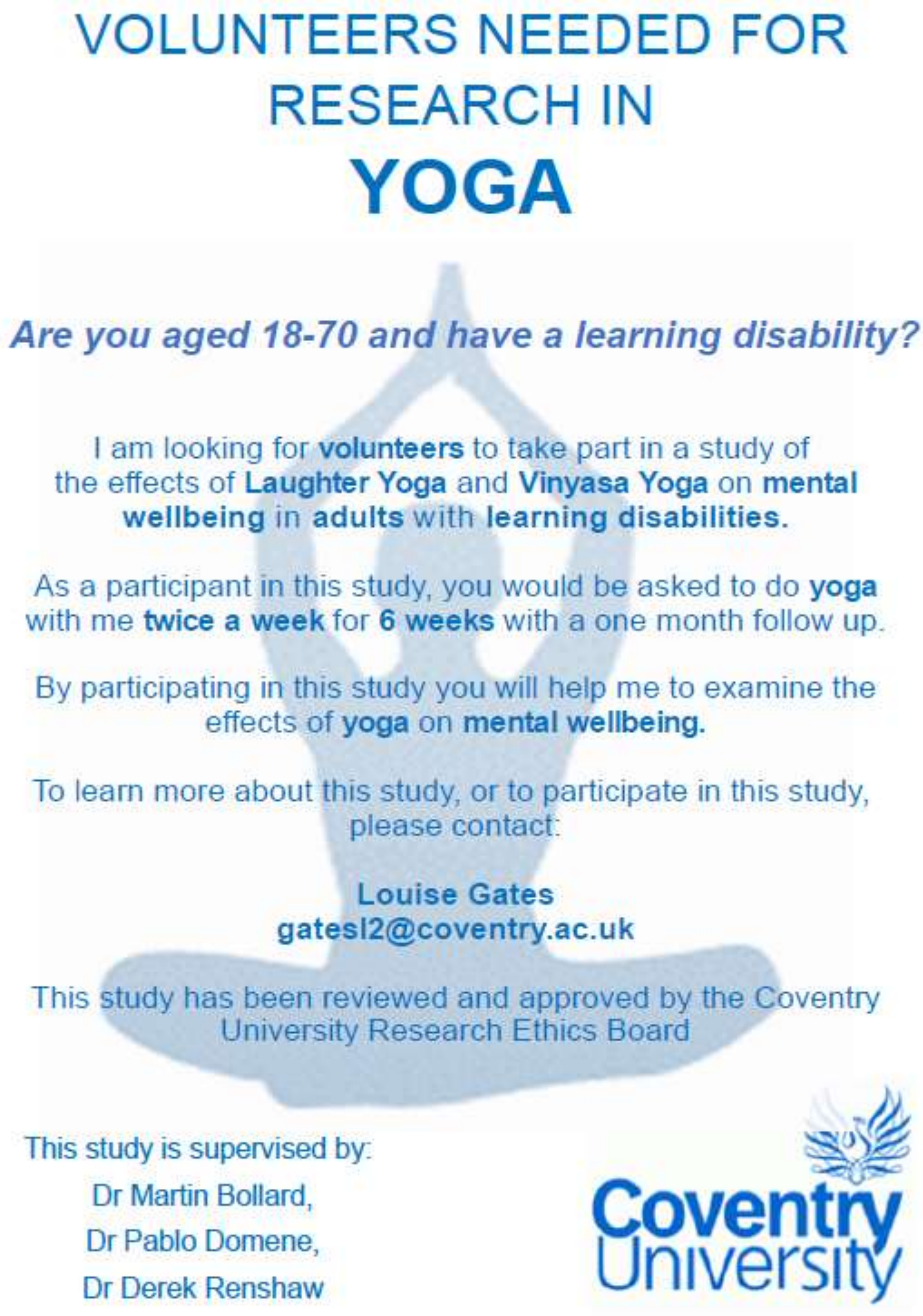
10. Appendices

10.1 Recruitment poster



VOLUNTEERS NEEDED FOR RESEARCH IN

YOGA

Are you aged 18-70 and have a learning disability?

I am looking for **volunteers** to take part in a study of the effects of **Laughter Yoga** and **Vinyasa Yoga** on **mental wellbeing** in **adults** with **learning disabilities.**

As a participant in this study, you would be asked to do **yoga** with me **twice a week** for **6 weeks** with a one month follow up.

By participating in this study you will help me to examine the effects of **yoga** on **mental wellbeing.**

To learn more about this study, or to participate in this study, please contact:

Louise Gates
gatesl2@coventry.ac.uk

This study has been reviewed and approved by the Coventry University Research Ethics Board

This study is supervised by:
Dr Martin Bollard,
Dr Pablo Domene,
Dr Derek Renshaw

Coventry University

10.2 Participation Information Sheet

PARTICIPATION INFORMATION SHEET

Psycho-social interventions for adults with intellectual disability and associated mental health conditions.

Hello, my name is Louise.

I am a researcher who is carrying out a study.

What is this study about?

You are invited to take part in a study.

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I want to learn about your experience of having **depression** or **anxiety** alongside your **intellectual disability**.

Depression is when you feel sad and maybe cry a lot.

Anxiety is when you may feel nervous or worried a lot.

I want to see if coming to **Yoga** classes twice a week could help with your mood.

You may do **Laughter Yoga** where you will laugh a lot

Or

You may do **Vinyasa Yoga** where you will move your body

I hope both will be fun.

You may not do **Yoga** at all and we may just meet to talk.

Why have I been asked to take part?

You have been asked to take part because you have an **intellectual disability** and you also have **depression** or **anxiety.**

How will it help me?

I hope the results of this study may help other people like you.

I hope you enjoy taking part.

I hope that the study will help people understand more about having **depression** and **anxiety** alongside an **intellectual disability**.

I hope this study will help people with **intellectual disability** manage their moods and feel happy a lot of the time.

What information will I be asked for?

You will be asked to fill in a **CONSENT FORM**.

This form will ask you if you would like to take part in the study.

You will be asked to meet up with me and talk about your experiences of **depression** and **anxiety.**

We will also talk about if you have heard of **Yoga** before.

You can bring someone with you to our meeting if you would like to.

You can talk in a group with other people.

Or if you prefer we can talk alone.

I would like to record our meeting. I will show you the recorder.

I would like to write down what you say.

I will not use your name when I write what we talked about.

The recording and notes will be kept safe. They will be kept for 5 years. After 5 years, the recording and notes will be thrown away.

Taking part in this study will not affect your care.

If you decide to take part you may need to come to **two Yoga classes a week** for **six weeks**.

I hope you will find this fun.

I will ask you to fill out some easy questions about you mood after each Yoga class. For example – ‘Do you feel happy?’ ‘Do you feel sad?’

I will take your blood pressure after each Yoga class but putting a band around your arm. This will not hurt.

I will ask for a saliva (spit) sample after each class. You will need to put a cotton ball in your mouth for 10 seconds. This does not hurt.

One **month** after the study ends, I will ask to meet you to take these measurements for one **last time**.

You will get a certificate and thank you letter for taking part in this study.

Do I have to take part in the study?

No. You do not have to take part.

If you want to take part and then change your mind,

that is ok too.

You can stop taking part at any time.

Will you tell anyone if I take part in the study?

My research team will know you are taking part.

If you would like someone to come to the yoga classes or group talks with you, they will know too.

I won’t tell anybody else what you tell me.

If you tell me that you have been harmed, I will have to tell someone. This is to help keep you safe.

Where will my information go?

I will use what you tell me to write a report.

I might use your words in my report.

I will not write your name in the report.

How will I find out the results of the study?

I will send you an easy read leaflet which will tell you what we found out.

What do I do if I’m unhappy with how the study has been carried out?

You can contact my research team on 02477 655886.

What do I do next?

If you would like to take part in the study, please fill in the

CONSENT FORM .

When I get the form, I will call you to give you further details.

Thank you for reading this participation information sheet.

10.3 Consent Screening Questions

Consent screening questions

At this stage, after reading the participation form, I will ask the potential participants the following questions. If they answer correctly with answer similar to those listed below or show an understanding of the study, I will continue to give them the consent form. If they show little to no comprehension of the study they will be excluded from participating.

Question:

"What type of yoga might you be doing as part of this study?"

Correct answers:

"Laughter Yoga or Vinyasa Yoga"

"Two different types of yoga"

Question:

"How many times a week will you need to partake in a yoga class?"

Correct answers:

"One"

"Once"

“I will do it once/one time a week”

Question:

“Are there good things or bad things about taking part in this study?”

Correct answers:

“Yes, I can help people who feel the same way that I do”

“This research can help people like me”

“I can help people understand about me and my moods”

“It will take up my time”

“I need to go somewhere different”

“I need to learn/do yoga”

Question:

“What can you do if you decide you no longer want to take part?”

Correct answers:

“I can tell you”

“I can stop attending the yoga sessions”

“I don’t have to do it if I don’t want to”

Question:

“How many focus group will you come to and talk about your experience?”

Correct answers:

“Three”

“You want to see me more than once”

“You want to talk to me with other people”

Question:

“How long after the study do I want to contact you for a follow up?”

Correct answers:

“One month later”

“Four weeks”

“You want to see me again after a while”

Question:

“What do I want to measure?”

Correct answers:

“Blood pressure”

“My feelings/mood”

“You want to put a band on my arm to measure something”

“You want a saliva sample”

“You want some of my spit”

“You want to ask me easy questions about my mood”

“You want me to write down how I feel”

“You want to ask me if I’m happy or sad or worried”

10.4 Consent form

CONSENT FORM

I would like to hear what you think about taking part in a research study about yoga and its effect on your moods, such as depression and anxiety.

- You do not have to answer any questions you do not like.
- You can stop talking to me at any time.

Do you want to talk to me about yoga and how you are feeling?

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Please put a circle around your answer.

YES **NO**

Can I keep a copy of this form?

Please put a circle around your answer.

YES **NO**

Can I tell other people what you think? I will not tell them your name.

Please put a circle around your answer.

YES **NO**

Do you want to come to two yoga classes a week for six weeks?

Please put a circle around your answer.

YES **NO**

Do you feel that you know what this study is about?

Please put a circle around your answer.

YES **NO**

Do you want to take part in a group talk about the study?

Please put a circle around your answer.

YES **NO**

Would it be OK if I recorded our conversation at the group talk?

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Please put a circle around your answer.

YES **NO**

Do you understand that at any time you can ask me to throw away the recording of your voice?

Please put a circle around your answer.

YES **NO**

Do you understand that you can stop taking part in the study at any time?

Please put a circle around your answer.

YES **NO**

Do you understand that I will measure your blood pressure?

Please put a circle around your answer.

YES **NO**

Do you know that I will want a saliva sample? It will not hurt. You just put a cotton swab in your mouth for 10 seconds.

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Please put a circle around your answer.

YES **NO**

Are you happy to answer some questions about how you feel? For example, do you feel happy or sad or nervous or worried?

Please put a circle around your answer.

YES **NO**

Do you want to take part in this study and have information from your participation used in research?

Please put a circle around your answer.

YES **NO**

Please write your name in the box below

Date

/ /

Researchers name and signature

Date

/ /

10.5 Ethics Certificates

Certificate of Ethical Approval

Applicant:

Louise Gates

Project Title:

Psycho-social interventions for adults with intellectual disability and associated mental health conditions.

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as High Risk

Date of approval:

29 July 2018

Project Reference Number:

P67972

Coventry University

Certificate of Ethical Approval

Applicant:

Louise Gates

Project Title:

Psycho-social interventions for adults with intellectual disability and associated mental health conditions.

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Low Risk

Date of approval:

15 January 2019

Project Reference Number:

P76030

10.6 REC-IRAS N/A certificate

10.7 Glasgow mood rating scales

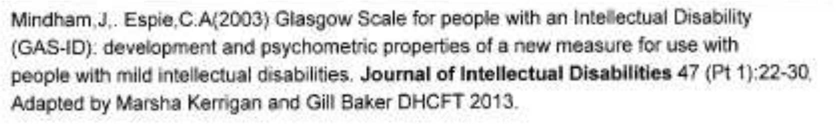
Glasgow Depression Scale

(score of 13 or over indicates depression).

Cuthill, F. M., Espie, C. A. , Cooper, S (2003) Development and psychometric properties of the Glasgow Depression Scale for people with a learning disability: Individual and carer supplement versions. The British Journal of Psychiatry 182:347-353. Adapted by MK, GB, GW, DHCFT 2008.

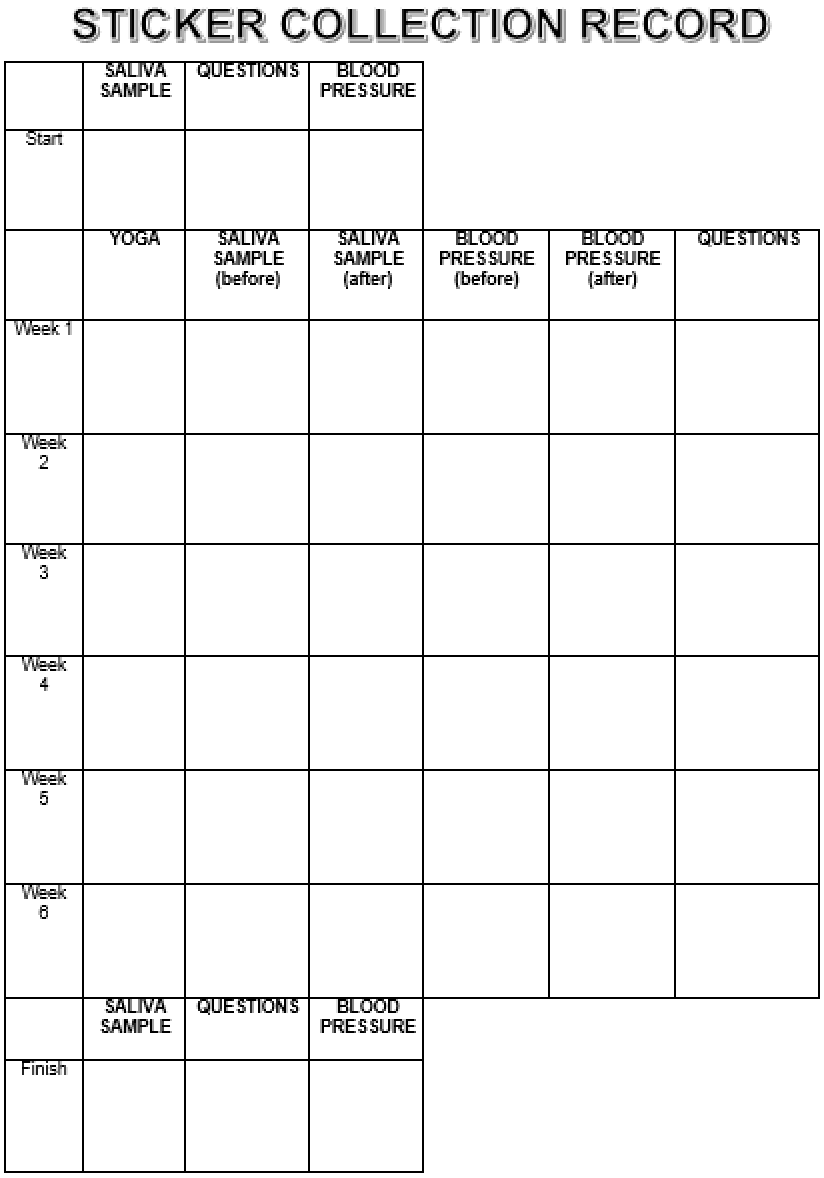
Glasgow Anxiety Scale.

(score of 15 or above indicates anxiety).



Mindham,J,. Espie,C.A(2003) Glasgow Scale for people with an Intellectual Disability (GAS-ID): development and psychometric properties of a new measure for use with people with mild intellectual disabilities. **Journal of Intellectual Disabilities** 47 (Pt 1):22-30. Adapted by Marsha Kerrigan and Gill Baker DHCFT 2013.

10.8 Sticker sheets



STICKER COLLECTION RECORD

	SALIVA SAMPLE	QUESTIONS	BLOOD PRESSURE
Start			

	YOGA	SALIVA SAMPLE (before)	SALIVA SAMPLE (after)	BLOOD PRESSURE (before)	BLOOD PRESSURE (after)	QUESTIONS
Week 1						
Week 2						
Week 3						
Week 4						
Week 5						
Week 6						

	SALIVA SAMPLE	QUESTIONS	BLOOD PRESSURE
Finish			

10.9 Yoga session outlines

Vinyasa Yoga – 45 minute session	
Deep breaths – 2 minutes	4 deep breaths
Deep breaths with arm raises – 1.5 minutes	4 deep breaths, raising arms when inhaling and lowering arms when exhaling
Inhale/Exhale and Shrink/Expand – 1.5 minutes	Inhale and expand body and arms to be as big as possible. Exhale and shrink body to be as small as possible.
Head circles – 1.5 minutes	Rotate the head round in a circle, ear to shoulder, chin to chest, ear to other shoulder. Repeat other way round.
Slow wide armed waves – 1.5 minutes	Arms out in front, stretched in a straight line, slow waving motion with the hands.
Wide clap and stretch – 1.5 minutes	Arms stretched out either side, draw arms slowly to the centre, slowly clapping palms together, repeat.
Circle shoulders – 1.5 minutes	Raise shoulders up to ears and rotate backwards, dropping shoulders down, repeat.
Small to big arm circles – 1.5 minutes	Arms stretched out either side, arms being to make smalls circles increasing to big circular movements.
Twists with hands behind head – 1.5 minutes	Place hands behind head, hips facing forward, twist torso side to side.
Banana stretch – 1.5 minutes	Arms up above head, palm to palm with hands, stretch to one side making curve with the side body. Repeat on other side.
Hands on back backbend – 1.5 minutes	Hands rest on lower back, hips gently forward for lower back bend.

Trikonasana – 1.5 minutes	Legs straight, arms out, one arm reaching forward one arm reaching behind, facing side of room. Repeat on other side.
Forward fold – 1.5 minutes	Legs and feet together, bend at hips, reaching arms down towards the floor.
Tall on toes – 1.5 minutes	Stand tall on tip toes, arms reach above head towards ceiling.
Warrior I – 1.5 minutes	Front leg in lunge, back leg straight, facing forward, arms reaching upwards in line with ears. Repeat on other side.
Warrior II – 1.5 minutes	Front leg in lunge, back leg straight, arms reaching arms out, one arm reaching forward one arm reaching behind, facing side of room. Repeat on other side.
Reverse Warrior – 1.5 minutes	Front leg in lunge, back leg straight, front arm reaching towards ceiling, back up resting on back thigh. Repeat on other side.
Tree pose – 1.5 minutes	Balancing on one foot, other foot placed on balancing leg, ankle, below knee or above knee. Repeat on other side.
Seated Knee Twist – 1.5 minutes	Sit down with one leg straight and one knee raised, twist torso in opposite direction to bent leg. Repeat on other side.
Seated Eagle leg twists – 1.5 minutes	Sit down with crossed legs, twist torso in opposite direction to top leg. Repeat on other side.
Eagle arm stretch – 1.5 minutes	Place one arm under the other, arms meeting at the elbows, bend at the elbows and join hands. Repeat on other side.
Meditation – 13 minutes	Relaxation and body scan

Laughter Yoga – 45 minute session	
3 reasons – 2 minutes	Brief description of the 3 reasons why we practice Laughter Yoga.
Clapping warm up - 1.5 minutes	Palm to palm clapping.
“ho ho ha ha ha”- 1.5 minutes	Say “ho ho ha ha ha” in clapping rhythm.
“very good, very good, yay!” - 1.5 minutes	Say “very good, very good, yay!” whilst clapping and reaching arms up towards the ceiling on “yay!”.
Throat Laughter – 30 seconds	Place fingers on throat and say “he he he”, feel for vibration.
Heart Laughter – 30 seconds	Place hands on heart and say “ha ha ha”, feel for vibration
Belly Laughter – 30 seconds	Place hand on belly and say “ho ho ho” feeling for movement of breath
Handshake Laughter – 2 minutes	Shake hands and laugh
One Metre Laughter – 2 minutes	Measure a metre with your arms and laugh with fully extended arms.
Zip Up Laughter – 2 minutes	Inhale and zip up the body from waist to neck, laugh on the exhale
Mobile Phone Laughter – 2 minutes	Pretend to hold a phone and laugh
Prod and Jump Laughter – 2 minutes	Gentle prop someone with your finger, jump and laugh when prodded.
Milkshake Laughter – 2 minutes	Pretend to hold two glasses of milk and fruit, mix them up and laugh on the exhale when pretending to drink the milkshake.
Soup Laughter – 2 minutes	Take in turns to throw in vegetables to the soup mixture, mix it up and pretend to splash it on one another laughing.

Lion Laughter – 2 minutes	Place your hands as claws beside your face, sit out your tongue, stretch your face and laugh.
Laughter Mediation – 8 minutes	Laughter meditation
Meditation – 13 minutes	Relaxation and body scan

10.10 Laughter Yoga teacher certificate

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10.11 Vinyasa Yoga teacher certificate

10.12 Thematic Analysis

Laughter Yoga Focus Group Week Three	Codes
Researcher: *“How are you?”*	
C3: *“Very well thank you, yeah”*	
Researcher: *“Did you enjoy the Laughter Yoga?”*	
C3: *“I did, yeah, I did.”*	Positive descriptors and reinforcement
C4: *“We did, very much, yeah”*	
Researcher: *“Good, I am glad. So, what was your favourite part of Laughter Yoga?”*	
C3: *“Oh, it was very good actually, the exercise, very good, yeah”*	Detailing and separating of certain elements of the yoga sessions
Researcher: *“Did you enjoy it?”*	
C3: *“Yeah, I did, yeah”*	Positive descriptors and reinforcement
Researcher: *“How do you find doing the saliva sample?”*	
C3: *“It’s like a sweet isn’t it, chewing a sweet, tastes horrible. Eurgh, it’s disgusting. Eurgh, horrible, but it’s all done, it’s horrible, but see, I can do it”*	Opinion of outcome measure
Researcher: *“Did you enjoy the Laughter Yoga last week C4?”*	
C4: *“Yeah”*	Positive descriptors and reinforcement
Researcher: *“C1, what was it that you didn’t like about the saliva sample?”*	
C1: *groans*	
Researcher: *“Do you not like the texture or the taste?”*	
C1: *“The taste”*	Opinion of outcome measure

Researcher: *"How do you feel after the laughing?'*	
C1: *"Energised"*	Positive descriptors and reinforcement
C3: *"Yeah, energised, me too"*	
C4: *"Energised"*	
Researcher: *"Are you enjoying the Laughter Yoga?"*	
C3: *"Yes, I am, yeah I do, I really enjoy it, yeah."*	
Researcher: *"What do you like about it?"*	
C3: *"ooo I like the exercise, the laughing, it's very good, yeah"*	Detailing and separating of certain elements of the yoga sessions
Researcher: *"Do you like the laughing?"*	
C3: *"Yeah, I do like laughing, yeh, he he he. How's it go J (carer). He he he he. Ha ha ha ha ha. Yeah, very good, yeah."*	Positive descriptors and reinforcement
Researcher: *"C1, what do you think of Laughter Yoga?"*	
C1: *"It's okay"*	
Researcher: *"It's okay. What do you like about it?"*	
C1: *"Dunno"*	
Researcher: *"Do you like the laughing?"*	
C1: *"Yeah"*	
Researcher: *"C2, are you enjoying it?"*	
C2: *"Yes"*	
Researcher: *"oh, good. You were laughing a lot last week weren't you?"*	Positive descriptors and reinforcement
C2: *"yes, I was"*	
Researcher: *"How was that? Did you enjoy it?"*	
C1: *"Yes, I did. What time do I come next week."*	

Researcher: *“You come at 10:30am next week, C1. How did you find the yoga today C3?”*	
C3: *“Very easy, yeah. Very good actually, yeah.”*	Acknowledgement of level of difficulty
Researcher: *“Do you like laughing?”*	
C3: *“I do like laughing, yeah. What about you D (carer), did you like it?”*	Positive descriptors and reinforcement
D (carer): *“Yeah, I did like it, I’d never heard of it before.”*	
C3: *“Didn’t want to cry. Yeah, I’m very happy now. Yeah. I quite enjoyed that yeah.”*	Reflecting on emotional state
Researcher: *“Do you feel happier afterwards?”*	
C3: *“I do yeah, what about you D (carer), do you feel happier?”*	
d (carer): *“Yeah, I do, yeah.”*	
C3: *“I’m happy now. I’m joyful. Do you enjoy life?”*	
Researcher: *“Yes, I do enjoy life, very much so. What about you?”*	
C3: *“I think I do, yeah. What about you D (carer), do you enjoy life?”*	
D (carer): *“Yeah, my life’s really good.”*	Reflecting on emotional state
C3: *“You gotta enjoy life really, don’t you. Gotta be happy and that. Gotta enjoy it.”*	
Researcher*: “C4, how do you find the saliva sample?”*	
C4: *“Boring. Oooo.”*	Opinion of outcome measure
Researcher: *“Do you find it easy to do?”*	
C4: *“Yeah”*	Acknowledgement of level of difficulty
Researcher: *“Are you enjoying the Laughter Yoga?”*	

C4: *“Yeah”*	Positive descriptors and reinforcement
Researcher: *“C1, would you want to give a saliva sample?”*	
C1: *“No”*	Acknowledgement of level of difficulty
Researcher: *“What is it that you don’t like about it?”*	
C1: *“I don’t know”*	Opinion of outcome measure
Researcher: *“Is it the texture or the taste?”*	
C1: *“Taste”*	
Researcher: *“Are you enjoying the Laughter Yoga?”*	
C1: *“Yeah”*	
Researcher: *“What do you like about it?”*	Positive descriptors and reinforcement
C1: *groans* *“What are we doing today?”*	
Researcher: *“Laughter Yoga. Do you enjoy it?”*	
C1: *“Yeah”*	
Researcher: *“Would you like it if I came back and did more Laughter Yoga?”*	
C1: *“Yeah”*	
Researcher: *“What do you like about Laughter Yoga E?”*	
C3: *“Ooo, it’s very good actually. Very good.”*	Positive descriptors and reinforcement
Researcher: *“What’s your favourite part?”*	Detailing and separating of certain elements of the yoga sessions
C3: *“Oh, urm, this bit…”* *claps twice and says ‘yay’*	
Researcher: *“I like that bit too. Are you looking forward to doing yoga today?”*	
C3: *“I am yeah, yeah. Yeah, it’ll be nice for a change.”*	Positive descriptors and reinforcement

Laughter Yoga Focus Group Week 10	Codes
Researcher: *“How are you feeling after Laughter Yoga? Do you feel in a good mood?”*	
C1: *“Yeah!”*	
C4: *“Yeah, of course I do.”*	Reflecting on emotional state
C3: *“Laughter Yoga is good, it keeps you fit, it’s good, like exercise.”*	
Researcher*: “Great! And what do you like about laughing?”*	
C3: *“Ooo, I like laughing”*	
Researcher: “*Yeah? Good. C2, do you like the Laughter Yoga?”*	Positive descriptors and reinforcement
C2: *“Yes, please.”*	
Researcher: *“Would you do it again, C2?”*	
C2: *“Yes.”*	
Researcher: *“Would any of you like to do yoga again?”*	
C3: *“Yeah, I would, yeah, it’d be nice for a change.”*	Positive descriptors and reinforcement
Researcher: *“Have you enjoyed it C4? Would you do it again? What did you like about it most?*	
C4: *“Of course. I like holding the phone with the music.”*	Detailing and separating of certain elements of the yoga sessions
Researcher: *“You liked holding the phone with the music. What about the laughter, did you like that?”*	
C4: *“Yeah, I liked the music.”*	
Researcher*: “The music played during the meditation?”*	

C4: *"Yeah"* Researcher*: "C1 did you enjoy the Laughter Yoga?"* C1: *"Yeah."* Researcher: *"Would you do it again?"* C1: *"Yeah."* Researcher: *"Why is that? What did you like about it?"* C1: *"Don't know"* Researcher: *"You don't know?"* C1: *"No"* Researcher: *"Did you like laughing?"* C1: *"Yes"* Researcher: *"And did you like the meditation?"* C1: *"Yeah"* Researcher: *"What was your favourite part?"* C1: *"Don't know"* Researcher: *"Okay, but you would do it again if you could?"* C1: *"Yeah"* Researcher: *"Okay"*	Positive descriptors and reinforcement Positive descriptors and reinforcement Positive descriptors and reinforcement

Vinyasa Yoga Focus Group Week Three	Codes
Researcher: “So how did you find that class?”	
B1: “I said it already, I found it alright, anyway”	
Researcher: “Good”	
B1: “Perfect again, in my case, anyway”	Positive descriptors and reinforcement
Researcher: “You found it perfect?”	
B1: “Even more so than that, I found it marvellous and perfect”	Positive descriptors and reinforcement
Researcher: “Do you find it relaxing?”	
B2: “Yes”	
B1: “Always, as well again, anyway”	Positive descriptors and reinforcement
Researcher: “What’s your favourite part of doing yoga?”	
B2: “The relaxation”	Detailing and separating of certain elements of the yoga sessions
Researcher: “Me too”	
B1: “I don’t mind again, I like all of it, anyway”	Positive descriptors and reinforcement
Researcher: “How do you find doing the saliva sample?”	
B1: “Easy, as well, anyway”	Opinion of outcome measure Acknowledgement of level of difficulty

Vinyasa Yoga Focus Group Week 10	Codes
Researcher: "Did you enjoy the yoga, B2?"	
B2: "Yes"	Positive descriptors and reinforcement
Researcher: "How did you find the questionnaire?"	
B1: "Really good, also, as well, anyway"	Opinion of outcome measure
Researcher: "Did you find it okay, the questionnaire? Was it easy or hard to fill out?"	
B1: "Easy to fill out in my case, rather than hard, but thanks for all that. Cheers, also, as well, anyway, Louise"	Acknowledgement of level of difficulty Opinion of outcome measure

Control Group Focus Group Week 10	Codes
Researcher: “So A1, How do you like the saliva sample? Do you find it easy to chew on?”	
A1: …no reply	
Researcher: “When you chew on the saliva sample cotton, do you find it easy?”	
A1: *nods yes*	Opinion of outcome measure
Researcher: “Was that a yes? You find it easy?”	
A1: *nods yes*	Acknowledgement of level of difficulty
Researcher: “Do you mind having your blood pressure taken?”	
A1: *nods yes*	
Researcher: “Okay, good. K, how do you find giving the saliva sample?”	
A2: “It’s okay, I can do it.”	Opinion of outcome measure
Researcher: “What do you prefer, chewing or spitting into the tube?”	
A2: “I prefer spitting, otherwise, I could choke on it”	Opinion of outcome measure

10.13 Declaration of EU conformity for sphygmomanometer

10.14 Researchers Data

As part of the data collection my own outcome measures were recorded as the solo researcher and deliverer of the interventions. Due to being a solo researcher with one set of data, an ANOVA or ANCOVA could not be carried out. Therefore a narrative description of results follows.

Table 1: Data collection from sole researcher for all outcome measures from week 0 (baseline) to week 10 (follow-up).

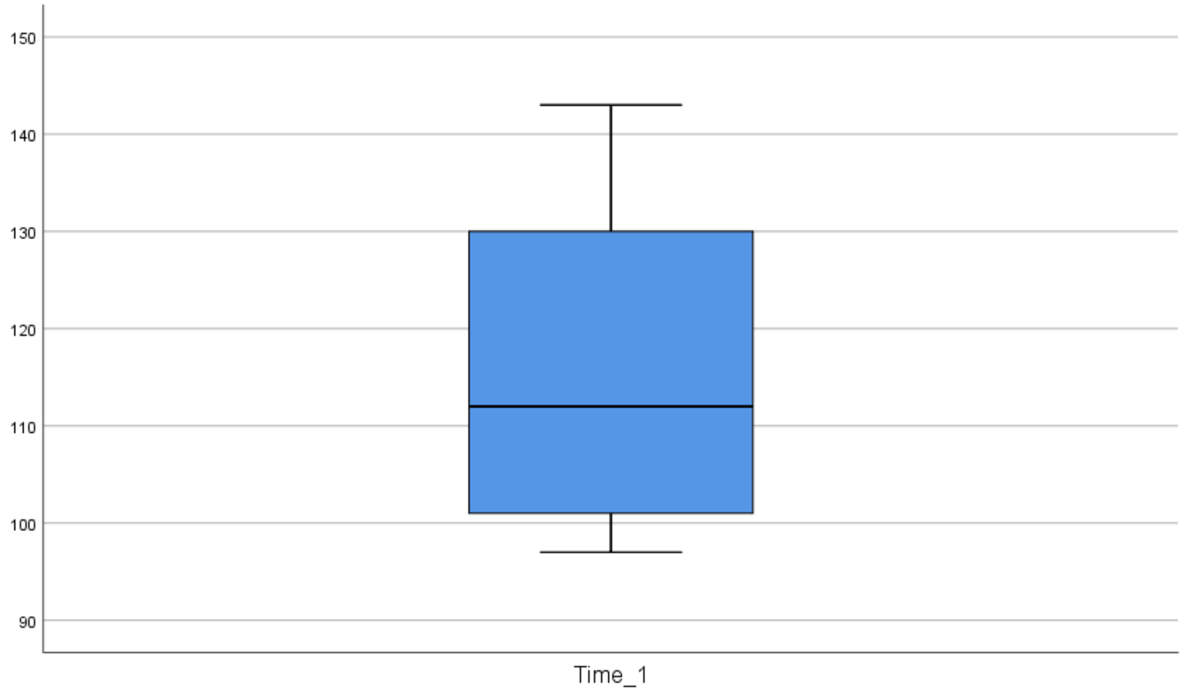
Researchers data collection				
Time	Anxiety	Depression	Salivary Cortisol	Systolic Blood Pressure
Week 0 (baseline)	7	4	7.09	120
Week 3	8	3	10.13	106
Week 6	5	1	10.16	111
Week 10 (follow-up)	5	1	10.68	113

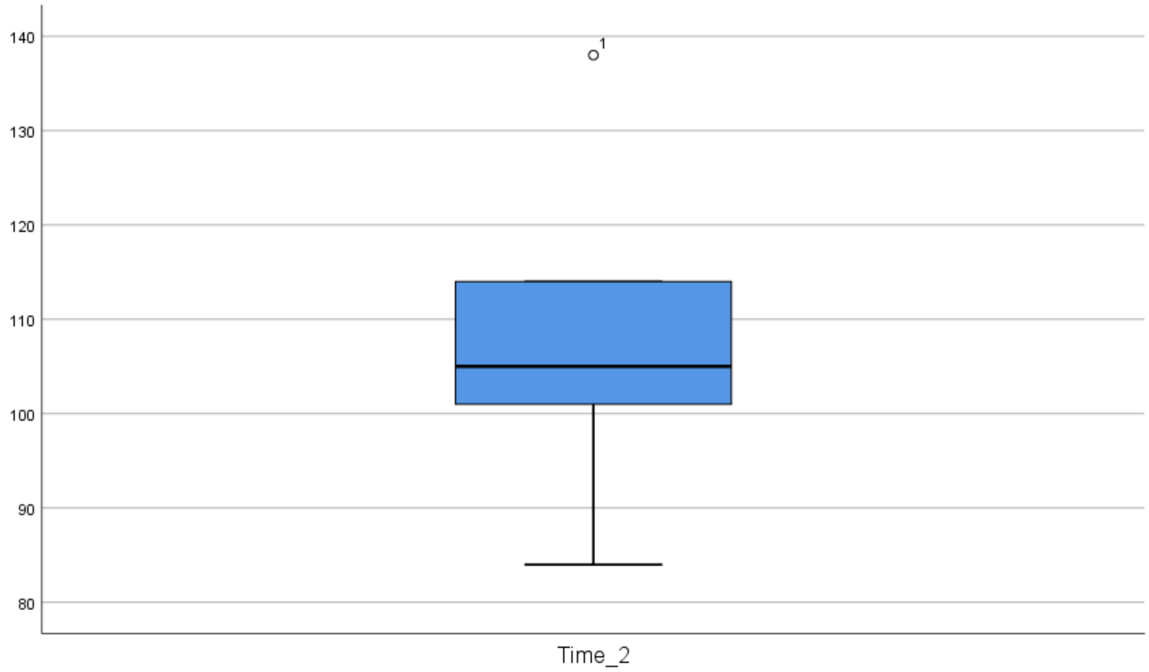
From the data is can be seen that a small reduction in levels of anxiety and depression can be seen from week the point of follow up measurements (week 10). A marginal increase in salivary cortisol and is noted, though not enough to be substantial. The systolic blood pressure readings marginally increase from an initial decrease between baseline and week 3 measurements, however the systolic blood pressure never exceeds the baseline measurement, even at the time of follow-up (week 10). This data is preliminary and has too many external variables, however it could be expanded on in future studies.

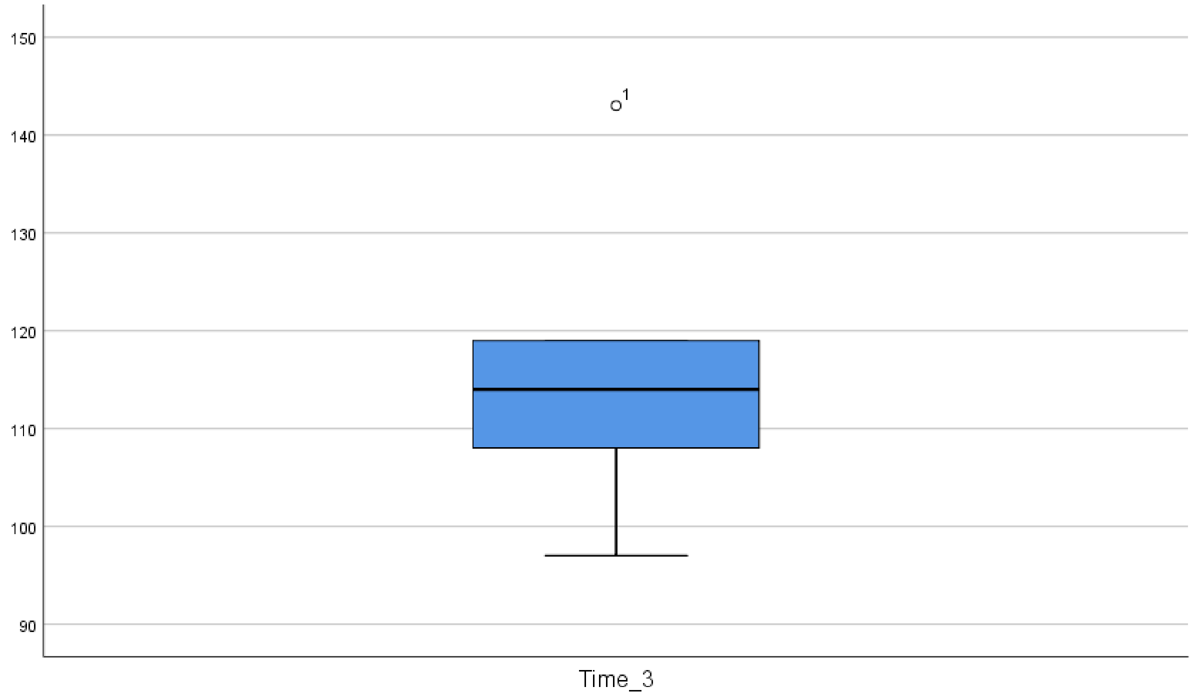
10.15 Boxplots

Laughter Yoga Blood Pressure Boxplots

(Time 1 = W0 baseline, Time 2 = W3, Time 3 = W6, Time 4 = W10 follow-up)



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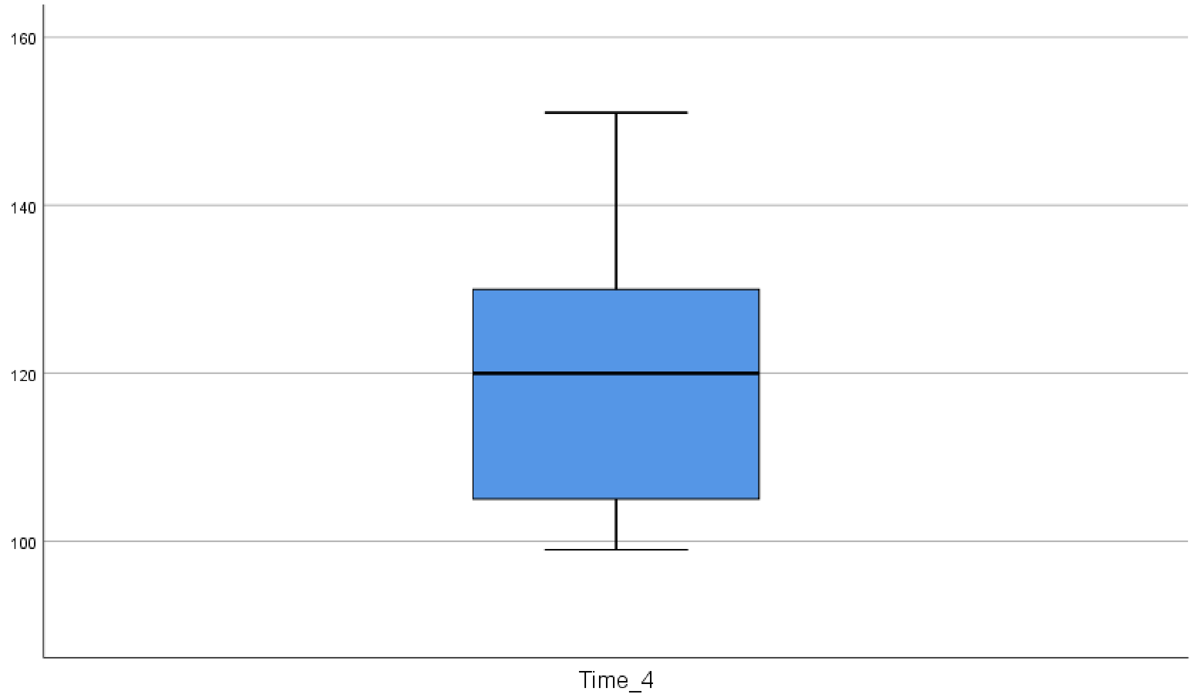
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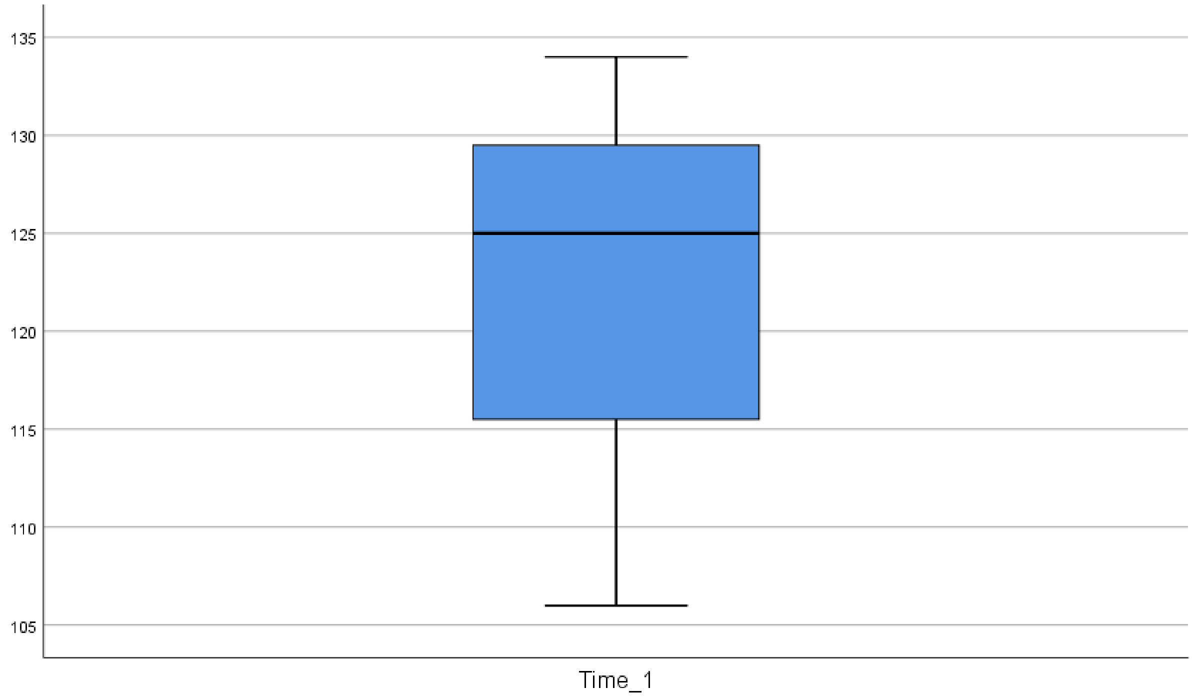
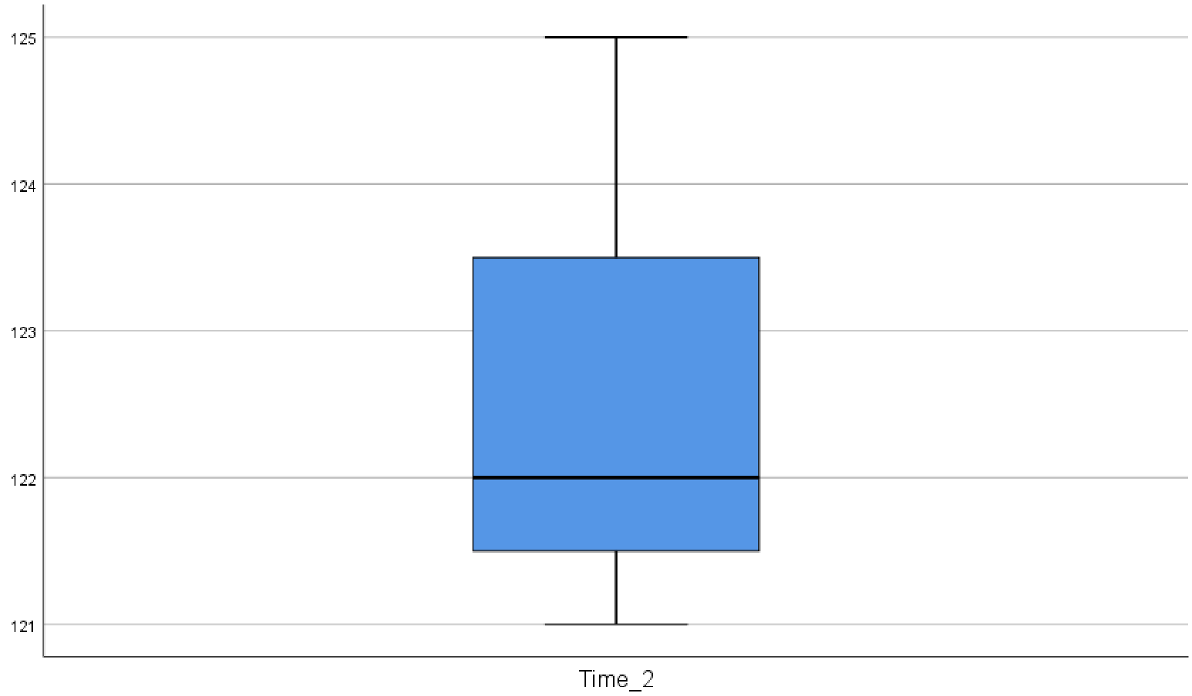
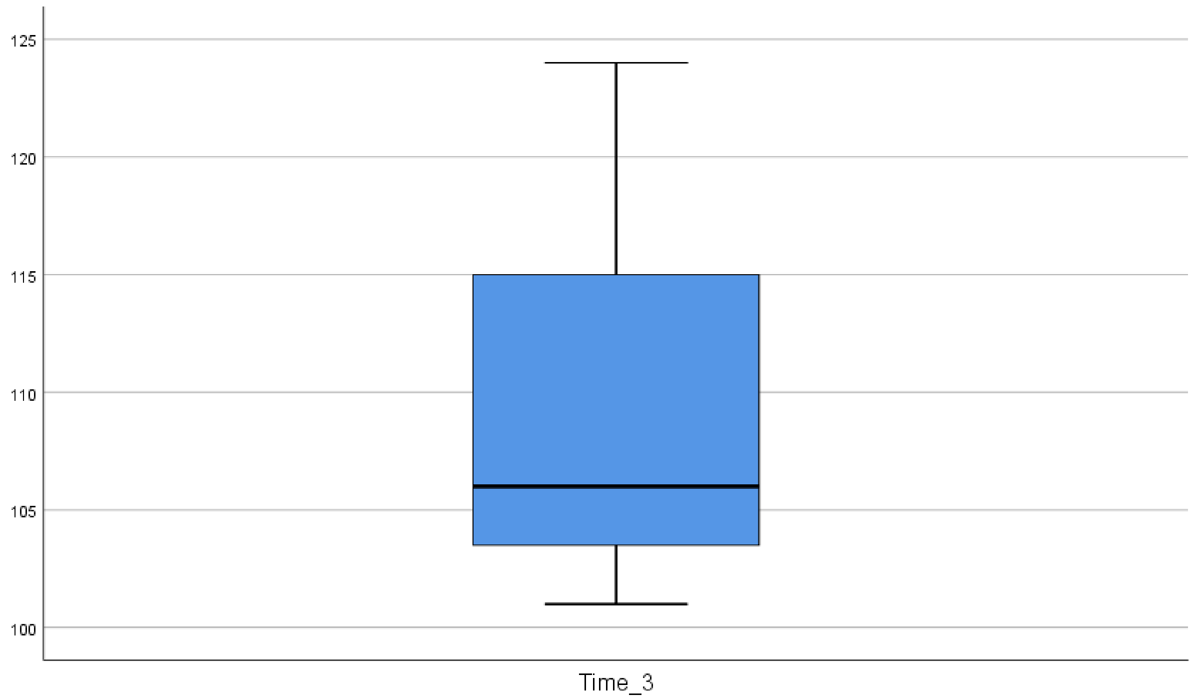
Vinyasa Yoga Blood Pressure Boxplots

(Time 1 = W0 baseline, Time 2 = W3, Time 3 = W6, Time 4 = W10 follow-up)



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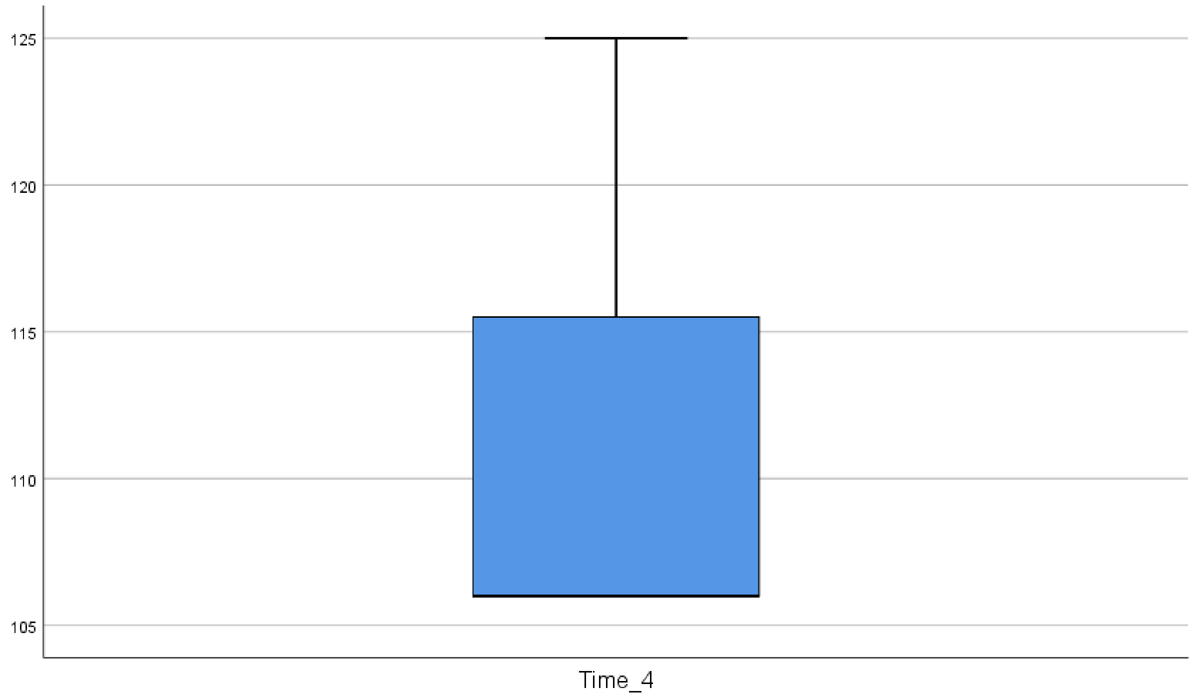
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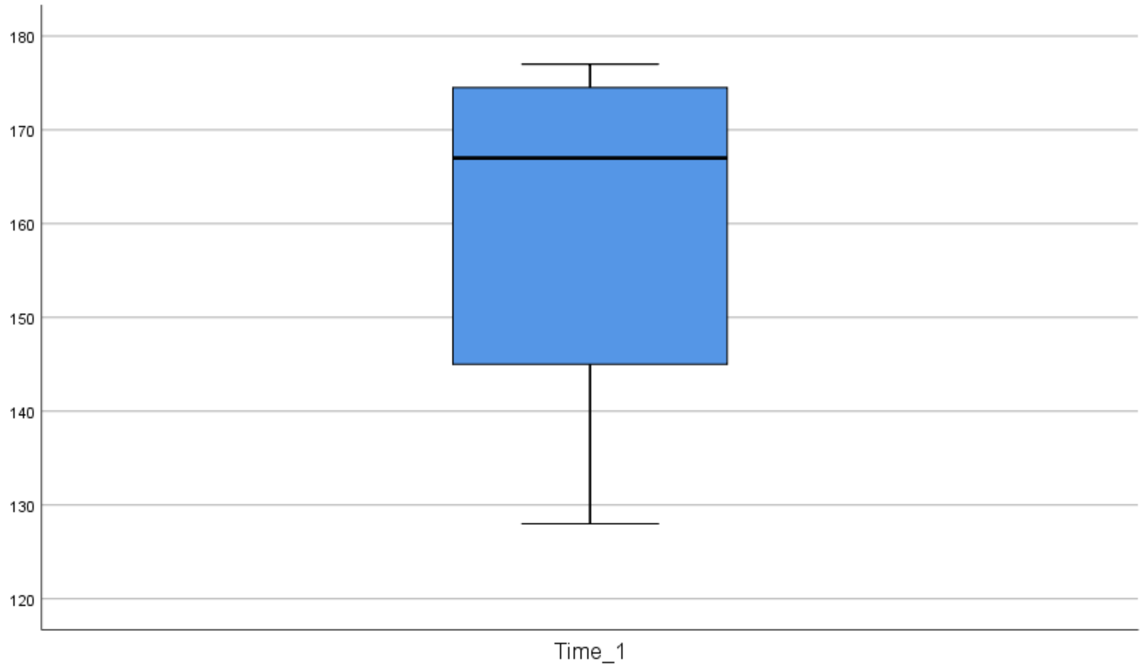
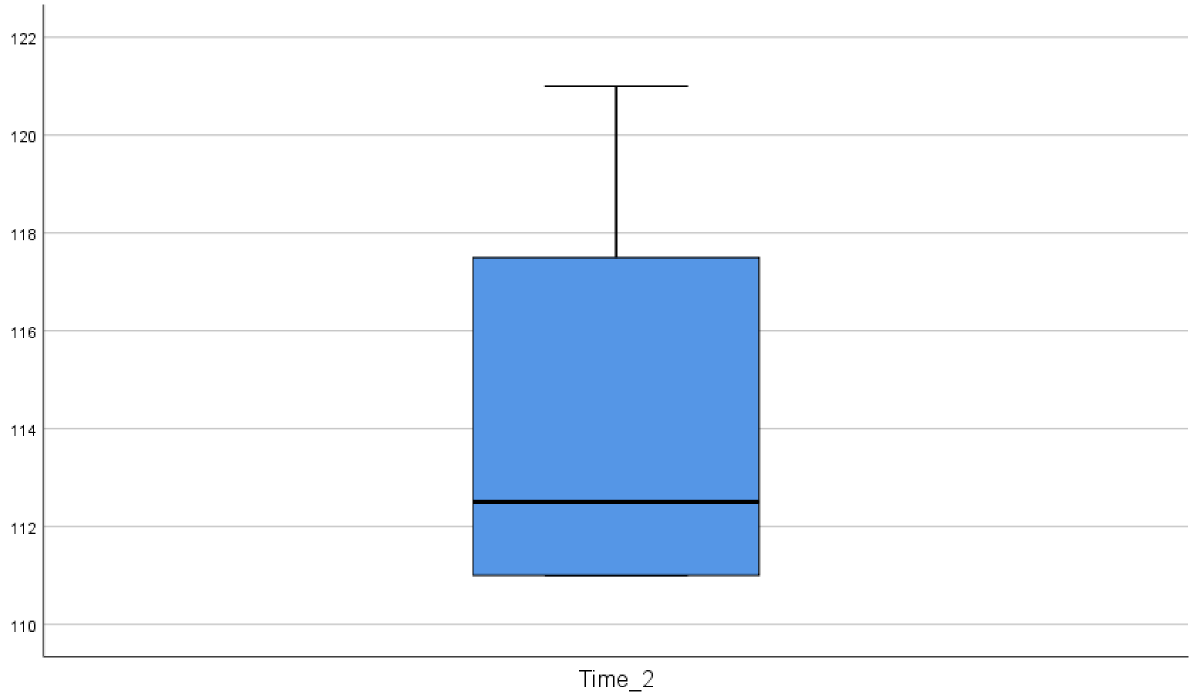
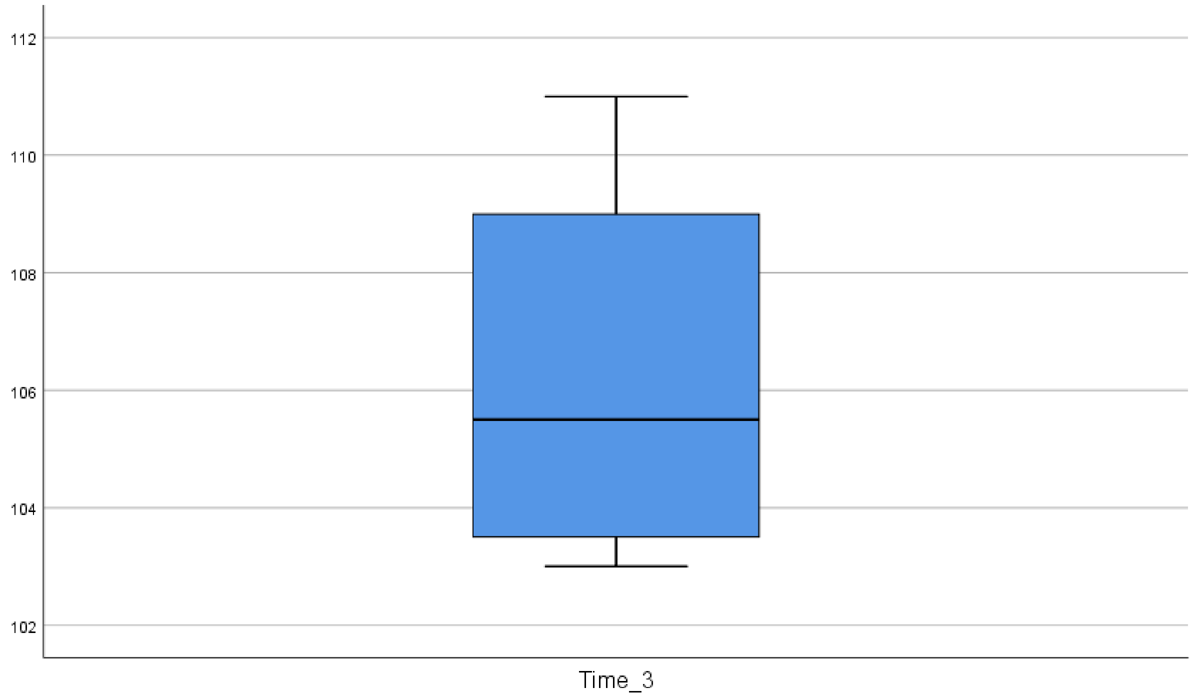
Control Group Blood Pressure Boxplots

(Time 1 = W0 baseline, Time 2 = W3, Time 3 = W6, Time 4 = W10 follow-up)



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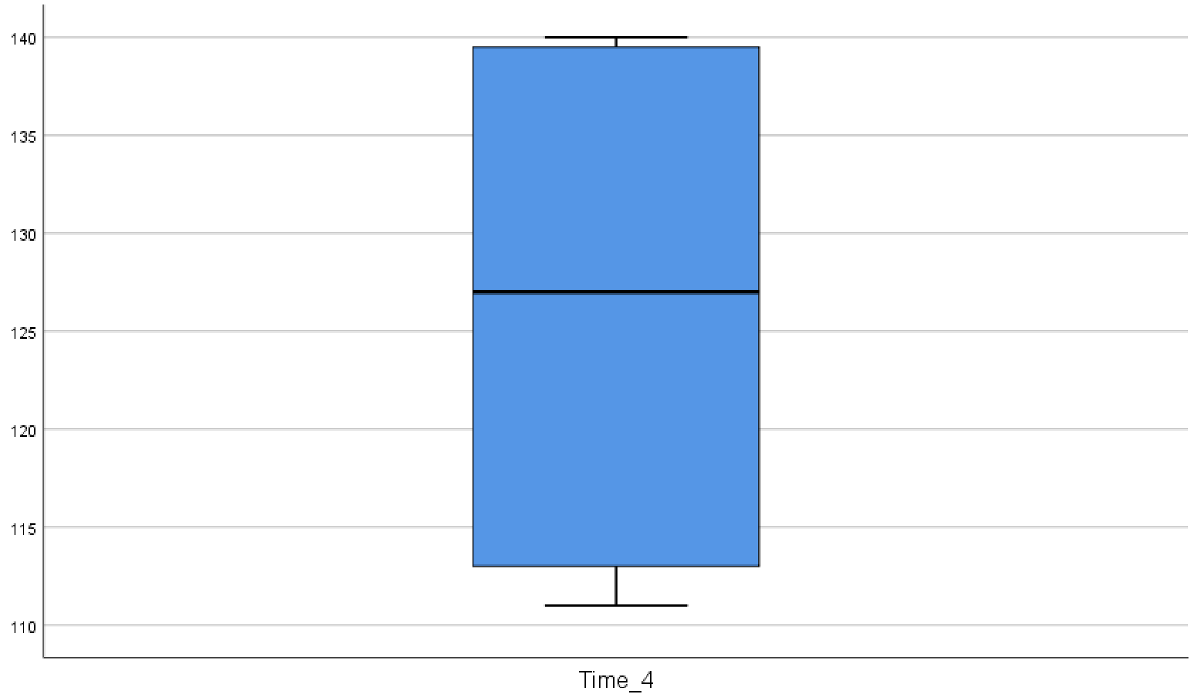
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Laughter Yoga Anxiety Boxplots

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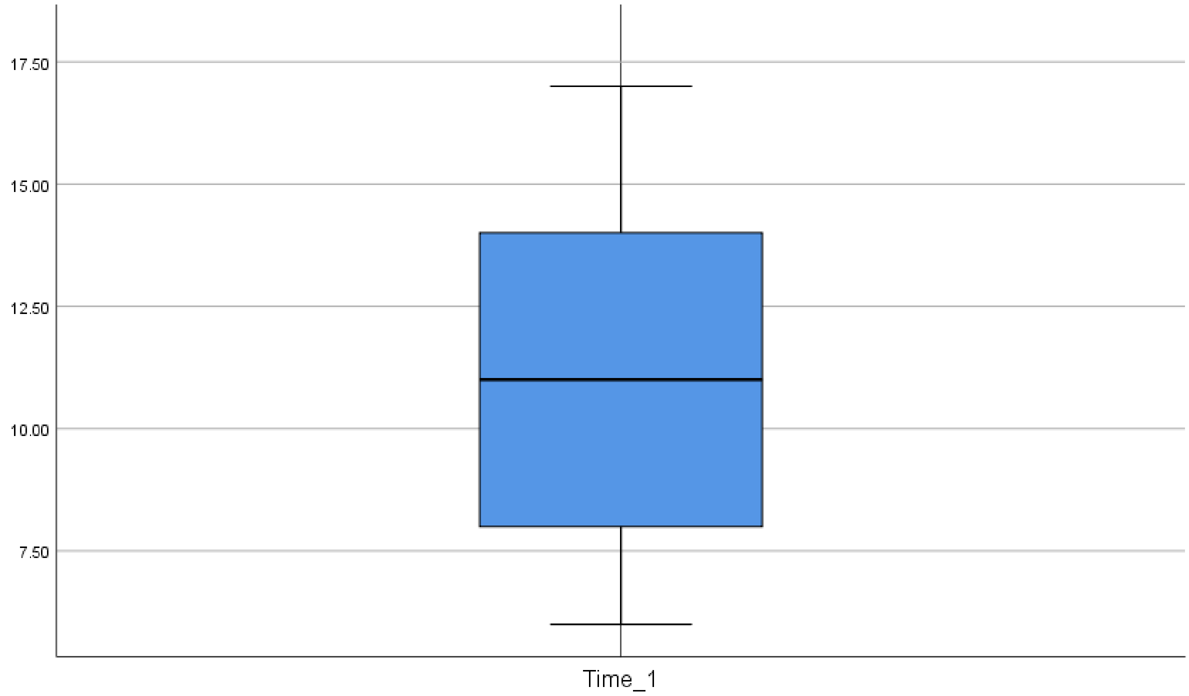

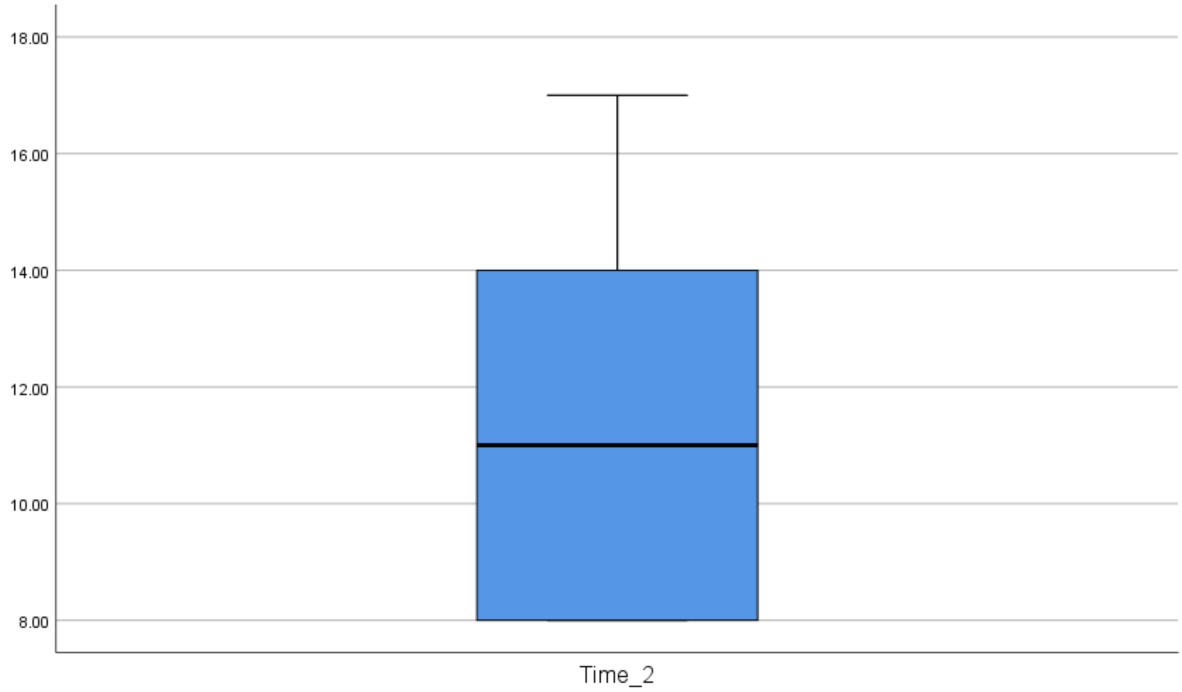

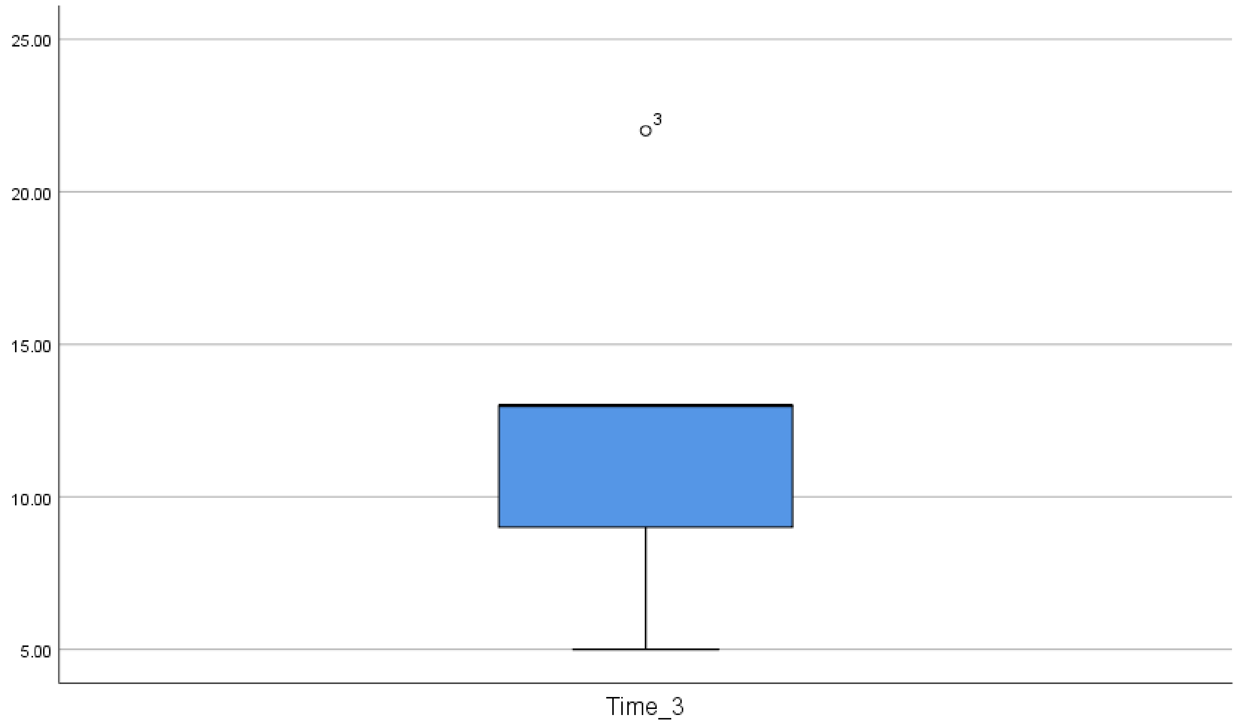
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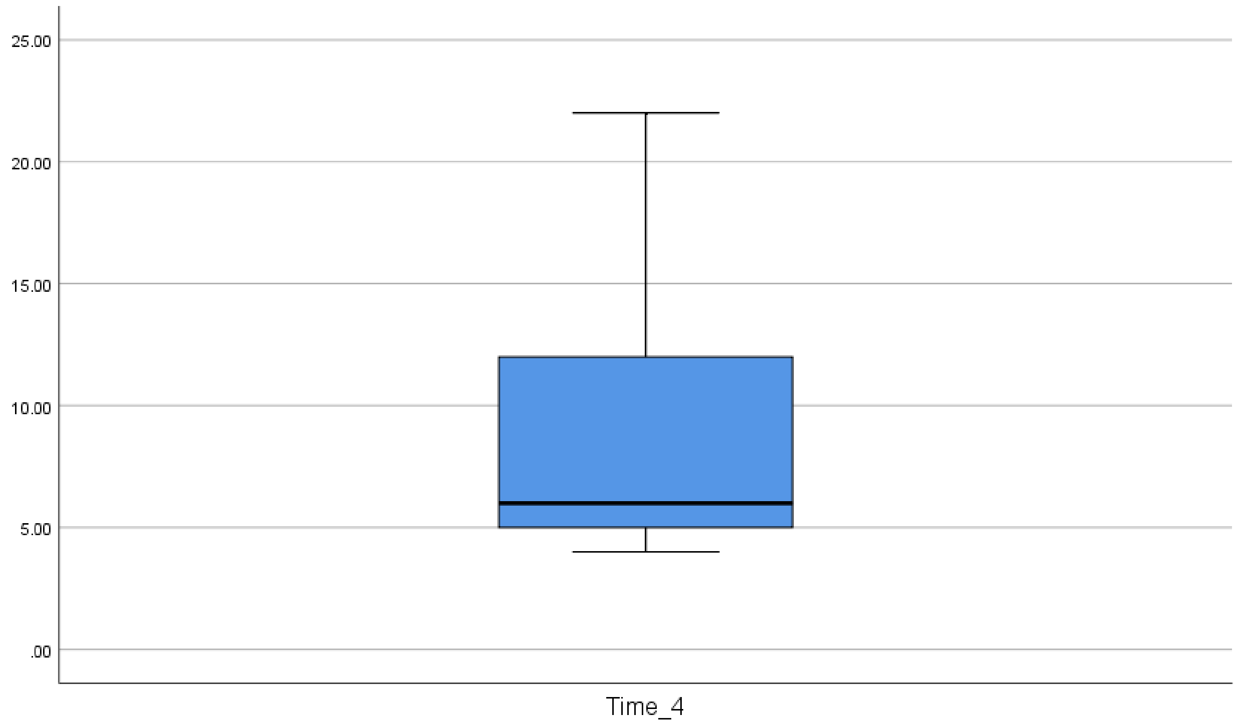
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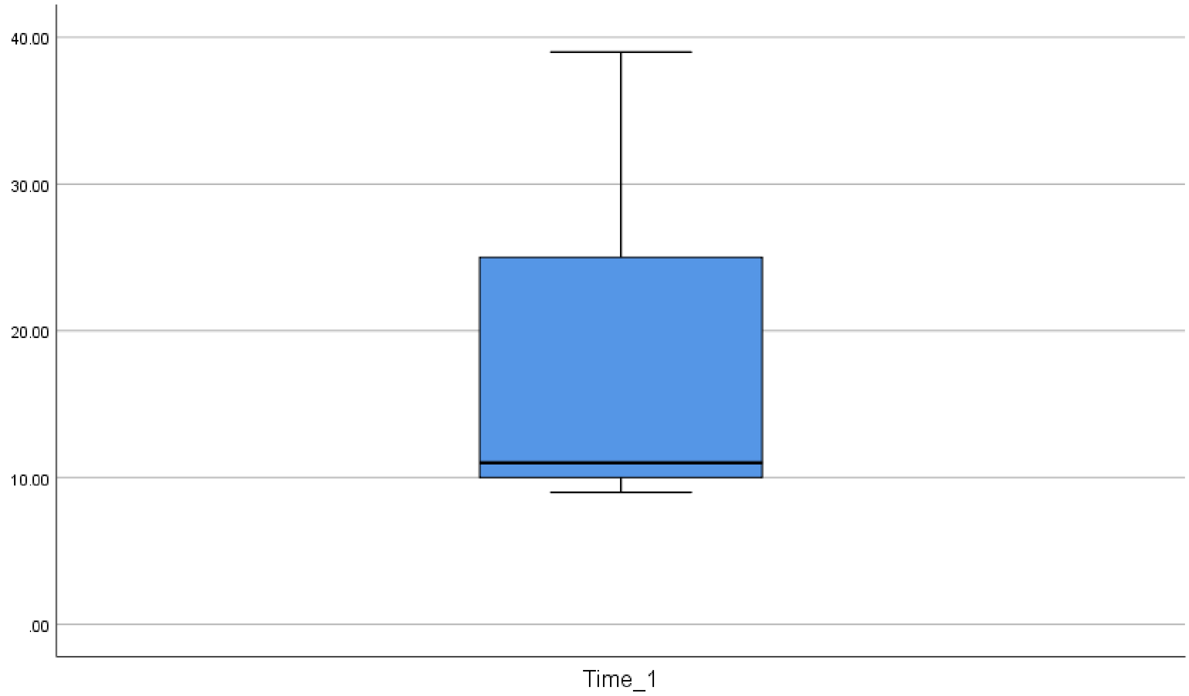
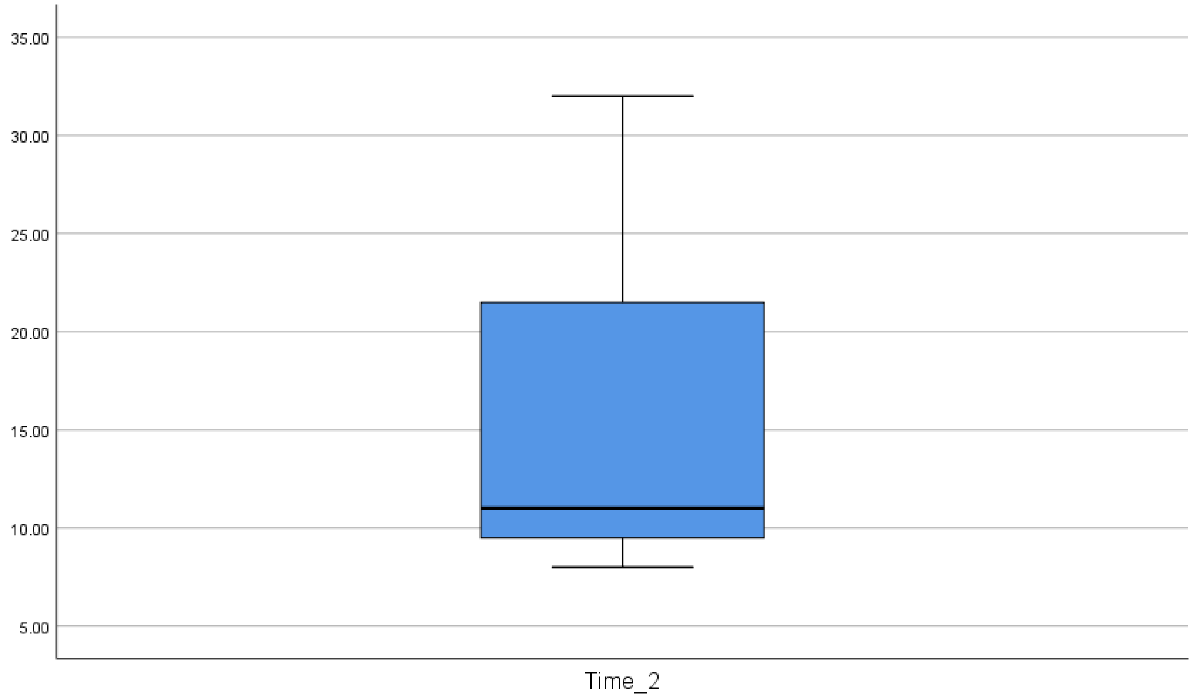
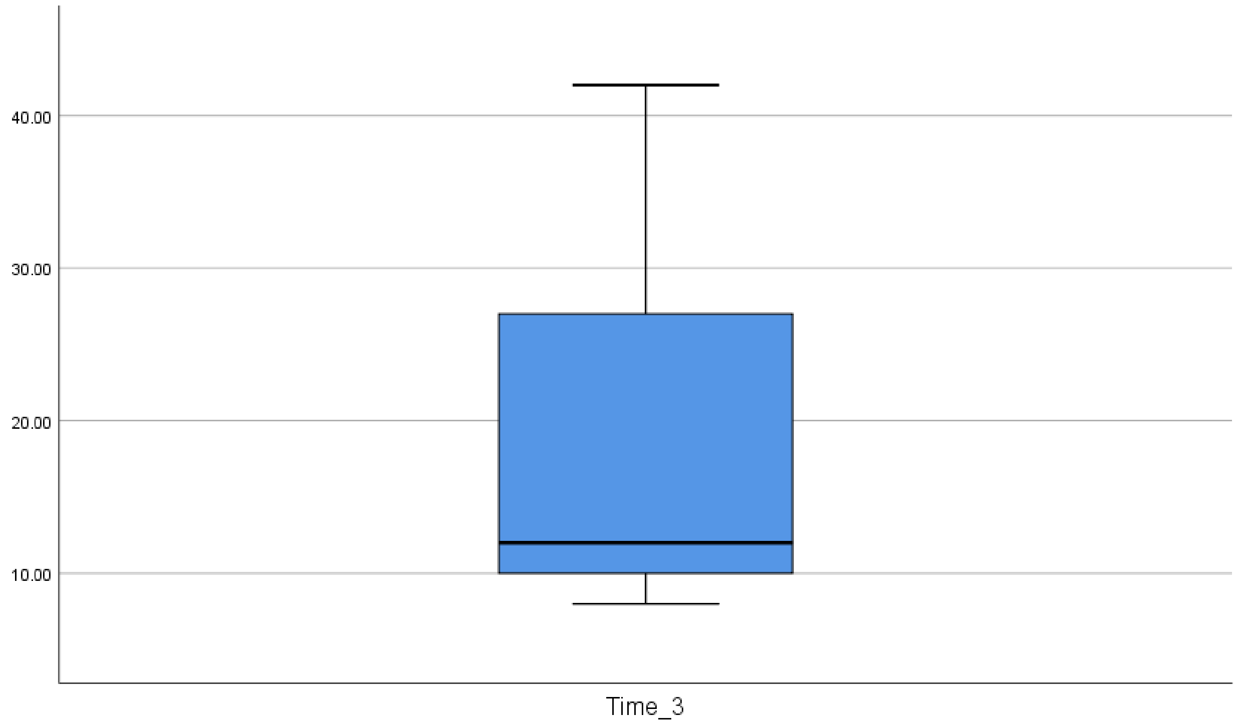
Vinyasa Yoga Anxiety Boxlplots

(Time 1 = W0 baseline, Time 2 = W3, Time 3 = W6, Time 4 = W10 follow-up)



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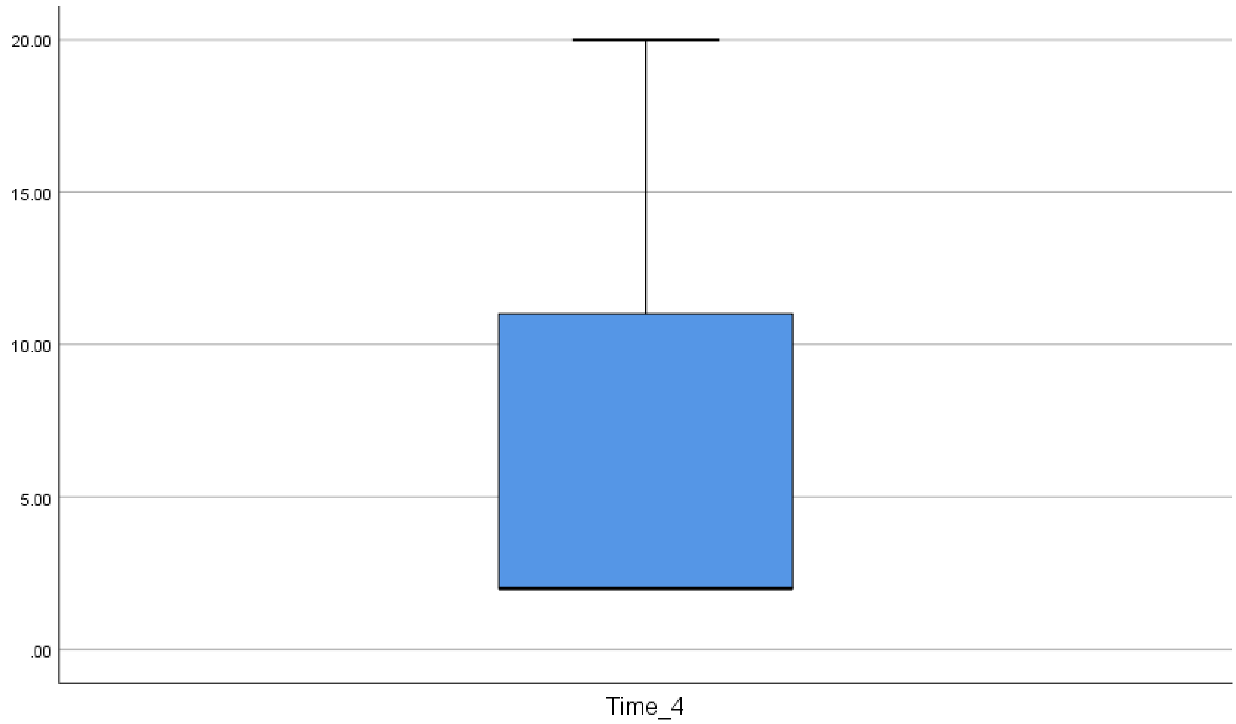
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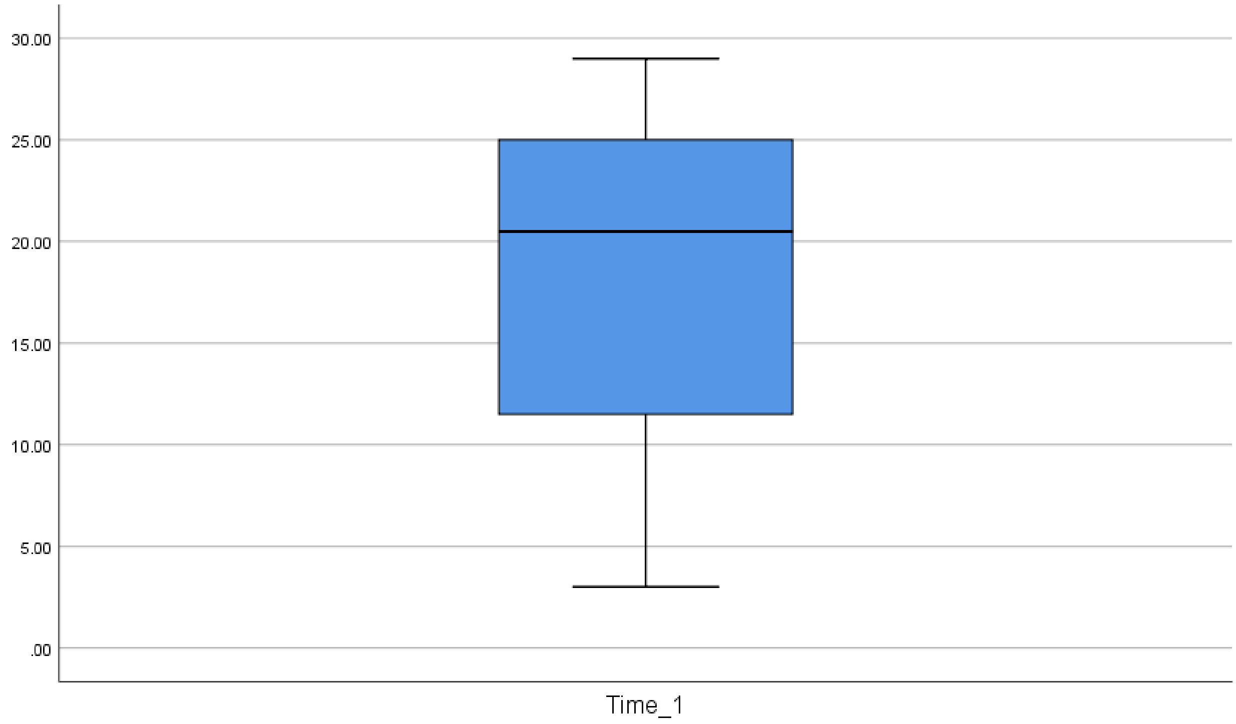
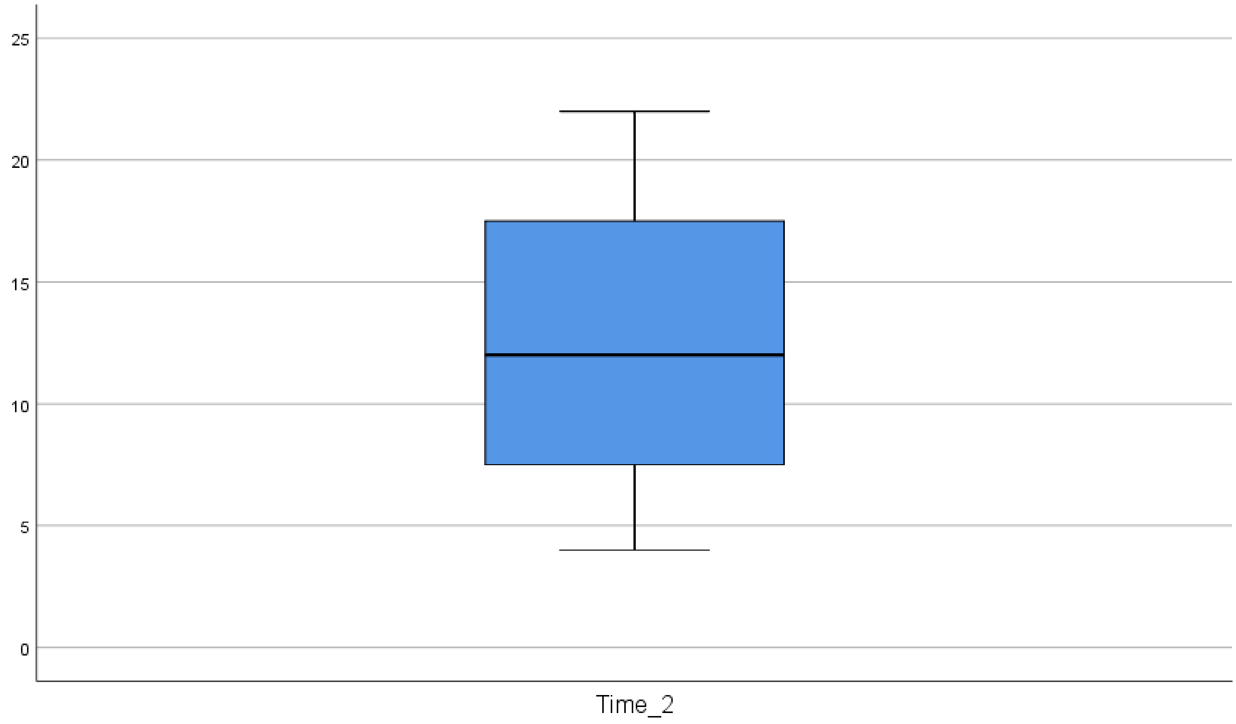
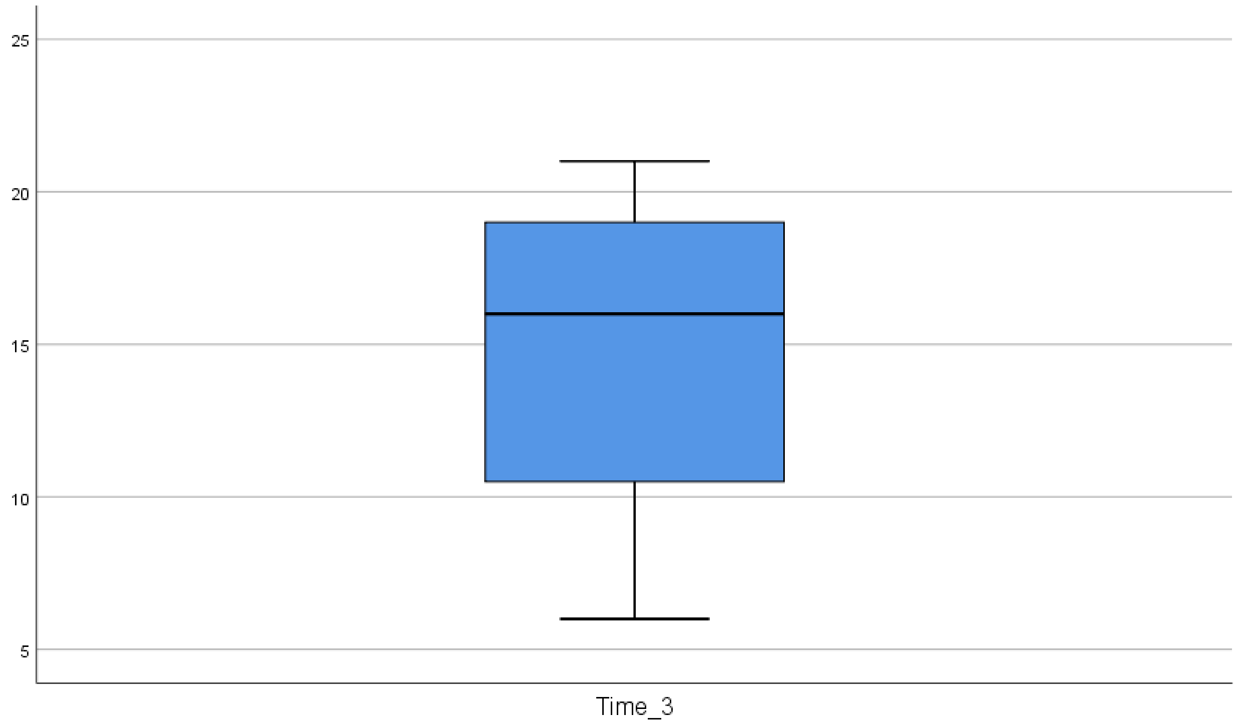
Time_4

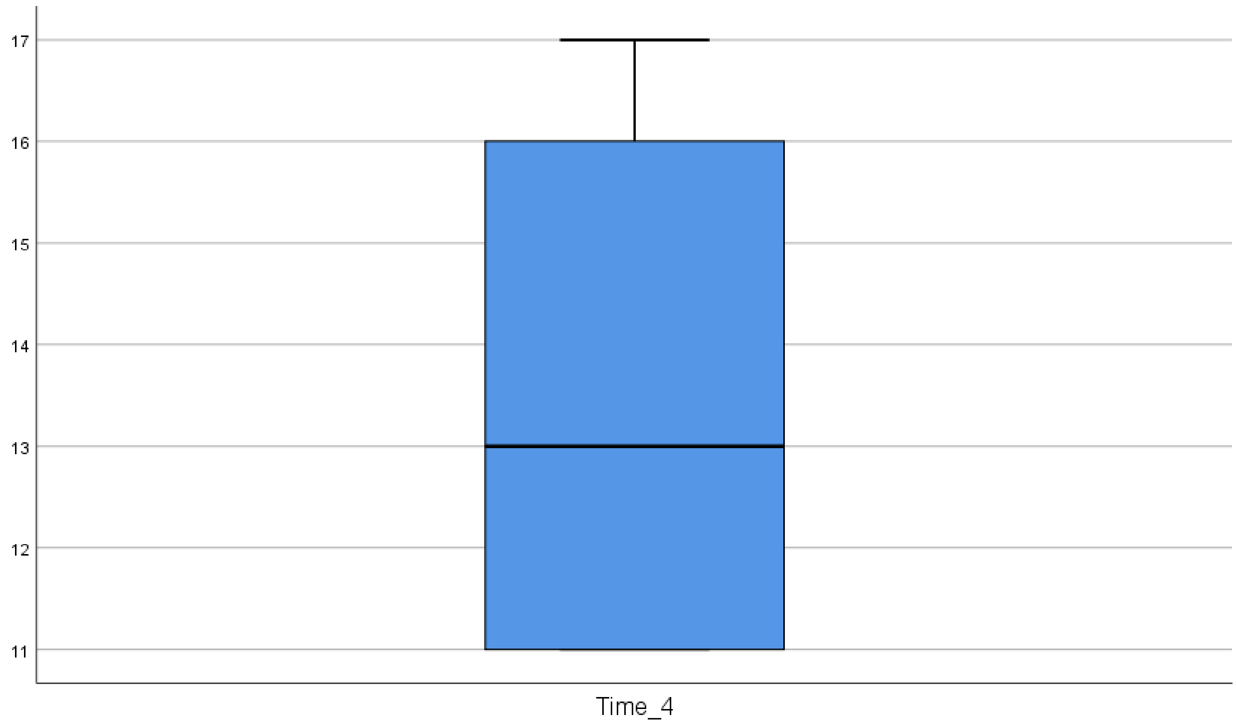
Control Group Anxiety Boxplots

(Time 1 = W0 baseline, Time 2 = W3, Time 3 = W6, Time 4 = W10 follow-up)



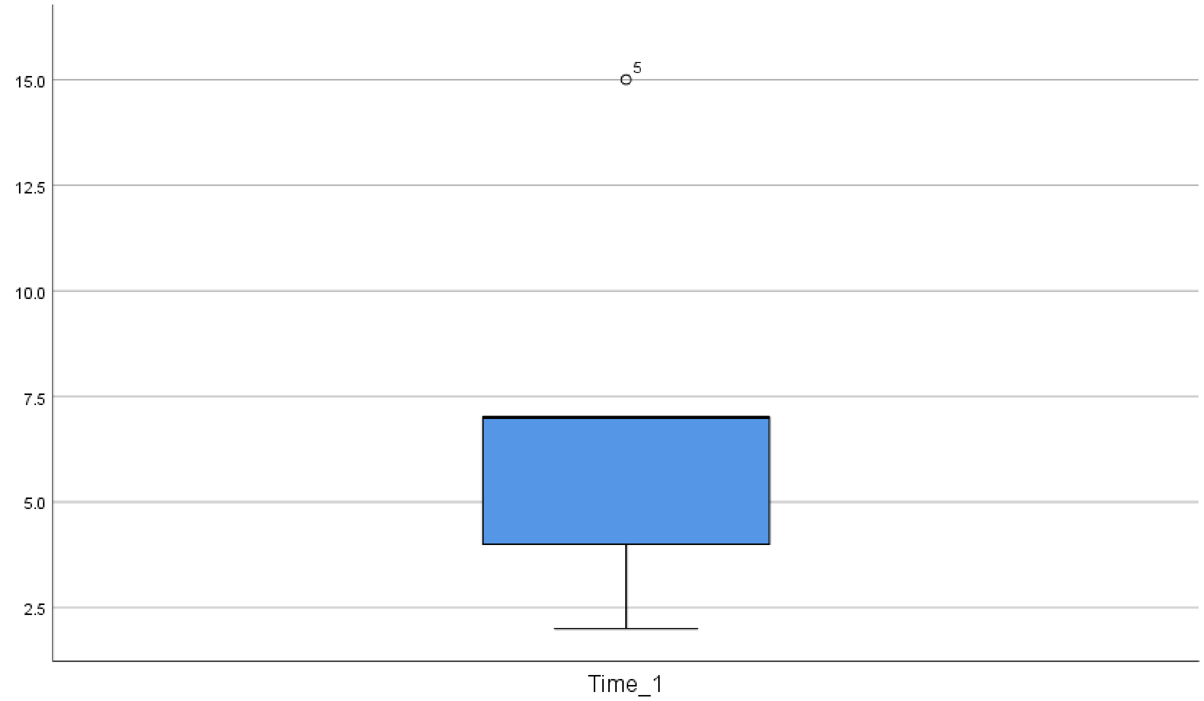


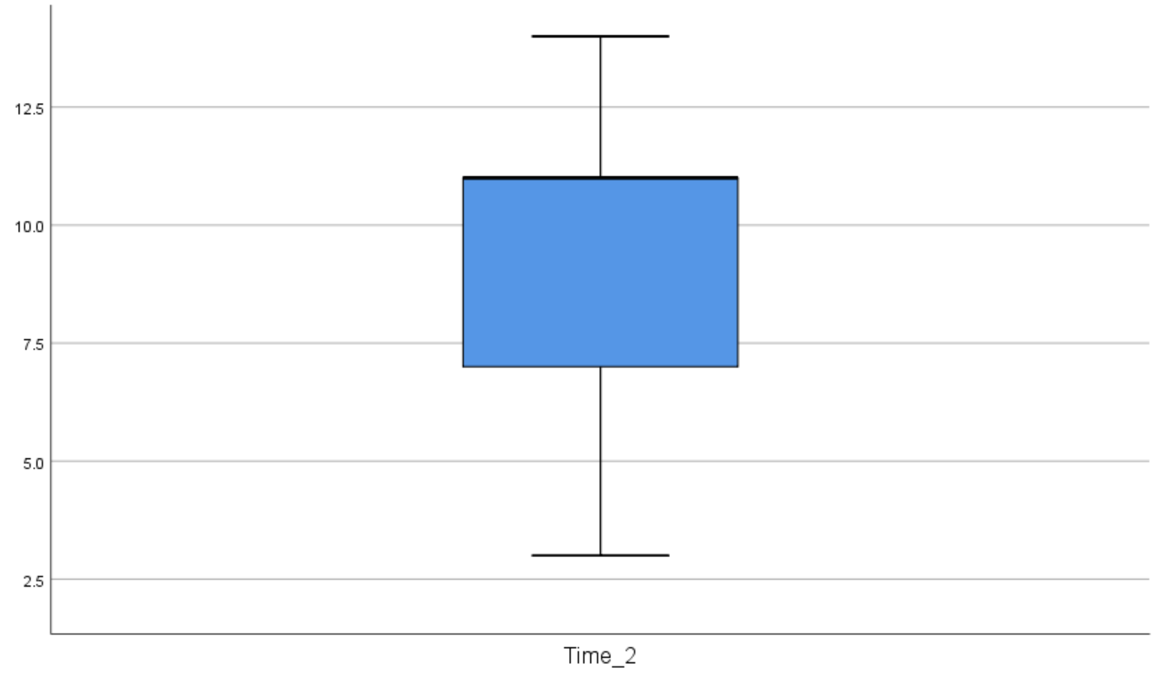

25
20
15
10
5
Time_3

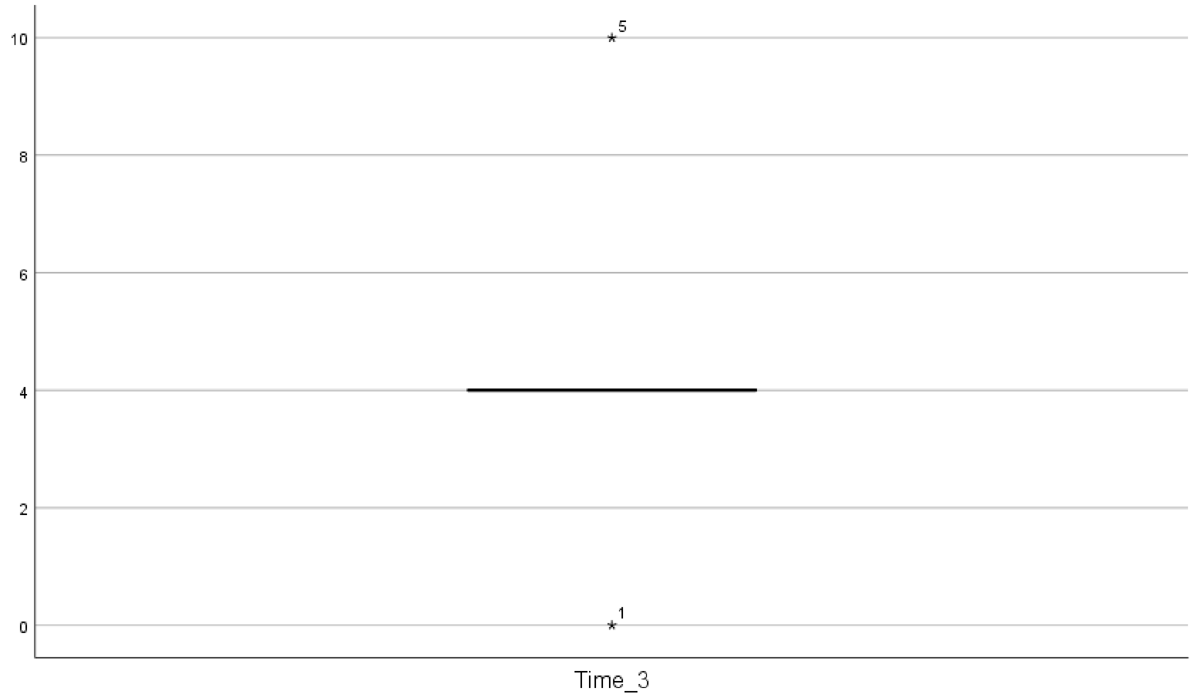

17
16
15
14
13
12
11
Time_4

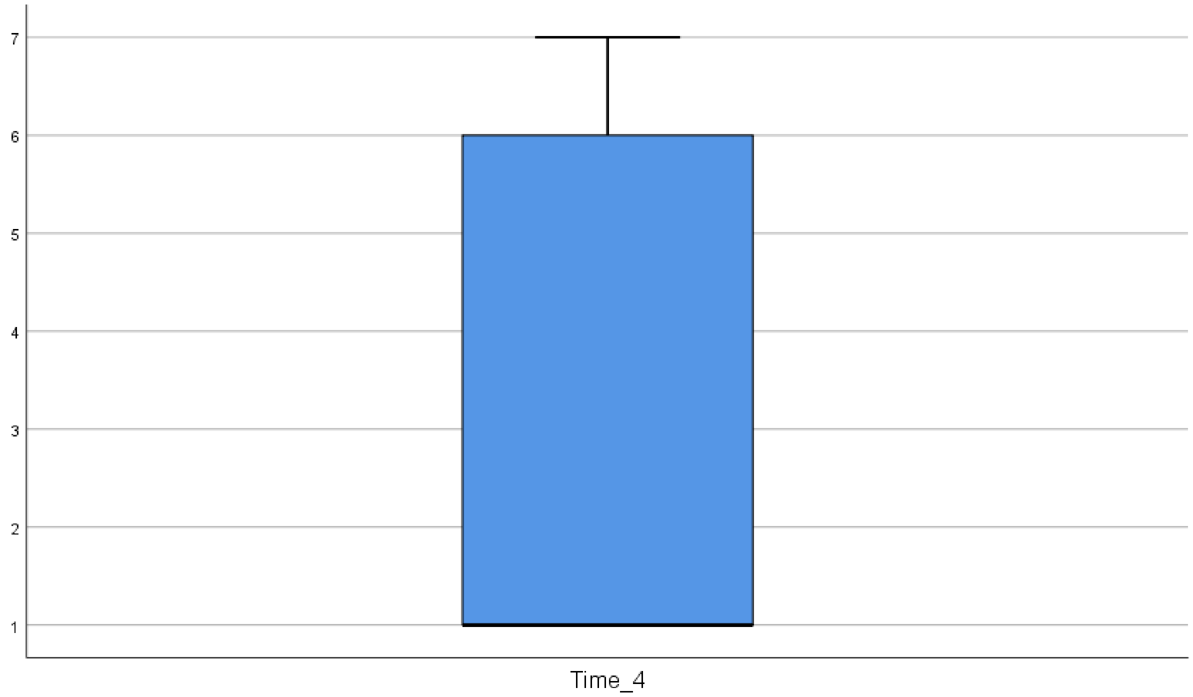
Laughter Yoga Depression Boxplots

(Time 1 = W0 baseline, Time 2 = W3, Time 3 = W6, Time 4 = W10 follow-up)



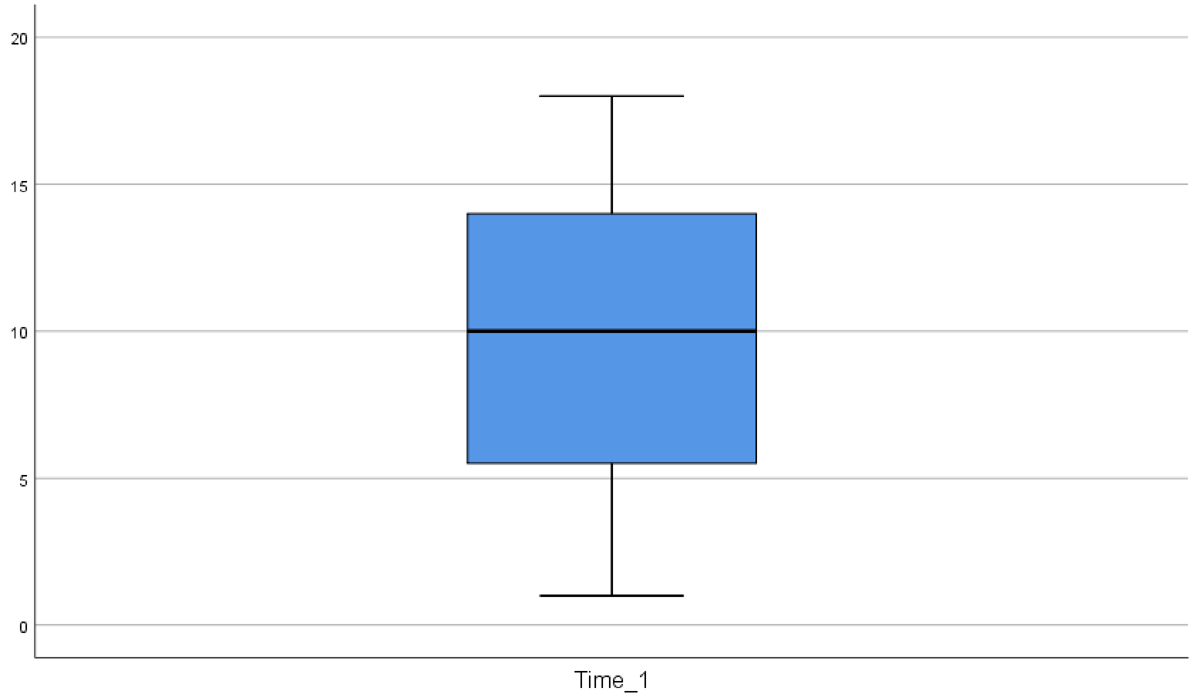


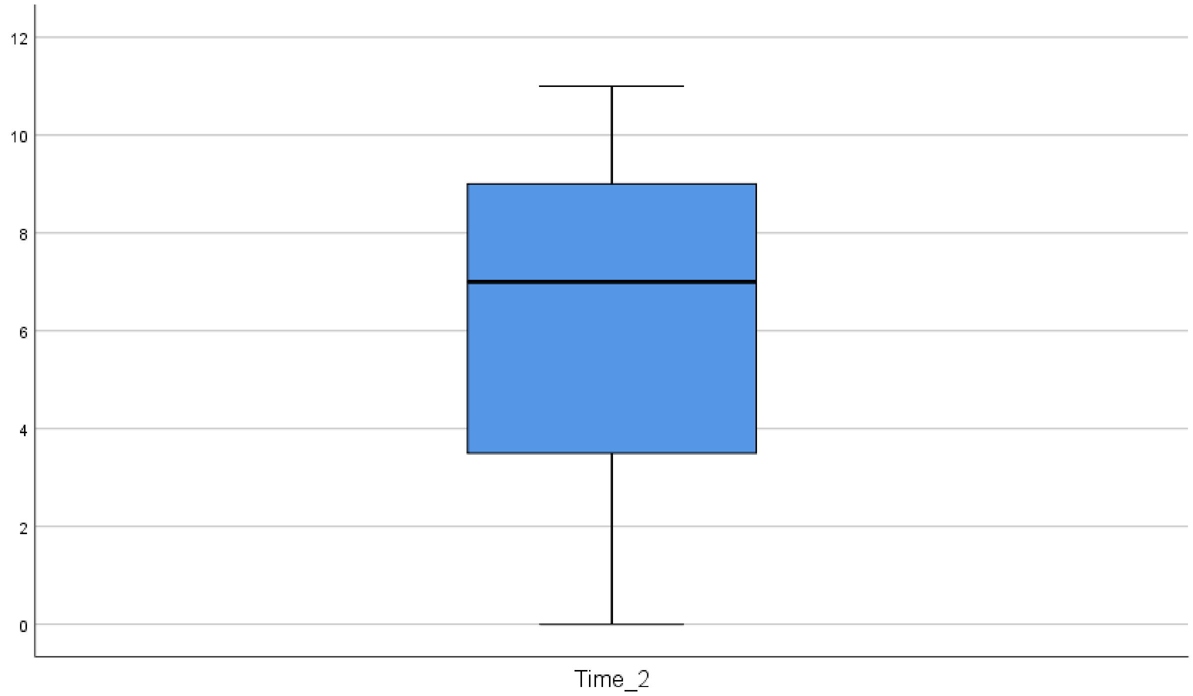

10
8
6
4
2
0
5
1
Time_3

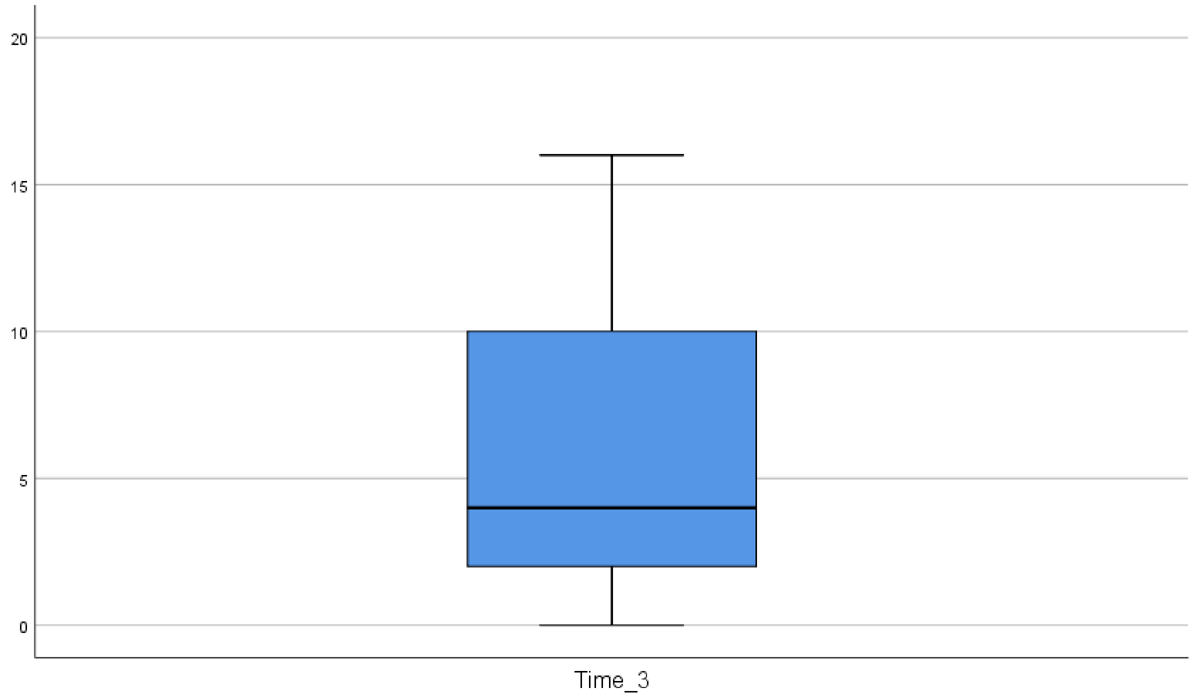

7
6
5
4
3
2
1
Time_4

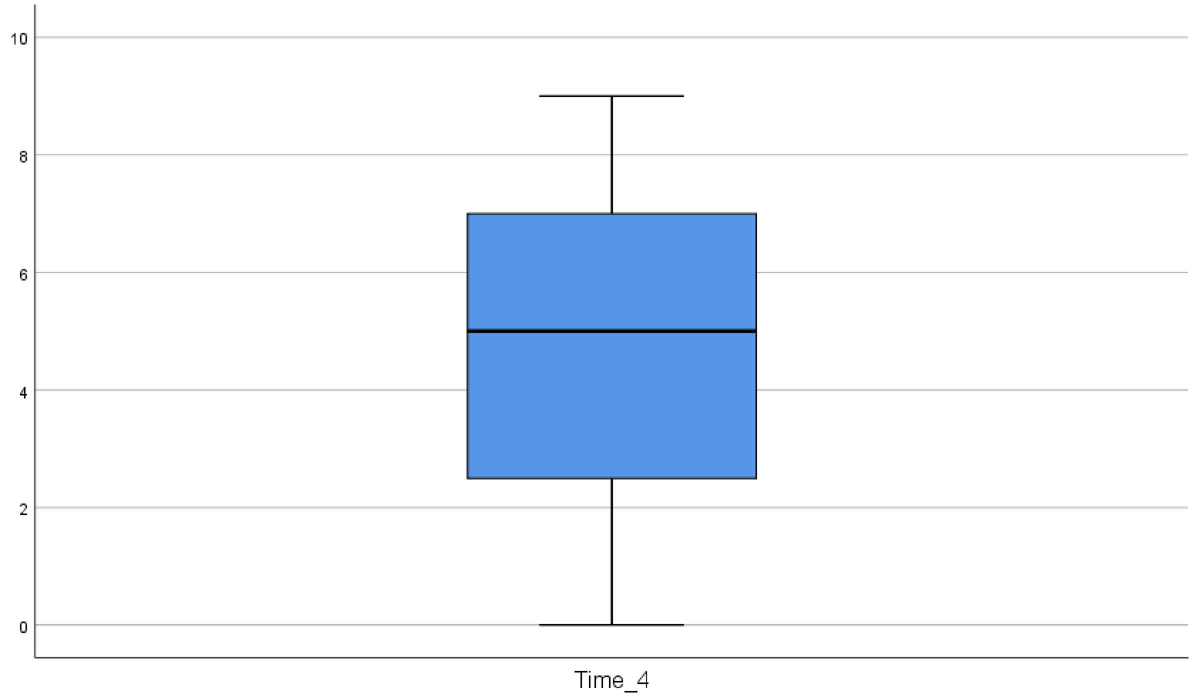
Vinyasa Yoga Depression Boxplots

(Time 1 = W0 baseline, Time 2 = W3, Time 3 = W6, Time 4 = W10 follow-up)



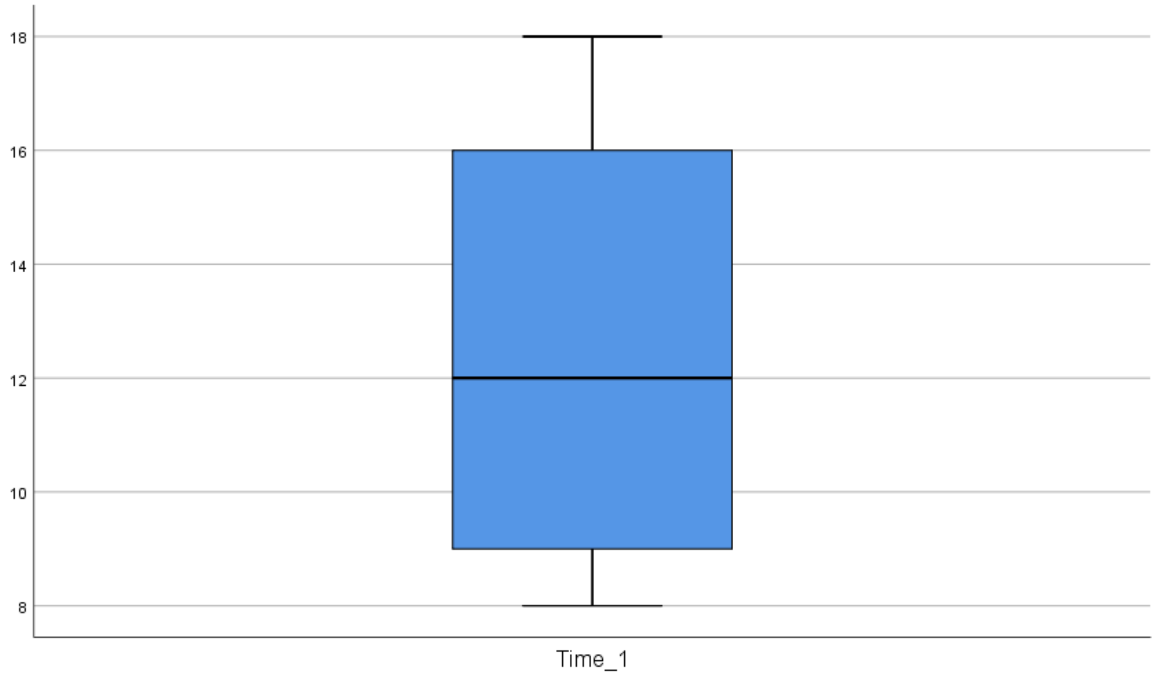


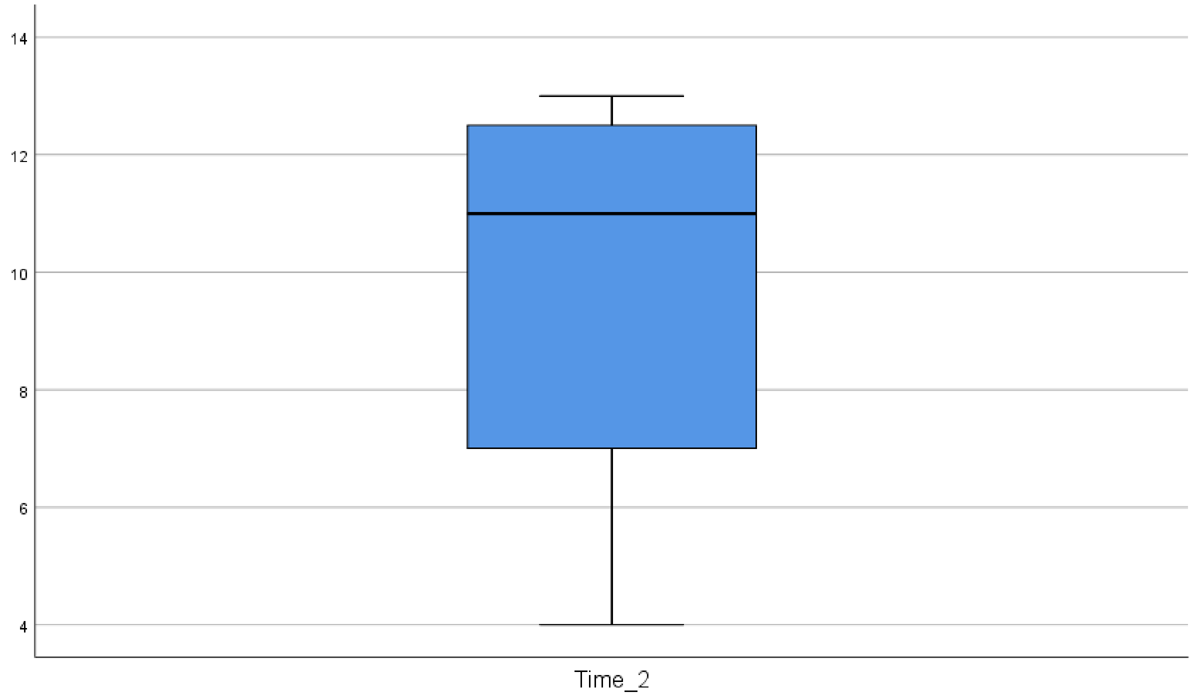

20
15
10
5
0
Time_3

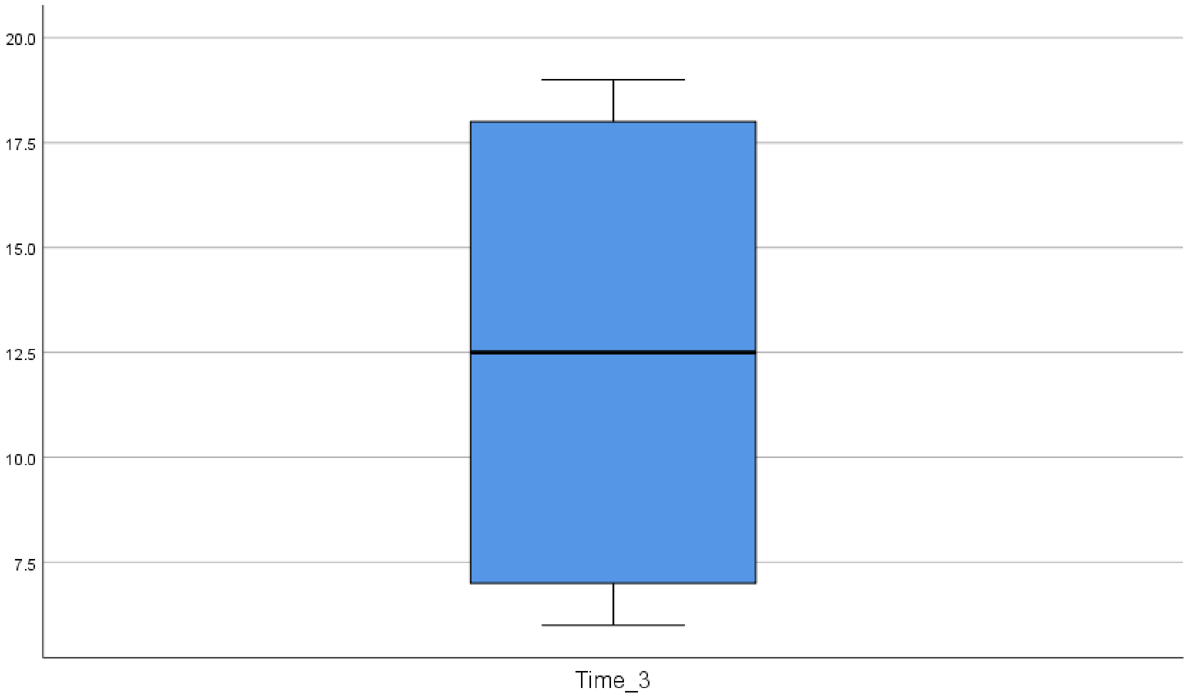

10
8
6
4
2
0
Time_4

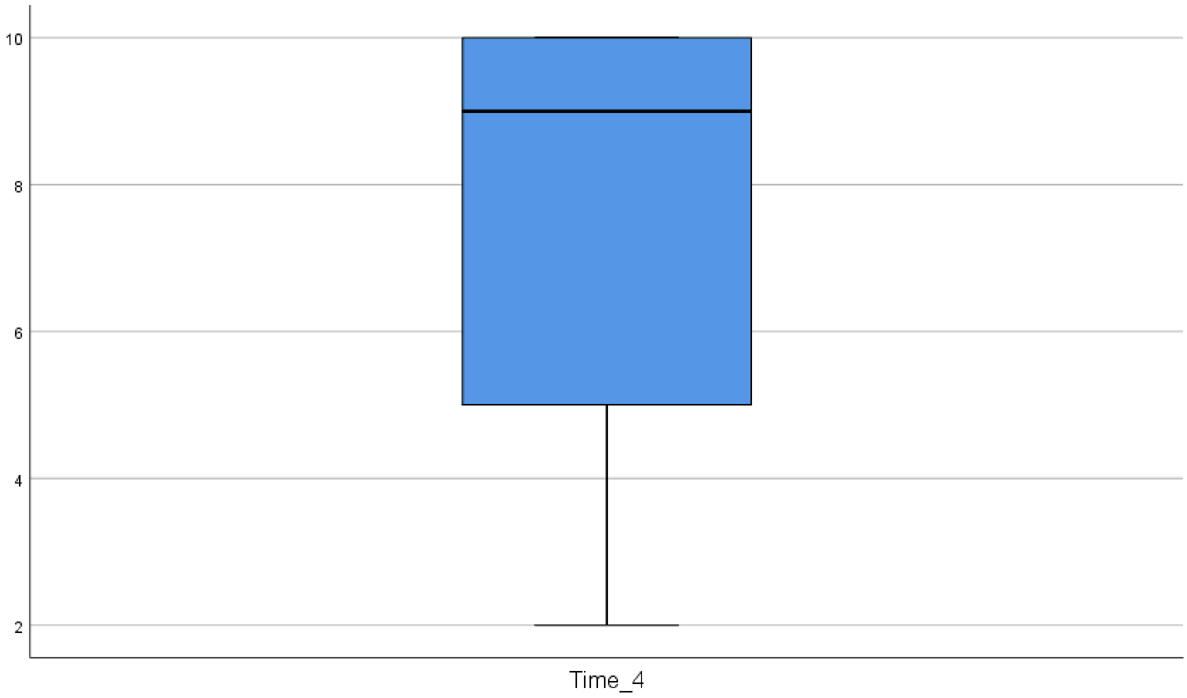
Control Group Depression Boxplots

(Time 1 = W0 baseline, Time 2 = W3, Time 3 = W6, Time 4 = W10 follow-up)



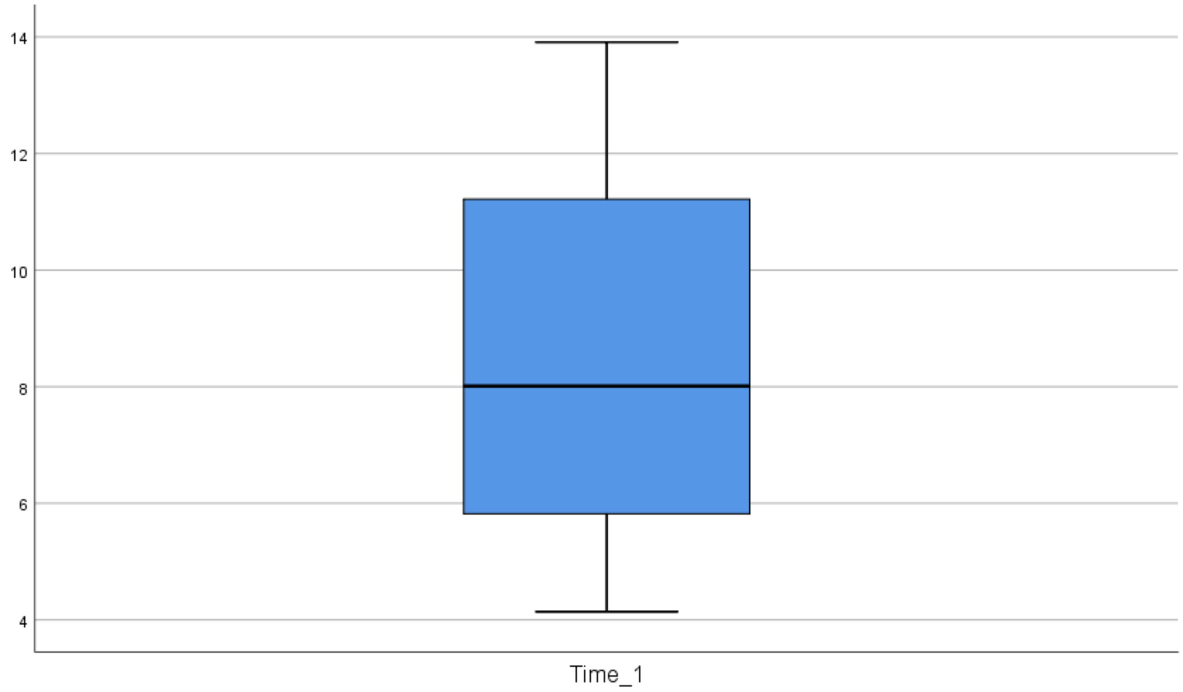


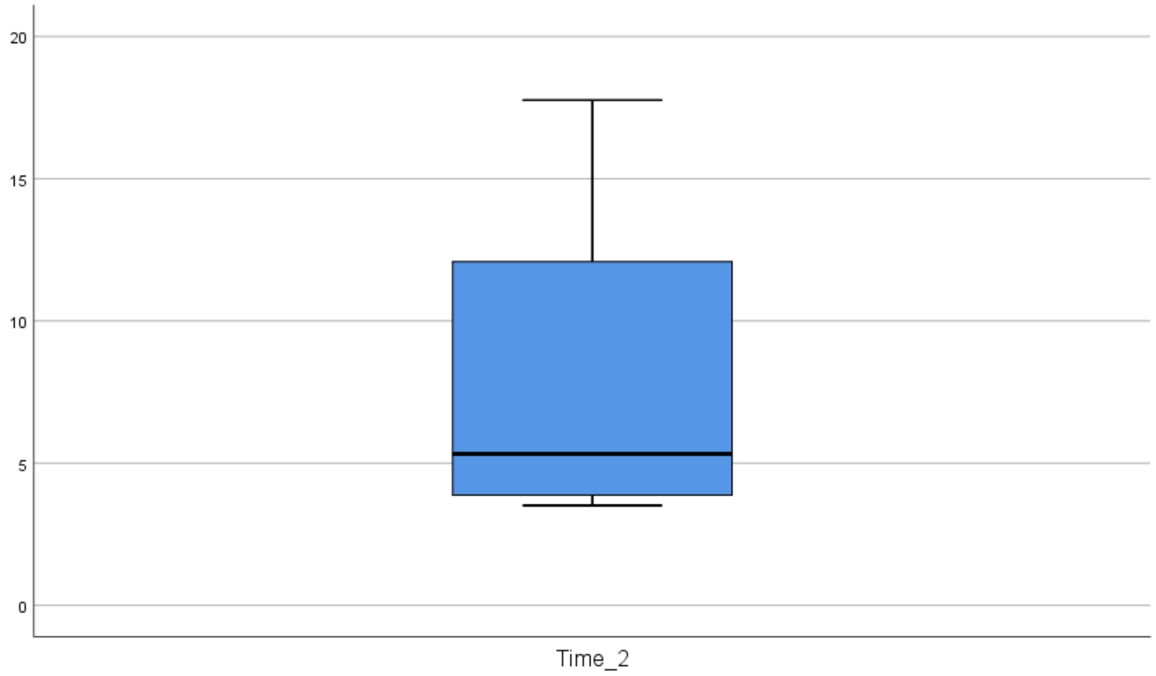

20.0
17.5
15.0
12.5
10.0
7.5
Time_3

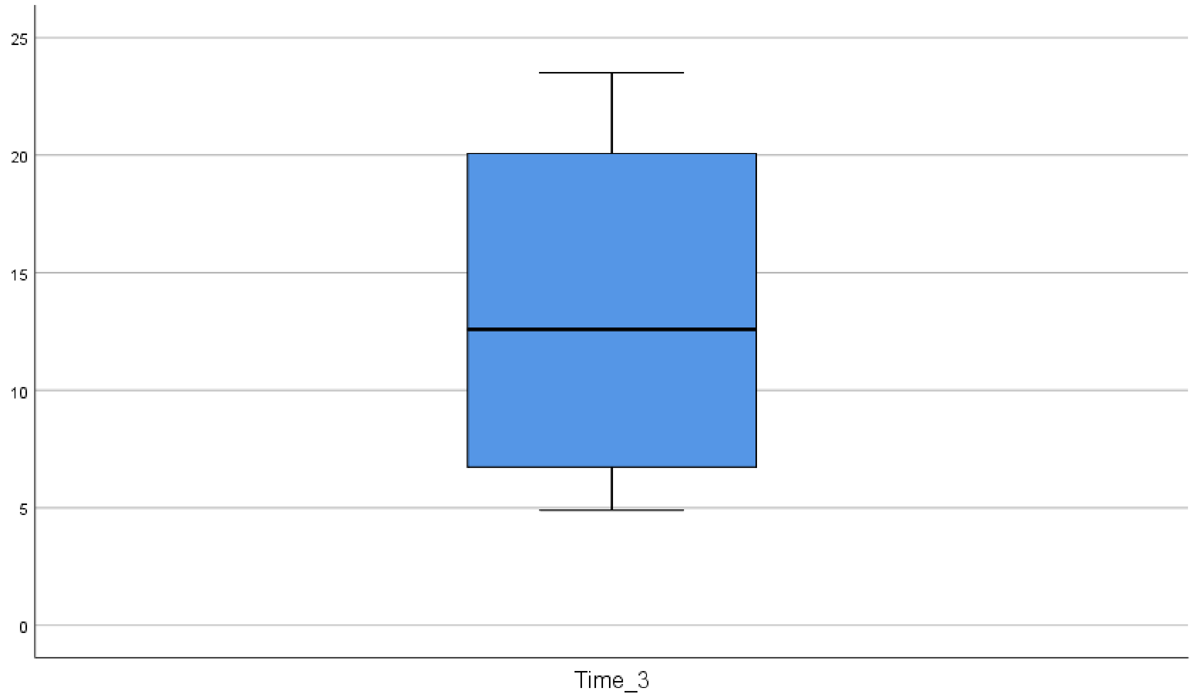

10
8
6
4
2
Time_4

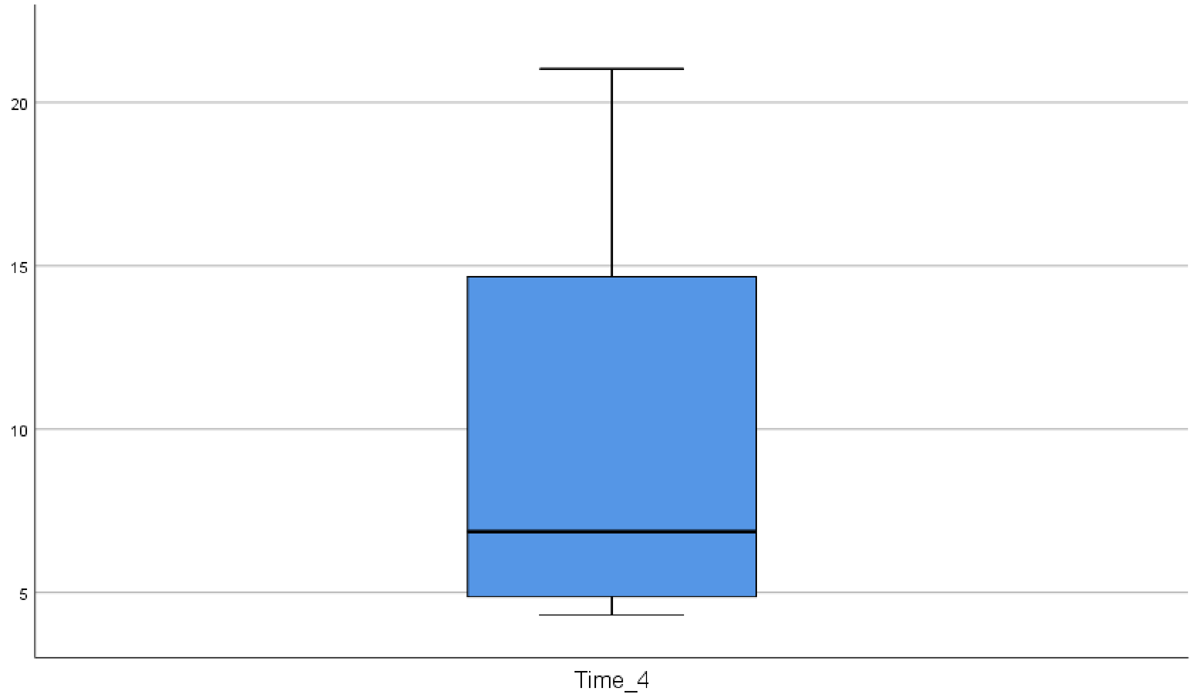
Laughter Yoga Salivary Cortisol Boxplots

(Time 1 = W0 baseline, Time 2 = W3, Time 3 = W6, Time 4 = W10 follow-up)



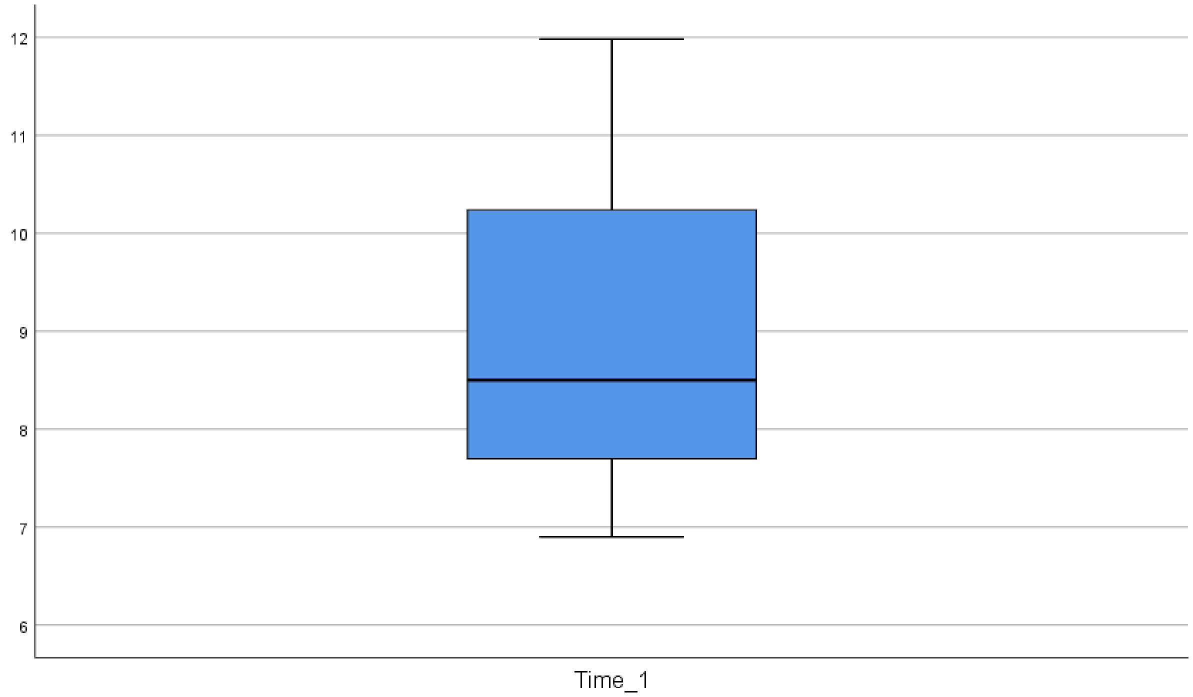


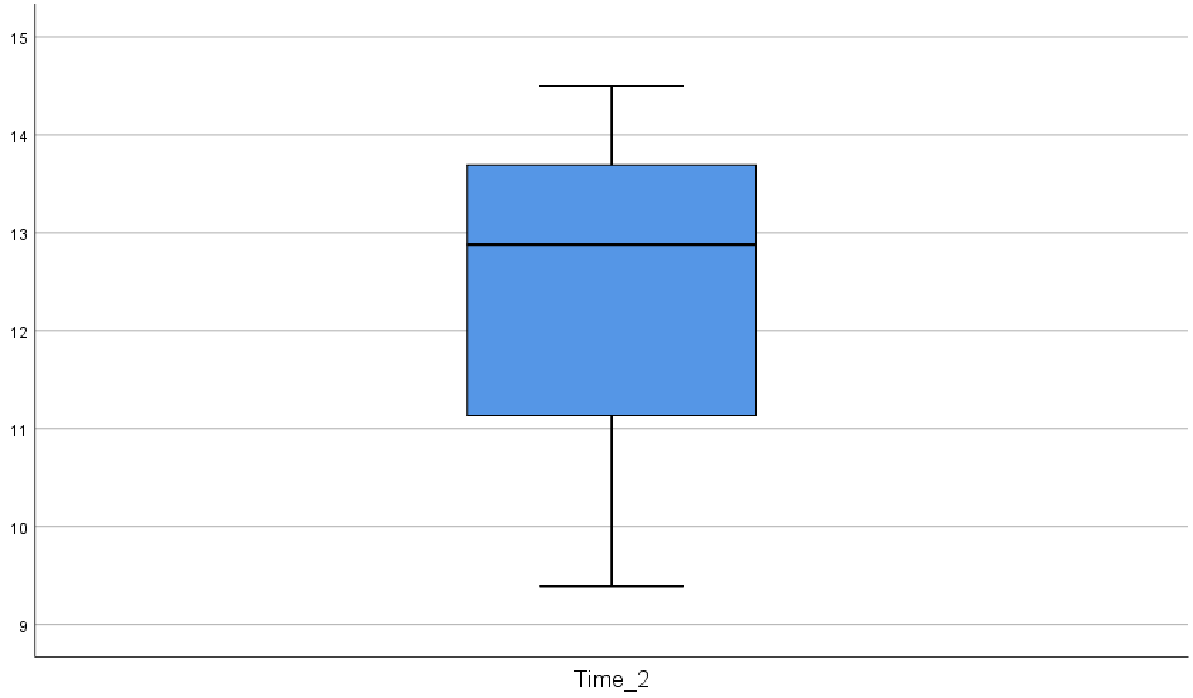

25
20
15
10
5
0
Time_3

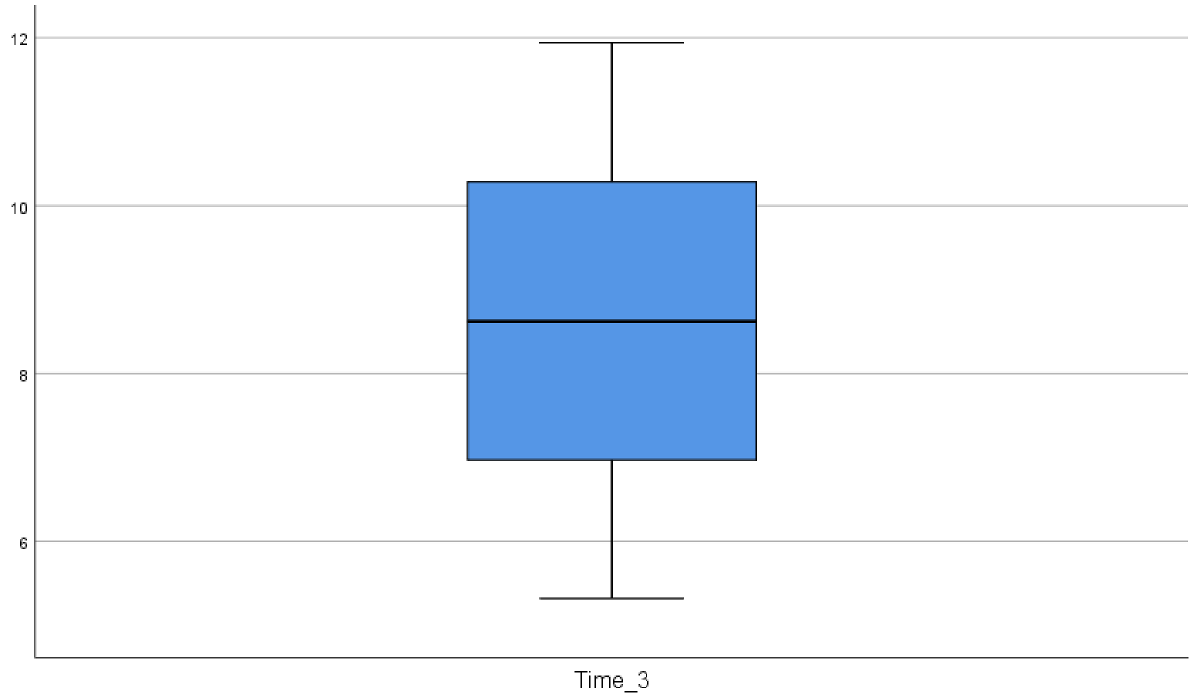

20
15
10
5
Time_4

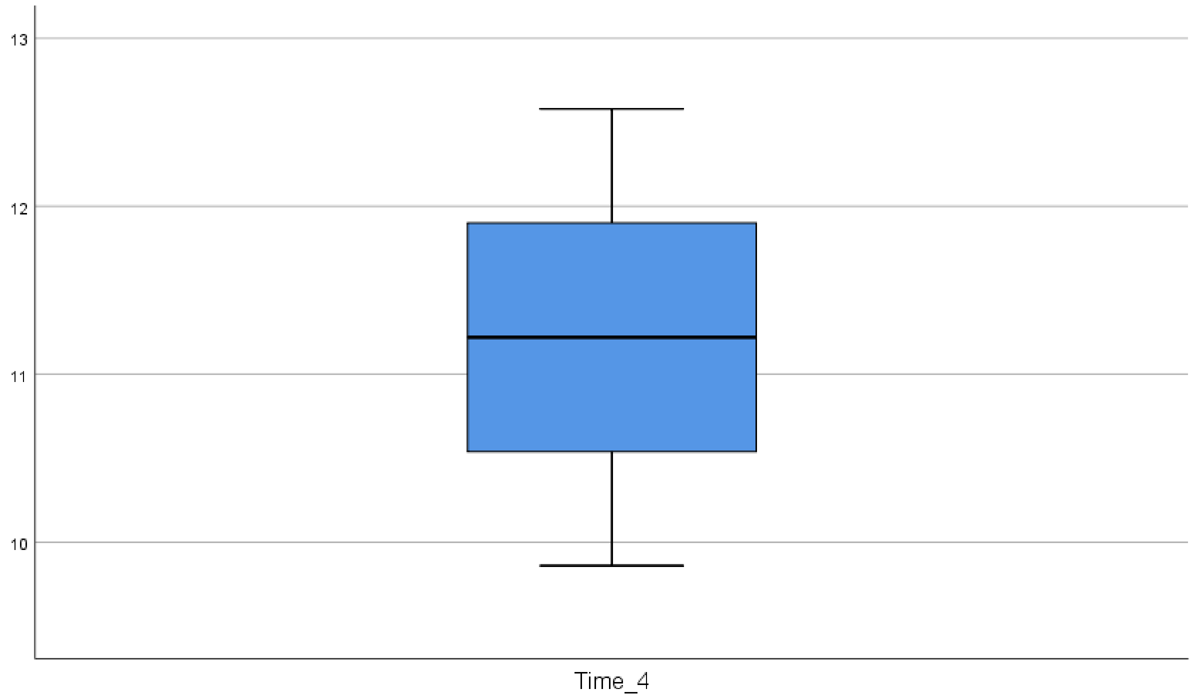
Vinyasa Yoga Salivary Cortisol Boxplots

(Time 1 = W0 baseline, Time 2 = W3, Time 3 = W6, Time 4 = W10 follow-up)



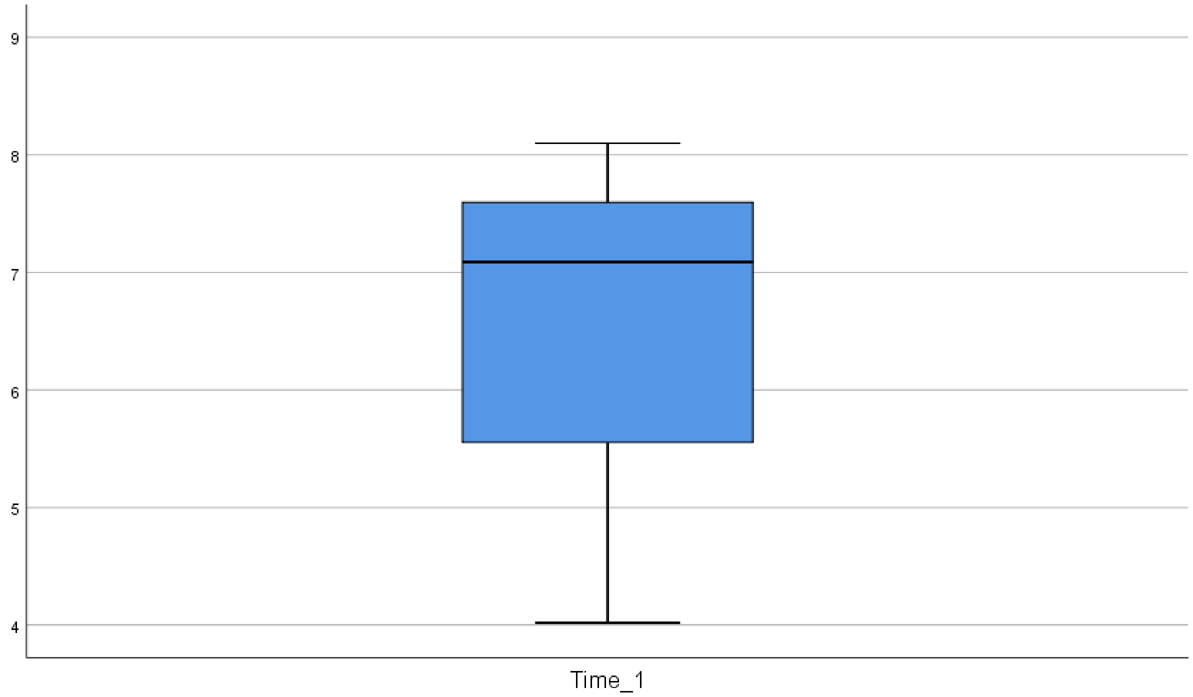


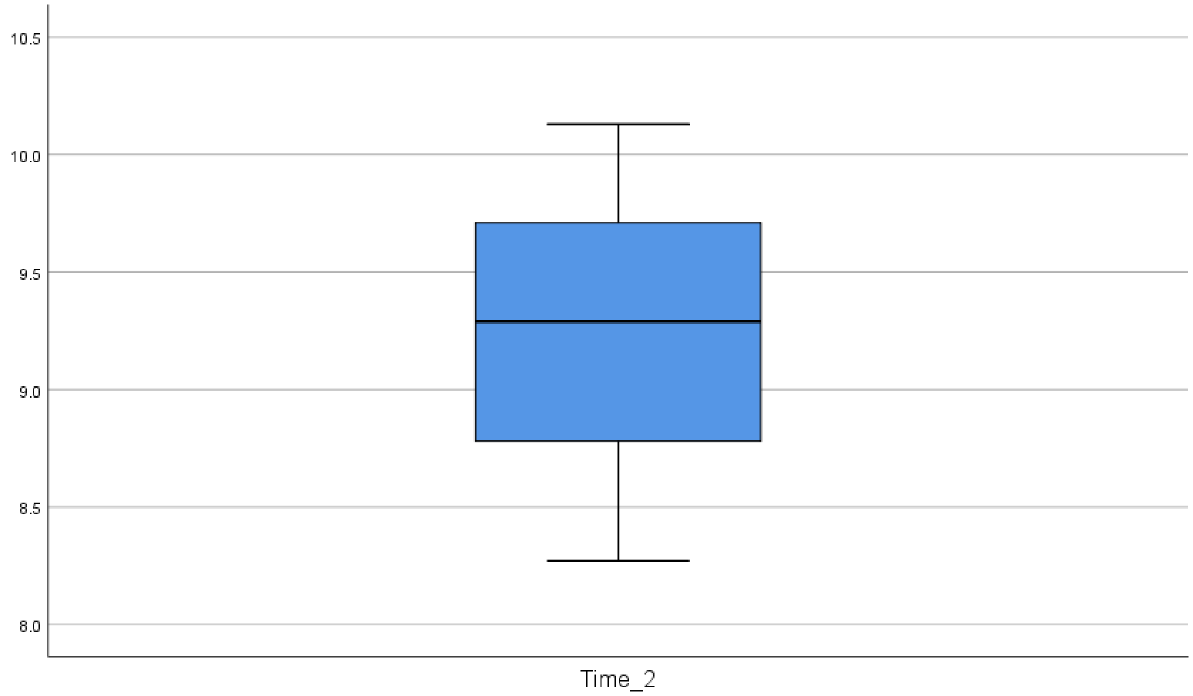

12
10
8
6
Time_3

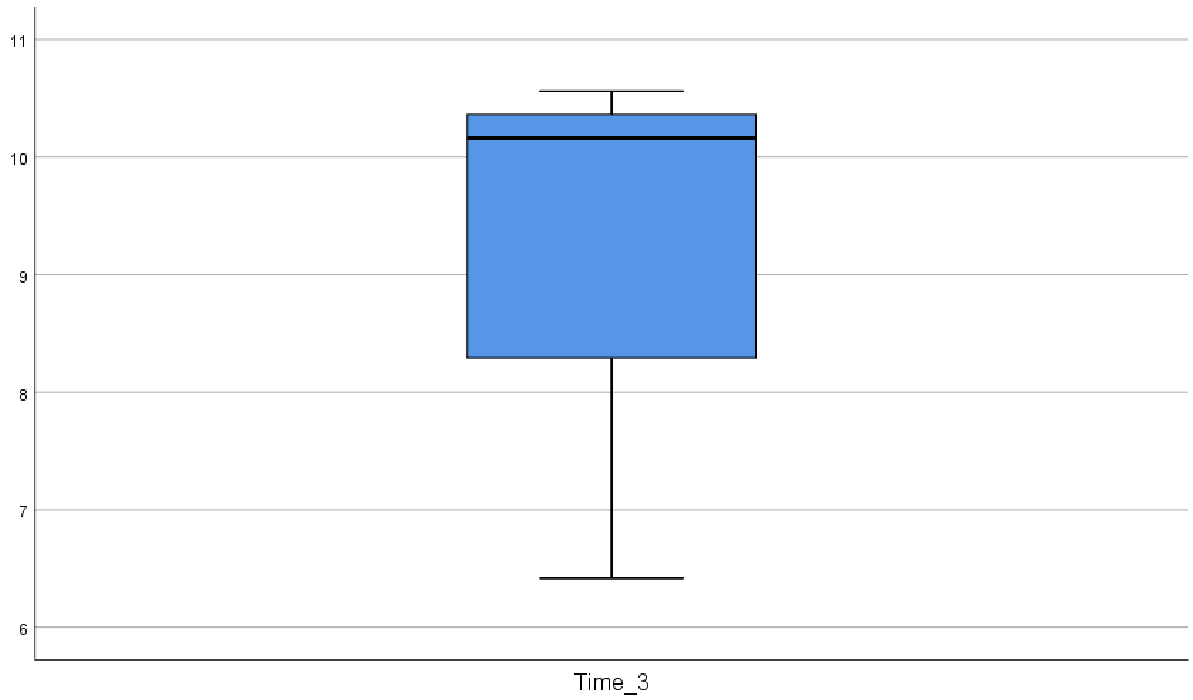

13
12
11
10
Time_4

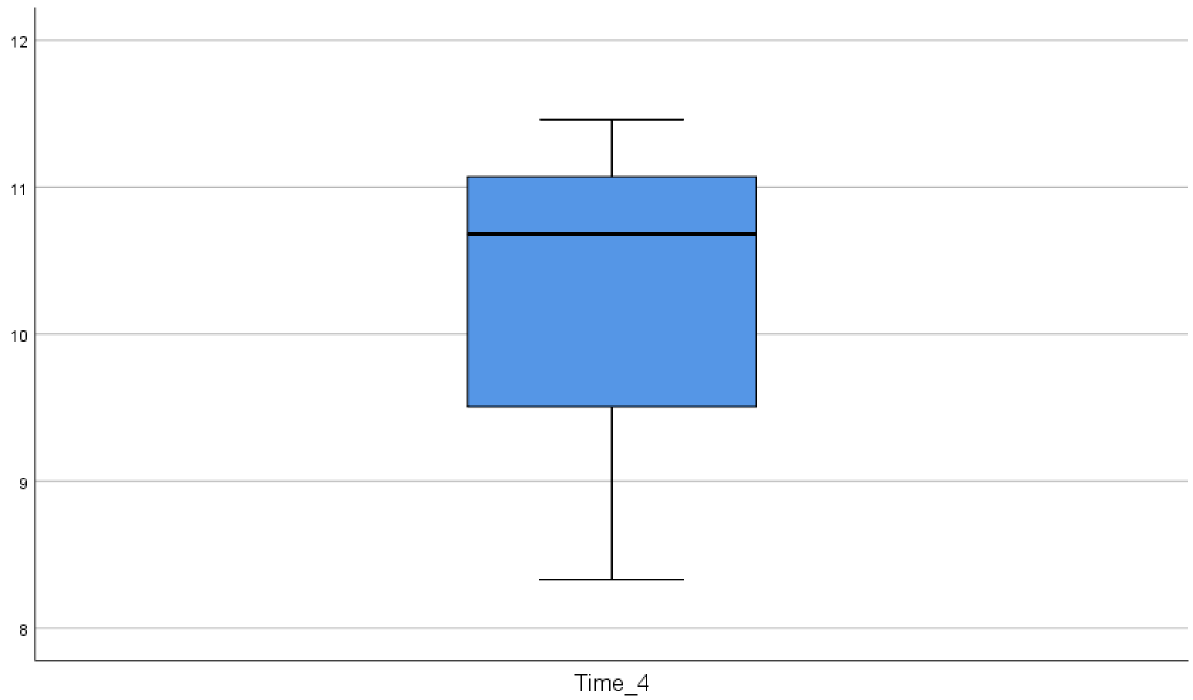
Control Group Salivary Cortisol Boxplots

(Time 1 = W0 baseline, Time 2 = W3, Time 3 = W6, Time 4 = W10 follow-up)

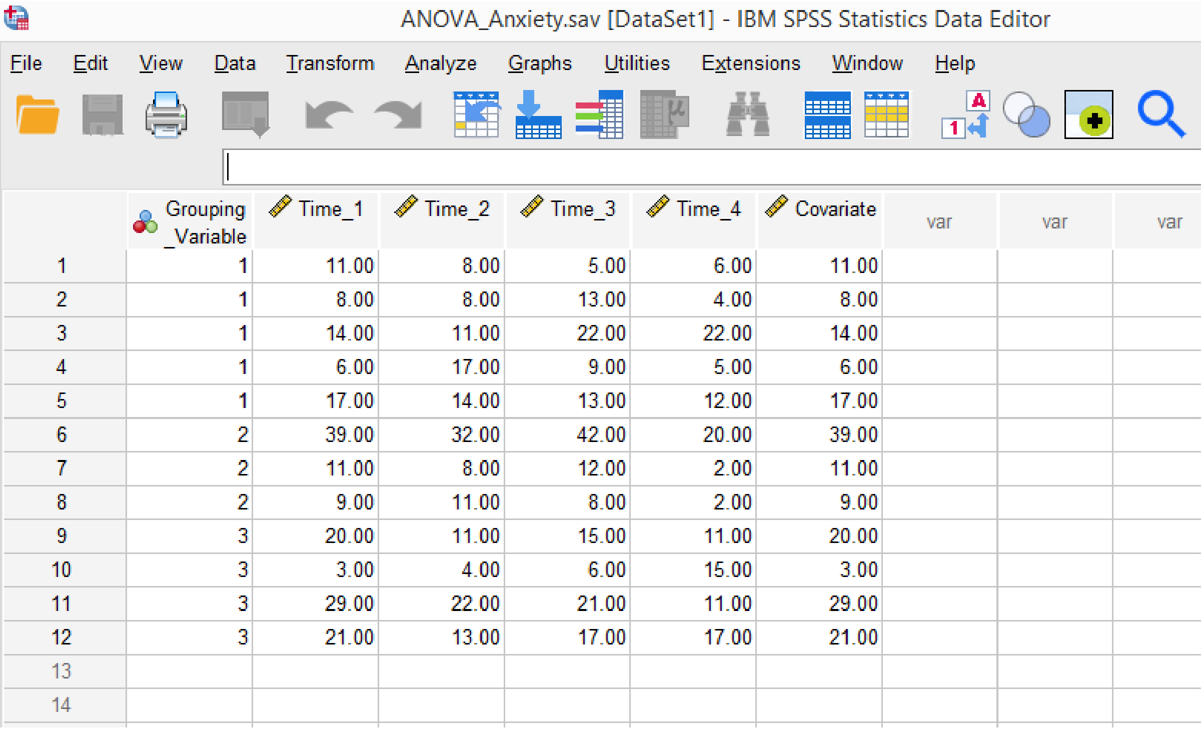




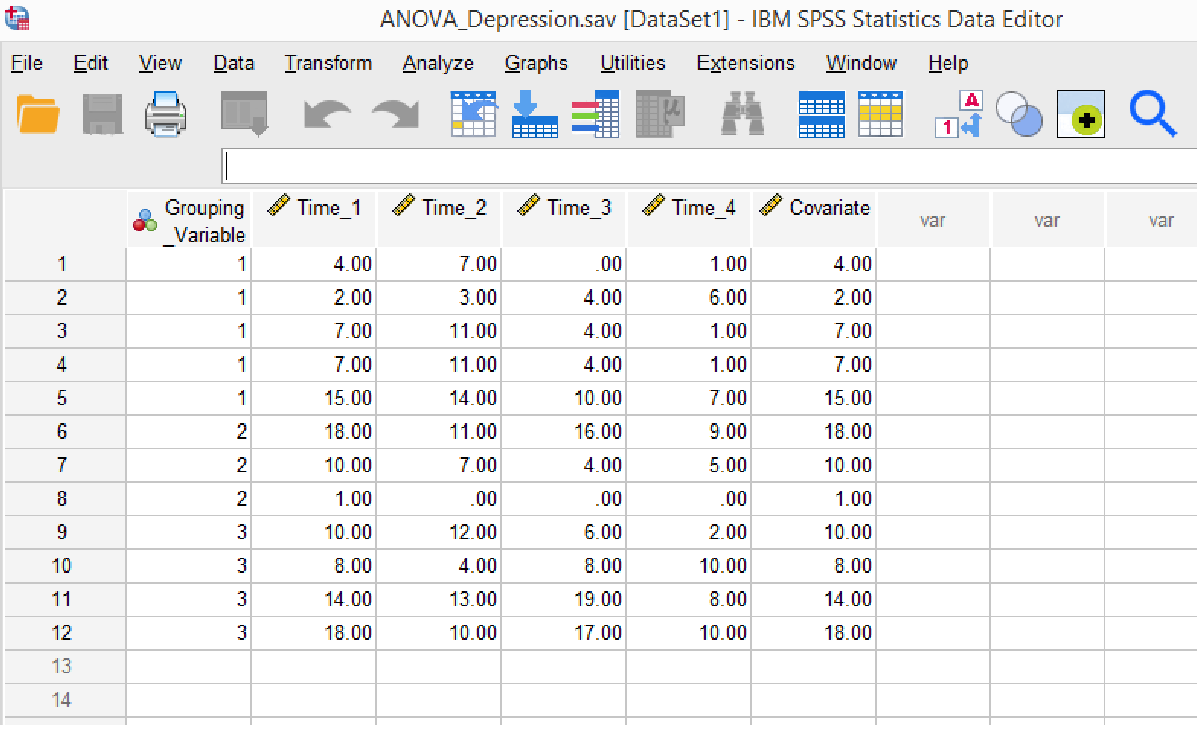

11
10
9
8
7
6
Time_3


12
11
10
9
8
Time_4

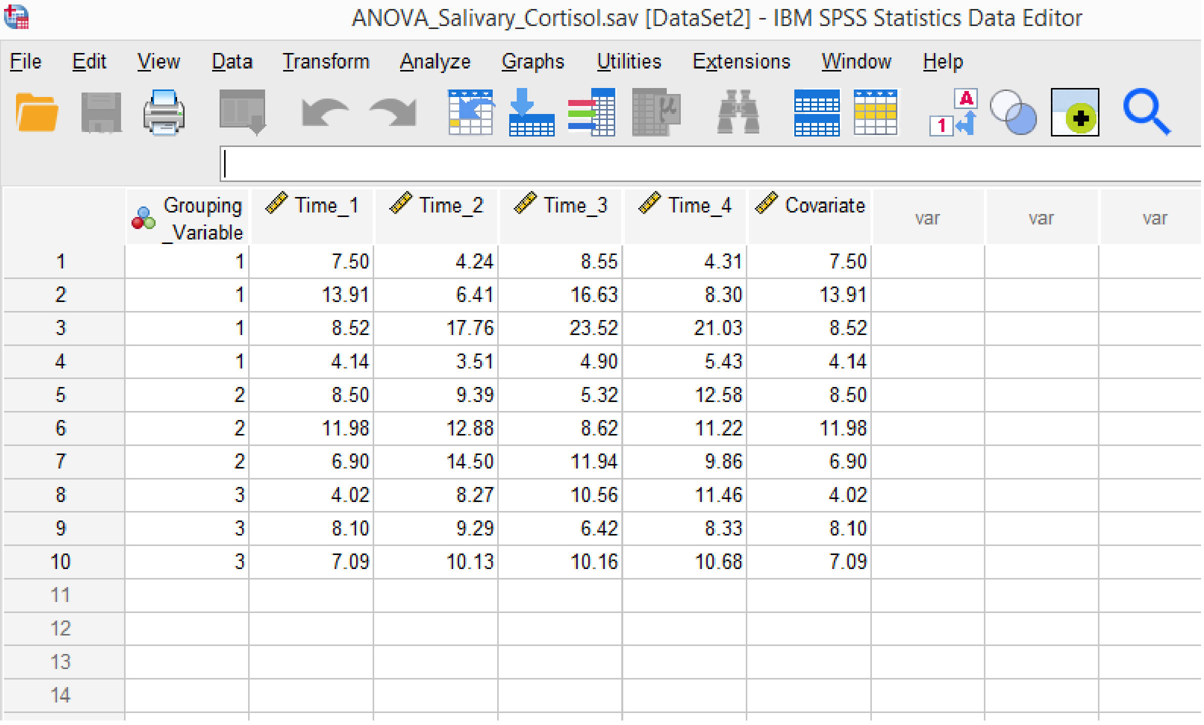
10.16 SPSS Outputs



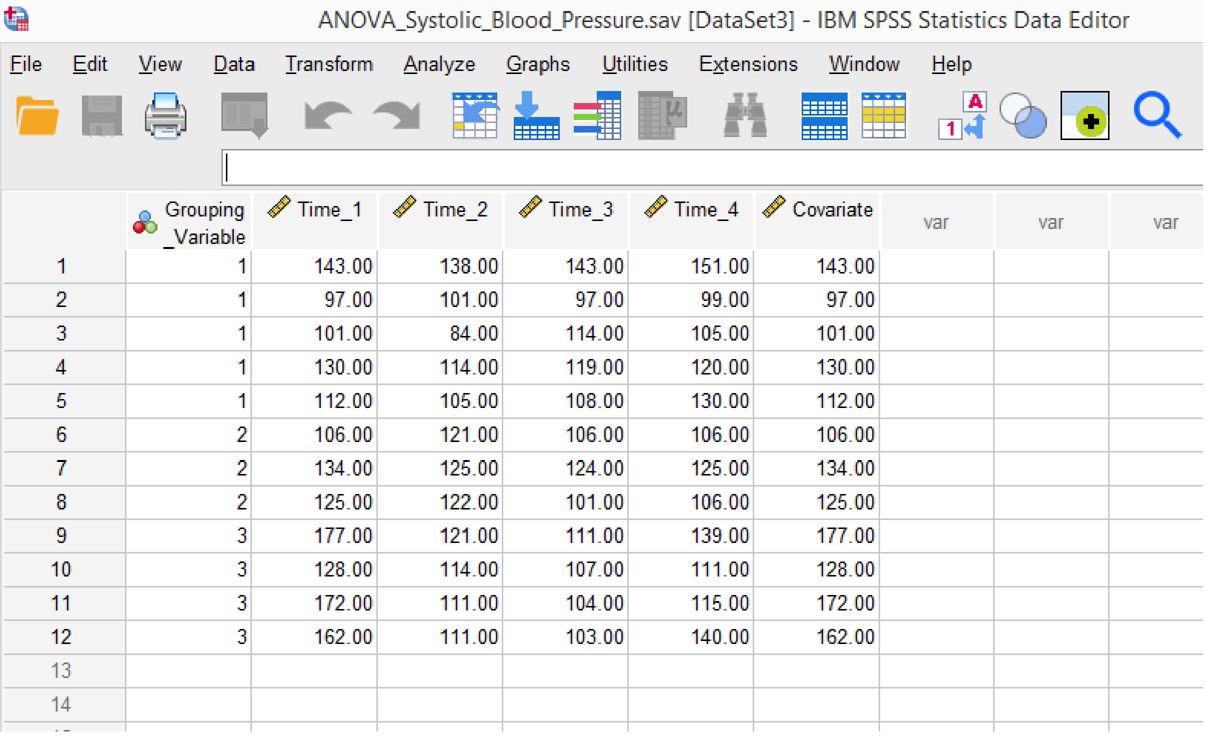
	Grouping _Variable	Time_1	Time_2	Time_3	Time_4	Covariate	var	var	var
1	1	11.00	8.00	5.00	6.00	11.00			
2	1	8.00	8.00	13.00	4.00	8.00			
3	1	14.00	11.00	22.00	22.00	14.00			
4	1	6.00	17.00	9.00	5.00	6.00			
5	1	17.00	14.00	13.00	12.00	17.00			
6	2	39.00	32.00	42.00	20.00	39.00			
7	2	11.00	8.00	12.00	2.00	11.00			
8	2	9.00	11.00	8.00	2.00	9.00			
9	3	20.00	11.00	15.00	11.00	20.00			
10	3	3.00	4.00	6.00	15.00	3.00			
11	3	29.00	22.00	21.00	11.00	29.00			
12	3	21.00	13.00	17.00	17.00	21.00			
13									
14									



	Grouping _Variable	Time_1	Time_2	Time_3	Time_4	Covariate	var	var	var
1	1	4.00	7.00	.00	1.00	4.00			
2	1	2.00	3.00	4.00	6.00	2.00			
3	1	7.00	11.00	4.00	1.00	7.00			
4	1	7.00	11.00	4.00	1.00	7.00			
5	1	15.00	14.00	10.00	7.00	15.00			
6	2	18.00	11.00	16.00	9.00	18.00			
7	2	10.00	7.00	4.00	5.00	10.00			
8	2	1.00	.00	.00	.00	1.00			
9	3	10.00	12.00	6.00	2.00	10.00			
10	3	8.00	4.00	8.00	10.00	8.00			
11	3	14.00	13.00	19.00	8.00	14.00			
12	3	18.00	10.00	17.00	10.00	18.00			
13									
14									

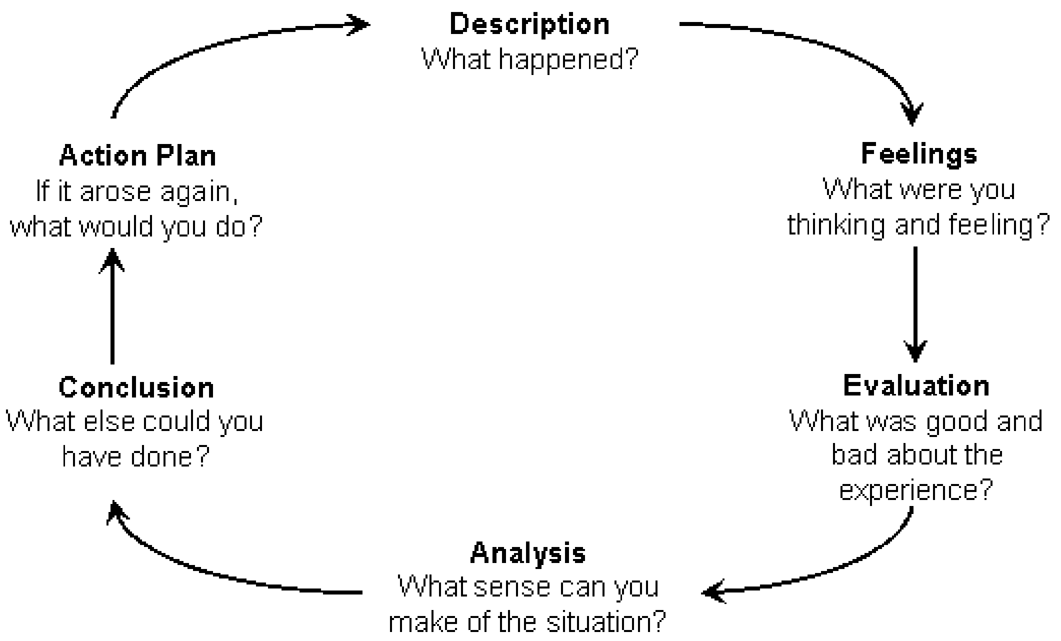


	Grouping _Variable	Time_1	Time_2	Time_3	Time_4	Covariate	var	var	var
1	1	7.50	4.24	8.55	4.31	7.50			
2	1	13.91	6.41	16.63	8.30	13.91			
3	1	8.52	17.76	23.52	21.03	8.52			
4	1	4.14	3.51	4.90	5.43	4.14			
5	2	8.50	9.39	5.32	12.58	8.50			
6	2	11.98	12.88	8.62	11.22	11.98			
7	2	6.90	14.50	11.94	9.86	6.90			
8	3	4.02	8.27	10.56	11.46	4.02			
9	3	8.10	9.29	6.42	8.33	8.10			
10	3	7.09	10.13	10.16	10.68	7.09			
11									
12									
13									
14									



	Grouping _Variable	Time_1	Time_2	Time_3	Time_4	Covariate	var	var	var
1	1	143.00	138.00	143.00	151.00	143.00			
2	1	97.00	101.00	97.00	99.00	97.00			
3	1	101.00	84.00	114.00	105.00	101.00			
4	1	130.00	114.00	119.00	120.00	130.00			
5	1	112.00	105.00	108.00	130.00	112.00			
6	2	106.00	121.00	106.00	106.00	106.00			
7	2	134.00	125.00	124.00	125.00	134.00			
8	2	125.00	122.00	101.00	106.00	125.00			
9	3	177.00	121.00	111.00	139.00	177.00			
10	3	128.00	114.00	107.00	111.00	128.00			
11	3	172.00	111.00	104.00	115.00	172.00			
12	3	162.00	111.00	103.00	140.00	162.00			
13									
14									

10.17 Reflective Research Journal



Recruitment

<u>Description</u> – *what happened?*

Recruitment was a challenge within this population group. The schedules for adults with ID are complex and have rigid timings. To permeate this structure and find time to deliver an intervention was challenging. I arranged and had in-person meetings with three gatekeepers at their locations (a wellbeing centre, a learning facility for adults with ID, and a residential home/day centre). At one point, I had all three sites involved and was planning to deliver the intervention at two of these, using the third site for the control group. However, two sites dropped out due to timetabling issues, leaving me with just one (the residential home/day centre). I used this site alone to recruit all participants for the study.

Feelings – *what were you thinking and feeling?*

This process of recruitment has numerous ups and downs emotionally. I was initially excited to see levels of interest within the field. I was curious to see the reaction from carers and support workers on the study design, as well as having focus group discussions with the individual with ID themselves.

Evaluation – *what was good and bad about the experience?*

It was a good education of the day to day life structure of adults with ID. I learnt how planning in advance is of upmost importance when working with this population group. New activities can bring about feelings of anxiety. So, giving participants plenty of time to hear about the study and ask as many questions as they liked was a necessity.

Analysis – *what sense can you make of the situation?*

People have different priorities. So, it was important to remember that taking part in my study may not be a priority in some people's lives. Therefore, it was necessary to be as accommodating as possible in the study design, including for the duration and location of the intervention.

Conclusion – *what else could you have done?*

Due to the time constraints of a PhD, the option of a lengthy prior planning would have been a challenge to instigate. For future study of larger preparations, giving 18 months or more for planning and preparation would not be an overestimate.

Action Plan – *if it arose again, what would you do?*

For future studies I will allocate more time for recruitment. Planning a lot further in advance to allow for adequate preparation for scheduling and timetabling. By doing this I believe that a larger amount of participants would be recruited into the study.

Baseline Measurements

Description – *what happened?*

I met with all participants who had said they wish to take part in the study. Each participant filled out a consent form. Additionally baseline outcome measure measurements were taken. Each participant had their blood pressure taken, filled in the Glasgow mood rating scales for anxiety and depression, as well as given saliva samples.

Feelings – *what were you thinking and feeling?*

I was excited to be commencing the practical part of my research and I enjoyed the organisational aspect to recorded initial data.

Evaluation – *what was good and bad about the experience?*

Some of the outcome measures – such as the questionnaire – took a lot longer than planned. They were adapted for people with ID to be able to complete on their own. However, the participants were unable to use them in this way. Each participant required approximately 10 minutes of one-on-one assistance. With a total of 14 people, this took quite some time.

Analysis – *what sense can you make of the situation?*

Doing a practice questionnaire with an adult with ID prior to commencing the study could have been beneficial, as this would have shown how long it would take.

Conclusion – *what else could you have done?*

Some carers were available to assist, but for some of them, it was their first time assisting someone in filling out a questionnaire. So, it was a new experience for them too. I decided that, due to the time required, the questionnaires would only be filled out four times during the study – and not before and after every session.

Action Plan – *if it arose again, what would you do?*

In future studies, I will run training sessions for the carers, providing explanations of the questionnaires. Prior experience and having seen the questionnaires beforehand could speed up the process of completing them, thereby allowing more to be filled in and providing more data.

Week One

Description – *what happened?*

Week one was a new experience for everyone involved. I took measurements form the control group first. I then lead the Laughter Yoga session second, taking the participants outcome measures before and after the session. And lastly, I did the Vinyasa yoga session. Taking their saliva samples, blood pressure and doing th Glasgow Mood Rating scales before and after the yoga session.

Feelings – *what were you thinking and feeling?*

I felt excited this week as it was my very first experience of leading the session as part of the study were collection of outcome measures was also included. I was a little nervous, naturally, but I think more excited.

Evaluation – *what was good and bad about the experience?*

Again, it began apparent how time consuming the actual data collection took. The collecting of the saliva samples and blood pressure was ok. However, the Glasgow Mood Rating scales took longer than anticipated once again.

Analysis – *what sense can you make of the situation?*

It was decided at this stage to fill in the questionnaires again at week 3, week 6 and week 10 at the follow up. By doing this it enabled the participants to focus on the yoga sessions more without having additionally time consuming activities to do around it.

Conclusion – *what else could you have done?*

Again, a run through with the questionnaire before the study again could have been beneficial.

Action Plan – *if it arose again, what would you do?*

I think for future studies a trial run through of collecting the outcome measurements could be beneficial before going to take the baseline measurements. This would help account for time management.

Week Two

Description – *what happened?*

Upon arrival, the control group participants were ready and waiting for me. They seemed very eager to have their outcome measurements taken. They were asking me lots of questions about how the study was going so far and shared their happiness at being able to be part of it.

Feelings – *what were you thinking and feeling?*

I felt extremely grateful this week that it ran so smoothly. Again, I lead the Laughter Yoga session first followed by the Vinyasa yoga session and I felt that the timing of all aspects of the data collection was a lot smoother third time round after having already done it twice, at baseline and at week one. I felt grateful and calm.

Evaluation – *what was good and bad about the experience?*

There nothing negative about this week. It was good to feel on top of the data collection and it was reassuring that it was running so smoothly this week.

Analysis – *what sense can you make of the situation?*

At this stage, the participants have met me four or more times and it feels like they are more trusting and welcoming of me. This is beneficial for the study, as they are all happy and willing to be taking part and have more interest and curiosity as the weeks go on.

Conclusion – *what else could you have done?*

This week worked really well. I had to collect the yoga mats for the Vinyasa session from a separate room so I just requested to keep the mats in this room for the rest of the study for efficiency. This was agreed upon.

Action Plan – *if it arose again, what would you do?*

I was not left with any issues to address after week two. It ran seamlessly without error.

Week Three

Description – *what happened?*

Week three continued in the same pattern of the control group giving saliva samples and blood pressure measurements first, followed by the Laughter Yoga session and the Vinyasa Yoga session. This week the Glasgow Mood Rating Scales were also filled in.

Feelings – *what were you thinking and feeling?*

I felt productive this week. It marked the halfway mark for the intervention part of the study. I felt some level of achievement.

Evaluation – *what was good and bad about the experience?*

This week was positive as I felt the filling in of the Glasgow Mood Rating scales was a lot more streamlined than usual. The participants were beginning to get familiar with the questions, with a couple of participants even being proactive and attempting to fill out the questionnaires themselves.

Analysis – *what sense can you make of the situation?*

At this stage, the participants are familiar both with me as the researcher and with the materials used for the outcome measures. There is more enthusiasm about giving saliva samples and blood-pressure readings. Additionally, there is more curiosity, as the participants ask more questions about the materials – such as the cotton swabs in the salvia sampling kits.

Conclusion – *what else could you have done?*

This week ran well so no amendments to the current layout and scheduling of the study needed to be made.

Action Plan – *if it arose again, what would you do?*

No action needed to be taken after this week. All elements of the yoga sessions and of the data collection ran well. I feel this is now due to the familiarity of it, for both me as the researcher and for the participants.

Week Four

Description – *what happened?*

Week four followed the same running order of the control group having their outcome measures taken first, followed by the Laughter Yoga session and their measurements and lastly the Vinyasa yoga session and the collection of their outcome measures.

Feelings – *what were you thinking and feeling?*

I am feeling happy and content that no big issue had arisen within the study. Due to the challenges faced at recruitment and finding a study site it was a relief that at week four of the study things are still running to time and as planned.

Evaluation – *what was good and bad about the experience?*

Having a rigorous schedule and plan prior to doing the data collection has been paramount to the success of the feasibility study so far.

Analysis – *what sense can you make of the situation?*

I feel I understand at this stage the importance of preparation as being equally as important in research design as the actual study. Running estimates and taster sessions of timings for the yoga sessions was very useful for time management. Additionally, looking at the outcome measurements and realistically assessing the time and effort required for them to be completed was beneficial in how the study has been running on time and to schedule since baseline measurements.

Conclusion – *what else could you have done?*

Involving the carers and allowing them to become familiar with the outcome measures prior to data collection could have been beneficial. A more in-depth explanation of the equipment used and the rationale for these choices could have been a benefit for them and not just the participants. I feel this would be beneficial, as the participants are becoming more curious as the study goes on. They quite often ask the same questions numerous times, and if the carers had more knowledge, they would be able to answer these questions when I was not at the study site.

Action Plan – *if it arose again, what would you do?*

I think, for future studies, an hour dedicated to educating carers more in depth about the outcome measures and when, why, and how we would use them would be prudent.

Week Five

Description – *what happened?*

The same running order was used, control group, Laughter yoga session, Vinyasa yoga session.

Feelings – *what were you thinking and feeling?*

This week I still felt very grateful that the study was going well do far without any glitches. The participants were very friendly with me as they now know me so much better and I am familiar to them.

Evaluation – *what was good and bad about the experience?*

I’ve learnt that familiarity is paramount for this population group. The longer the study goes on, the more enthusiastic and proactive they are about taking part. For example, they are sharing their excitement about the following week’s yoga sessions. Additionally, something that came as a surprise was that the control group are just as enthusiastic and happy about taking part.

Analysis – *what sense can you make of the situation?*

I feel that adults with ID love to be included in research about themselves. They enjoy learning new things that are completely different to their day-to-day activities and schedules. They enjoy holding the music player during relaxation. They like to press the buttons on the blood-pressure machine and to undo and look intensely at the saliva sample kits.

Conclusion – *what else could you have done?*

This week ran to plan. No further amendments need to be made at this stage.

Action Plan – *if it arose again, what would you do?*

One participant no longer wanted to give saliva samples. This was due to him forgetting why we were taking them – but not how: he had full comprehension of how to give one, but no longer understood why. Therefore, I did not take any more samples from him. This suggested that perhaps each week I should give a brief reminder of the "why" behind all the outcome measures, as I had done at baseline and week 1 – rather than just indicating how to give them.

Week Six

Description – *what happened?*

This being the final practical week of the study where yoga was included, I again followed the same format of the control group first, then Laughter yoga and finally Vinyasa yoga.

Feelings – *what were you thinking and feeling?*

There was a tinge of sadness to this week as it was the last time I was delivering the yoga sessions to the participants. This particular aspect of the study was my favourite and most enjoyable.

Evaluation – *what was good and bad about the experience?*

It was good to have completed the practical side of the study and be secure in the knowledge that all had gone to plan and I have all the required data collection that I need up to this point.

Analysis – *what sense can you make of the situation?*

This experience has taught me how imperative preparation is. If I did not have a running order for the yoga sessions as well as the collection of the outcome measurements it would have been very challenging to time manage.

Conclusion – *what else could you have done?*

No further amendments to the study are required at this stage.

Action Plan – *if it arose again, what would you do?*

Having everything mapped out, including a pose by pose breakdown of the Vinyasa yoga session and an exercise by exercise breakdown for the Laughter yoga were incredibly helpful. In future studies this aspect of preparation will be a necessity to undertake again.

Week 10 – Follow Up Measurements

Description – *what happened?*

As this was the day of follow up measurements no yoga took place. Three to four participants at a time came to have their outcome measures recorded as well as filling in the Glasgow Mood Rating scales one last time.

Feelings – *what were you thinking and feeling?*

I felt proud and productive this week. Proud that I had completed the data collection and this large and pivotal phase of my PhD. Additionally, the feeling of productivity came for the same reasons. I felt a sense of completion and joy that I had collected all information that I require form the practical side of the study to go onto the next phase that is the data analysis.

Evaluation – *what was good and bad about the experience?*

The best aspect of undertaking the research has been the interaction with the participants who took part. Getting to know and have discussions with the adults with ID was by far my favourite and most enjoyable part of doing my field research. Getting to know them throughout the study and being invited into part of their lives felt like a privilege. In future studies when more time allows I feel it would be prudent to arrange more than just one or two meetings and focus groups prior to commencement of the study.

Analysis – *what sense can you make of the situation?*

During the study as familiarity increased with me, their researcher and yoga teacher, so did the participants enthusiasm. I've learnt how important it is to build trust with this population group. I learnt that they have so many different care givers, activity leaders, teachers, doctors and health care professionals in their lives that introducing a new person to this already complex pool of people that friendliness and trust goes a long way.

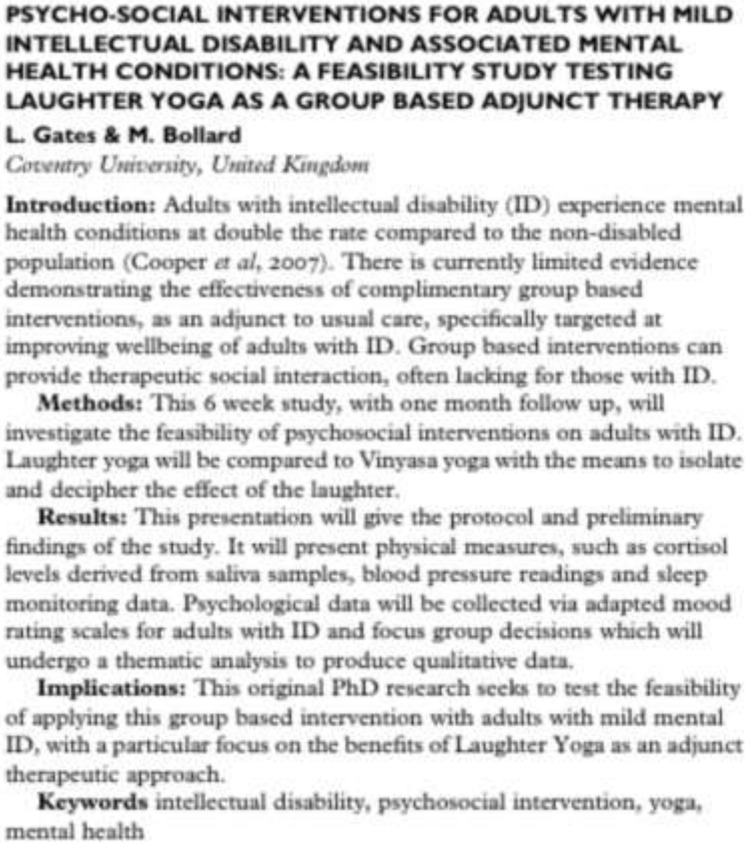
Conclusion – *what else could you have done?*

As any researcher may likely feel, I would have loved more time to do a much longer study. However the positive aspect of this being a feasibility study makes this work I have just produced a stepping stone to larger and longer studies in duration in the future.

Action Plan – *if it arose again, what would you do?*

If I were to undertake this exact study again, I would enlist the support of an assistant to help facilitate the data collection of the outcome measures, as this was often the most time-consuming aspect. I thoroughly enjoyed the process of collecting the data, but this would benefit the participants (rather than me, as the researcher). It would decrease the time that the participants had to wait for me to finish with each person's blood-pressure readings. With two or more people doing this, the process would move a lot faster. A ratio of one researcher for every five participants would be ideal.

10.18 IASSID Abstract



PSYCHO-SOCIAL INTERVENTIONS FOR ADULTS WITH MILD INTELLECTUAL DISABILITY AND ASSOCIATED MENTAL HEALTH CONDITIONS: A FEASIBILITY STUDY TESTING LAUGHTER YOGA AS A GROUP BASED ADJUNCT THERAPY

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Introduction: Adults with intellectual disability (ID) experience mental health conditions at double the rate compared to the non-disabled population (Cooper *et al*, 2007). There is currently limited evidence demonstrating the effectiveness of complimentary group based interventions, as an adjunct to usual care, specifically targeted at improving wellbeing of adults with ID. Group based interventions can provide therapeutic social interaction, often lacking for those with ID.

Methods: This 6 week study, with one month follow up, will investigate the feasibility of psychosocial interventions on adults with ID. Laughter yoga will be compared to Vinyasa yoga with the means to isolate and decipher the effect of the laughter.

Results: This presentation will give the protocol and preliminary findings of the study. It will present physical measures, such as cortisol levels derived from saliva samples, blood pressure readings and sleep monitoring data. Psychological data will be collected via adapted mood rating scales for adults with ID and focus group decisions which will undergo a thematic analysis to produce qualitative data.

Implications: This original PhD research seeks to test the feasibility of applying this group based intervention with adults with mild mental ID, with a particular focus on the benefits of Laughter Yoga as an adjunct therapeutic approach.

Keywords intellectual disability, psychosocial intervention, yoga, mental health