Portfolio Volume I:
Major Research Project

Investigating the Relationship between Flexibility in Thinking and Treatment Adherence for Individuals with Obsessive Compulsive or Related Disorders and Eating Disorders

Author: Shaunak Sanjay Deshpande

Student number: 2106 2322

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Abstract

Introduction: People with mental disorders characterised by obsessive and compulsive symptoms, such as obsessive-compulsive or related disorders and eating disorders, show poor adherence to mental health treatments, which represents a major clinical challenge. These disorders share a pattern of inflexible thinking, which is thought to influence treatment outcomes. However, there is sparse research exploring the link between cognitive inflexibility and treatment adherence in mental disorders.

A **Systematic Literature Review** investigated the possible link between inflexible thinking and treatment adherence among all forms of mental health disorder. It found evidence that inflexibility in thinking influences treatment adherence among a broad grouping of disorders characterised by poor impulse control and compulsivity. However, no studies were found that explored the link between cognitive inflexibility and treatment adherence among obsessive-compulsive or related disorders and eating disorders.

Aim: A cross-sectional study explored the link between cognitive inflexibility and treatment adherence among participants who self-reported having obsessive-compulsive & related disorders and/or an eating disorder and had received some form of mental health treatment.

Method: Participants completed an online survey consisting of a Personal Circumstances Questionnaire, Treatment Adherence Rating Scale-Revised, Medication Adherence Rating Scale, WHO-5 Wellbeing Index Scale, Compulsive Personality Assessment Scale and Wisconsin Sorting Card Test-64 card version. Logistic regressions were run, which explored the possible link between cognitive flexibility and treatment adherence.

Results: 201 participants (average age 33.77 years, and 168 females) reported a history of obsessive-compulsive & related disorder (n= 169) and/or an eating disorder (n= 92). Logistics regressions found that cognitive inflexibility was associated with therapy adherence ($\beta = -0.11$, $p \leq 0.003$, OR = 0.89, 95% CI. 0.83 - 0.96). Also, good psychological wellbeing ($\beta = 0.03$, $p \leq$

0.008, OR = 1.03, 95% CI. 1.01 – 1.05), as well as male sex at birth (β = 1.68, p ≤ 0.018, OR = 5.36, 95% CI. 1.34 – 21.40), was associated with therapy adherence. No factors were found to linked to medication adherence.

Conclusions: Cognitive inflexibility represents a risk factor for poor psychological therapy adherence and could represent a novel biomarker for personalising care for those affected by disorders characterised by obsessive and compulsive symptoms. Clinicians should look for signs of cognitive inflexibility in their patients to aid clinical decision-making.

Chapter I: Introduction

1.1 Background

This thesis investigates the link between cognitive flexibility and treatment adherence for mental health treatments received by people with Obsessive Compulsive & Related Disorders or Eating Disorders. Although these conditions present with different clinical symptoms, they are thought to share compulsivity and impulsivity traits and appear to influence cognitive flexibility. Understanding the factors that may influence poor adherence is essential since good adherence to therapy and medication among these patients can be expected to result in improved clinical outcomes following treatment (Kan et al., 2020; Leeuwerik et al., 2019; Simpson et al., 2011).

In this chapter, the trainee psychologist shares their epistemological stance (1.2) and then describes the key terms in a glossary (1.3) that informs how this thesis is understood. Next, the impact of Obsessive Compulsive & Related Disorders and Eating Disorders on individuals and society is described (1.4) and the issue of poor treatment outcomes and poor adherence among these conditions is discussed (1.5), including the potential for a negative influence of poor adherence on clinical outcomes (Leeuwerik et al., 2019) (1.6). The thesis then critiques current methods for assessing treatment adherence, which tend to rely on clinical observations, such as premature discontinuation (dropout) (1.7). Cognitive inflexibility, representing an impairment in the ability to flexibly adapt thoughts and behaviour when contingencies change, is a shared latent trait that occurs frequently in people with both OCRDs and EDs and that has been associated with poor clinical outcomes. Theoretically, the inability to change behaviours would be expected to impede adherence to interventions for these disorders (psychological and/or pharmacological therapies), as these interventions require initiating and maintaining behavioural changes. However, the role of cognitive inflexibility in poor treatment adherence in these disorders has barely been investigated (1.8). The chapter then concludes by discussing how systemic theory conceptualises treatment adherence, and

introduces a new concept related to the role of cognitive inflexibility on treatment adherence among these disorders, which has not so far been explicitly considered with these theories (1.9).

In summary, this chapter highlights that there is a dearth of empirical research exploring how flexibility of thinking may influence treatment adherence among the aforementioned clinical populations. This chapter concludes by offering a rationale for the next chapter, where a systematic literature review examines how objective measurements of flexibility in thinking may influence treatment adherence among adults with various mental health conditions.

1.2 Epistemological Stance

Positionality refers to the researcher's standpoint they have taken when conducting research. Understanding a standpoint is essential for researchers as it enables them to consider how empirical research is carried out and how the researcher understands knowledge and sensory experiences (Carlin, 2009).

There are various reasons why I chose to study how flexibility in thinking may influence treatment adherence. For the past 10 years, I have worked in the National Health Service (NHS), where I have supported people suffering from psychological distress and have witnessed how therapy can change lives. The importance of how therapists can promote change was instilled in me when I was introduced to the cognitive therapy rating scale, where I learnt the importance of motivating people to adhere to the plan, as informed by the agenda (Blackburn et al., 2001).

I realised that my role as a therapist is to promote access to therapy, as it can make a difference in one's life. It follows, therefore, that I remember clearly the clients with whom I worked who stopped returning or refused therapy midway. I often felt frustrated when writing to clients explaining that they could always come back in the future and knew that it can take several months to access therapy. In a recent report, the average time taken to attend a first

appointment for therapy can be 62.5 days (Baker & Kirk-Wade, 2024). For this reason, I often wondered if there was anything else I could have done to keep them engaged for longer to allow therapeutic change to take place, knowing how it can be challenging to enter therapy and show a willingness to promote change. Since I have witnessed the power of therapy, I wonder what may have happened to those adults who did not return or adhered sub-optimally to treatment, especially since the life expectancy of those with a severe mental illness can be 15-20 years less than the general population (Chew-Graham et al., 2021).

This thesis has led me to revisit memories of my clinical work and wonder how flexibility in thinking could be a factor that influences change. These experiences have enabled me to question how to frame knowledge and the role of the scientific method. I have observed the scientific method from a young age, as my parents work as scientist-practitioners (Stricker, 2002). I believe these principles derive from wanting to improve the society that we live in, which has arisen from socialist India that wanted to promote social welfare and reduce inequalities post-independence.

Reflecting on my positionality made me realise that the assumption of flexibility in thinking influencing treatment adherence requires scrutiny using the scientific method, which helped me to design research questions and methodologies for this empirical research.

This thesis adopts an empiricist stance, which understands that the source of human knowledge is developed from sensory experiences rather than emerging organically in the mind. This stance led to the development of the scientific method, which is used in contemporary science, suggesting that theories can be tested against observations rather than reasoning or assumptions. A core principle for empiricism is that knowledge is informed by experience, which should be questioned for continued revision (Carlin, 2009; Longworth, 2009).

1.3 Glossary of Key Terms

Cognitive Flexibility was first described as flexibility in thinking (Berg, 1948), and was later known as a distinct construct known as cognitive flexibility. It sees it as a continuum ranging from inflexible (rigidity) to flexible thinking traits. Cognitive flexibility is an executive function that generates a shift in perspective and behaviour that may occur interpersonally or spatially. A key component of cognitive flexibility requires shifting how we think about something, which may result in a novel solution and idea that may assist in solving challenges where a previous solution did not work. This may result in a change in behaviour or approach. Whereas rigid adherence to former viewpoints and perspectives may stop mental shifts. This executive function can promote the possibility of adaptively adjusting to different contexts, recognising a mistake and seizing upon an unanticipated and sudden opportunity (Diamond, 2013). Hence, inflexible thinking could be expected to obstruct this process. For instance, in treatment, the client needs to reach an agreement with the therapist or clinician and persist with concrete behavioural change, like practising homework a certain way or taking the right medication dosage. It could be hypothesised that those with greater levels of inflexibility would find making those changes more difficult to enact and would remain committed to their previous way of thinking and doing.

I**mpulsivity** is a tendency to act rapidly and without planning in response to internal or external information, often disregarding potential negative consequences (Hollander et al., 2005).

Compulsivity refers to repetitive behaviours or thoughts that individuals feel compelled to perform. This is typically in response to intrusive thoughts or urges and performed according to rigid rules, with the aim of reducing anxiety or preventing a feared event. The actions are performed despite the actions being unrealistic or excessive (Hollander et al., 2005).

Treatment Adherence: Treatment Adherence is how effectively a patient follows a treatment plan that has been designed and agreed upon by them and their clinician. There have been various words that preceded adherence, including compliance, which have been used in various health and social sciences to understand these behaviours. The shift from compliance to

adherence is intended to capture the consent and accountability of patients during their collaboration with their clinician and treatment plan. Treatment Adherence applies to mental health treatments, i.e. therapy and medication, and recognises how patient involvement in their treatment is a critical factor for offering an effective treatment plan. Understanding how treatment adherence and treatment is completed is different and can be measured through clinical observations, self-reported or clinician-reported measures, and biomarkers (i.e. metabolite concentration in body fluids) (Dong et al., 2018; Lam & Fresco, 2015; Sajatovic et al., 2010).

1.4 Impact of Obsessive Compulsive Related Disorders & Eating Disorders on individuals and society

Obsessive Compulsive & Related Disorders (OCRDs)[1] and Eating Disorders (EDs)[2] are mental health conditions that have been defined by different classification systems, i.e. Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5) and International Classification of Diseases-11 (ICD-11). These disorders are categorised by rigid and repetitive behaviours, which intensify intrusive thoughts and psychological impairment (American Psychiatric Association, 2013; World Health Organisation, 2018). Whilst both conditions have distinguishable differences in the form of thoughts and behaviours, there is also considerable symptom overlap between these disorders (Phillips et al., 2005; Williams et al., 2022), which are thought to be influenced by compulsivity and impulsivity traits (Grant & Chamberlain, 2023). Both of these groups of conditions are linked to compulsive, unwanted, impulsive, and stereotyped symptoms, thought to be driven by cognitive inflexibility, hence hampering their ability to generate new ways of

[1] Includes obsessive-compulsive disorder (OCD), body dysmorphic disorder, body-focused repetitive disorders (i.e., hair-pulling disorder and skin-picking disorder), olfactory reference disorder, hypochondriasis, and hoarding disorder.

[2] Includes Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder, Avoidant Restrictive Food Intake Disorder, Pica Disorder and Rumination-Regurgitation Disorder.

problem solving (Frota Lisboa Pereira de Souza et al., 2024; Grant & Chamberlain, 2023; Stein et al., 2016; Tchanturia et al., 2012).

Since both groups of conditions share similar clinical features, they also experience poor treatment outcomes. For example, a consensus review showed that fewer than 40% of people with OCD who sought treatment maintain sustained remission when followed up. The review also highlighted that the median duration of OCD can be 16 years, and 1/3 of cases do not reach remission (Fineberg et al., 2019). The reported mortality rate found in a population-based cohort study was 5.1 per 1,000 people per year (de la Cruz et al., 2024). It is possible that this prognosis also extends to other OCRDs (Stein et al., 2016).

Similar challenges of a poor prognosis also appear to be the case in eating disorder patients. A systematic review and meta-analysis that appraised over 400 studies offers insights into the treatment outcomes of working-age adults affected by anorexia nervosa, bulimia nervosa, and binge-eating disorder who received medication or therapy. The review showed that recovery is not possible for more than 50% of people with EDs. Moreover, 26% of cases experience relapses after recovery or need hospitalisation at follow-up. The mortality rate for EDs is 5.2 per 1000, which is a relatively high rate for people at a mean age of 26 years (Solmi et al., 2024).

The significant impact of these long-term and enduring mental health conditions also bears a considerable financial burden on society. Cost-of-illness studies carried out in the United Kingdom this decade estimate that OCD carries a societal cost of £5.1 billion (Kochar et al., 2023), and the burden for EDs is estimated at £3.5 billion (Jenkins, 2022). These figures underestimate the true impact of OCRDs and EDs on societal outcomes [3] (Jenkins, 2022; Kochar et al., 2023).

[3] For example, these figures did not consider the various other conditions grouped in OCRDs, and men with EDs were underrepresented in the respective Cost-of-illness studies. Nonetheless, it highlights the need and the

Since there are significant poor mental health, quality of life and financial outcomes linked with these conditions, the NHS offers a range of biopsychosocial interventions. The National Institute for Health and Care Excellence (NICE) recommends a range of psychological therapies and psychiatric medication for treating adults with OCRDs and EDs. For OCRDs, Cognitive Behavioural Therapy (CBT) is recommended as a first line of treatment. For increased complexity, CBT with medication (i.e. Selective Serotonin Reuptake Inhibitors or Clomipramine) is recommended for OCD (NICE, 2005). Although NICE (2005) offers recommendations for those affected by OCRDs, it does not provide specific medication guidance for first-line medication treatment for all OCRDs. For example, whilst Selective Serotonin Reuptake Inhibitors can alleviate non-hoarding symptomology among those affected by Hoarding disorder (Saxena, 2014), the International OCD foundation (n.d.) states that the recommended practice has limited empirical evidence, and suggests when there are no improvements from SSRI (highest dose and/or it is prescribed for 12 weeks), the physician may choose to augment treatment with another medication—for example, Fluphenazine, Haloperidol, Olanzapine, Quetiapine and Risperidone. For EDs, the following psychological therapies are considered: individual or group CBT, Maudsley Anorexia Nervosa Treatment for Adults, Clinical Management, and Focal Psychodynamic Therapy. Whilst medication alone is not recommended for EDs, Fluoxetine is recommended in combination with an intervention (Lovell & Bee, 2008).

Although these conditions significantly affect individuals and NICE provides recommended interventions, research presented below shows how these patients often struggle with treatment adherence (Ayers et al., 2012; Capel et al., 2024; Simpson et al., 2011, 2021).

relevance of effective health & social care interventions for those affected by these conditions (Jenkins, 2022; Kochar et al., 2023)

1.5 Poor Treatment Adherence and Clinical Outcomes among *Obsessive Compulsive & Related Disorders* and Eating Disorders

Difficulty adhering to psychiatric and psychological treatment is a commonly reported problem among individuals suffering from mental health problems. However, the causes and remedies are not well understood. This is particularly the case among people with OCRDs and EDs, as outlined below (Barnicot et al., 2011; DiMatteo et al., 2000; Karabulut & Uslu, 2024; Lappan et al., 2020; Pfund et al., 2021). This raises the question of whether the poor treatment outcomes seen for these disorders are related to poor treatment adherence.

1.5.1 Adherence to Psychological Therapies for Obsessive Compulsive & Related Disorders

In terms of psychological therapies, two separate models of CBT (i.e. exposure & response prevention and cognitive therapy) have been shown to be effective in treating those affected by these disorders (Salkovskis, 2007; Wells & Leahy, 1998). Despite its treatment efficacy, patients with these disorders often experience difficulties to adhering to this support. A systematic review and meta-analysis carried out by Leeuwerik et al., (2019) pooled data from 123 studies and found that there were no patient characteristics that predicted dropout, despite them finding 31.5% of patients refused CBT or dropped out later, which demonstrates the ongoing challenge of treatment adherence amongst this population. Another pertinent predictive factor was good adherence to in-between CBT session homework, which was linked to OCD symptom reduction with medium to large effect sizes (See figure 1). These findings were replicated in a study that offered exposure & response prevention therapy to a sample of working-age adults with OCD. The researchers found that good adherence to in-between session work, as rated by therapist-rated adherence tool, predicted symptom reduction of OCD symptoms as measured by the Yale-Brown Obsessive Compulsive Scale (Simpson et al., 2011). These findings were later replicated by these researchers (Simpson et al., 2021). The vital role of adherence to homework and therapy offered to adults with trichotillomania or hoarding

disorder was also considered beneficial for improving clinical outcomes (Ayers et al., 2012; Capel et al., 2024).

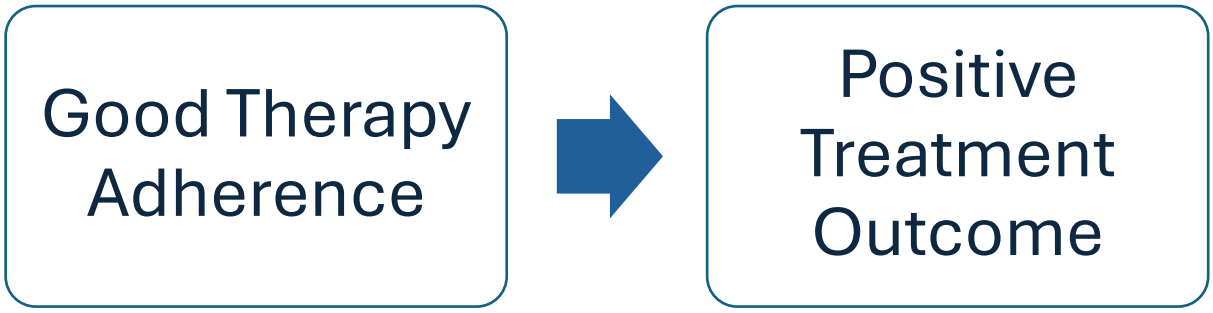

Figure 1: Link between treatment adherence and treatment outcome (Leeuwerik et al., 2019; Simpson et al., 2011 & 2021).

Note. This figure postulates how optimal therapy adherence appears to influence the course of treatment and can result in a positive clinical outcome. Moreover, it is also plausible that poor treatment adherence may also influence the course of treatment and result in a poor treatment outcome.

Poor treatment adherence appears to be a challenge for those receiving therapy throughout their lifespan. A systematic review (Johnco et al., 2020) found that dropout rates for Exposure Response & Prevention (10.24%) among children were smaller when compared to another systematic review (Ong et al., 2016) that found higher attrition for working-age adults receiving the same intervention (18.7%). Moreover, Ong et al. (2016) found exposure & response prevention had similar dropout rates to other therapies for OCD. Interestingly, the knowledge of the intervention and the number of sessions were not predictive of dropout rate from therapy (Ong et al., 2016). Perhaps these differences reflect the tolerance of behaviour-informed interventions for young people that appears to diminish later in life with those living with OCD. This is further supported by Simpson et al., (2021) findings that hinted at the relationship between cognition, possibly inflexible thinking, and treatment adherence among adults with OCD, which may consolidate into a cognitive trait through ageing. A systematic

review looking at neural imaging and cognitive flexibility found age-related cognitive trait differences between young adults and older adults (Xia, Hou, Li, & Chen, 2024).

The above research found that dropout rates among patients with OCD who received psychological therapy were up to 31.5%. Typically, systematic reviews include higher quality studies (e.g. RCTs) that select participants who met a stringent inclusion process and are perhaps motivated to participate in research (Jenkins et al., 2013; McCann et al., 2010). This explains how there are higher dropout rates in lower-quality studies (e.g. longitudinal or cohort studies), which typically include patients who may not necessarily meet the inclusion criteria for RCTs. For example, drop-out rates for patients with OCRDs that received some form of psychological therapy included 34%, 59%, 51% and 51% (Aderka et al., 2011; Diniz et al., 2011; Mancebo et al., 2011; Santana et al., 2013), which are higher than the reported figures mentioned above.

1.5.2 Adherence to Psychiatric Medication for Obsessive Compulsive & Related Disorders

Despite there being certain medications known to be effective treatments for symptom reduction for a number of OCRDs and are recommended by NICE (Lovell & Bee, 2008), the literature below highlights the ongoing challenges patients experience with tolerating a course of medication. A Cochrane review that evaluated the efficacy of Selective Serotonin Reuptake Inhibitors (SSRIs) by appraising double-blind randomised controlled trials found that medication versus placebo was efficacious in OCD symptom reduction as measured by the Yale-Brown Obsessive Compulsive Scale. The review did not clearly report the dropout rates of the included studies but rather reported that seven of the included studies had an overall dropout rate of up to 20%. Another 10 studies reported a dropout rate of more than 20% (Soomro et al., 2008). When looking at the range of drop-out rates for active treatment (See table below, 0% to 71.71%) of the 17 included studies for the Cochrane review. These discontinuation rate for SSRIs prescribed among patients with OCD recruited to trials vary considerably and highlight how it can be challenging for patients to remain in treatment and experience the benefits of

medication. Despite the considerable variability of the dropout rates, they do align with findings from studies using lower quality methodologies (e.g. Cross-sectional Study or Cohort study), which reported SSRI discontinuation rates of 61% and 44%, respectively (Santana et al., 2013; Grant et al., 2013).

Table 1: Dropout Rates of included Studies from the Cochrane Review receiving active treatment (Soomro et al., 2008)

Study	Discontinuers for Active Treatment	Active Treatment Total	Percentage
Chouinard et al., (1990)	11	40	27.50%
Dominguez et al., (1991)	76	210	36.19%
Goodman et al., (1989)	9	21	42.86%
Goodman et al., (1996)	26	57	45.61%
Greist et al., (1992)	93	176	52.84%
Hollander et al., (2002)	51	84	60.71%
Hollander et al., (2003)	24	263	9.13%
Jenike et al., (1990a)	0	18	0.00%
Jenike et al., (1990b)	0	10	0.00%
Jenike et al., (1997)	7	43	16.28%
Kamijima et al., (2004)	9	95	9.47%
Kasper et al., (1999)	174	254	68.50%
Kronig et al., (1999)	35	61	57.38%
Montgomery et al., (1993)	75	119	63.03%
Nakajima et al., (1996)	31	60	51.67%
Ushijima et al., (1997)	20	29	68.97%
Zohar et al., (1996)	109	152	71.71%

A systematic review and meta-analysis that pooled the data from 9 studies found that higher doses of SSRIs were significantly linked to improved clinical outcomes as measured by the YBOC-S, and a higher number of dropouts were linked to side effects from the increased medication dosage (Bloch et al., 2009). Another systematic review also found similar findings over the link between dropout rate and medication dosage among SSRI-resistant OCD patients who were prescribed a glutamatergic agent as add-on medication as part of their overall

treatment plan [4]. The reviewers found 8 double-blind, randomised controlled trials (RCTs) that showed this medication was effective for treatment-resistant OCD, but undesired side effects predicted dropout (Laoutidis et al., 2016).

This literature highlights how adhering to medication is a significant challenge for OCD patients, and the dose of medication appears to be a crucial factor that influences their ability to tolerate a course of it.

1.5.3 Adherence to Psychological Therapies for Eating Disorders

The challenges around poor treatment adherence for patients with OCRDs also apply to EDs patients. Although CBT for EDs can be efficacious for treating eating disorder symptomology in 66% of cases (Fairburn et al., 2015), a systematic review and meta-analysis evaluating the dropout rates for CBT compared to other therapies[5] and what factors influence treatment retention among people with eating disorders found patients with EDs are susceptible to discontinuing a course of psychological therapy (Linardon et al., 2018). The reviewers pooled together 99 randomised control trials and found that there was no statistically significant difference in the dropout rates between other therapies and CBT among eating disorders. The review reached this conclusion by making 44 possible comparisons between CBT and other therapeutic interventions. The overall dropout for CBT was 24% (20–29%), and dropout rates were much lower for enhanced CBT (18%; range 13% - 25%) than virtual CBT (33%; range 25% - 34%). There was also some evidence that suggested additional therapy sessions were linked to lower dropout rates. Interestingly, the symptom severity at assessment was not predictive of dropout rate. When compared to the overall dropout rate reported in this systematic review,

[4] This is a type of medication is used to augment the use SSRI medication for patients that have become treatment resistant to a SSRI medication (Laoutidis et al., 2016).

[5] i.e. interpersonal psychotherapy, behavioural therapy, nonspecific supportive therapy, family-based therapy, psychodynamic therapy, specialist supportive clinical management, behavioural weight loss, cognitive remediation therapy, mindfulness-based therapy, relational therapy, emotional and social mind training, integrative cognitive-affective therapy, compassion-focused therapy, and schema therapy

studies using lower-quality research designs showed much higher discontinuation rates (45%, 48%, and 51%), which exceeded the CBT dropout range (Carter et al., 2012; Geller, 2002; Von Brachel et al., 2014). The implications of discontinuing therapy could be adverse, since dropout can lead to poor clinical outcomes and a poor prognosis (Baran et al., 1995; Kahn, & Pike, 2001; Wallier, et al., 2009)

1.5.4 Adherence to Psychiatric Medication for Eating Disorders

Another systematic review that specifically evaluated the impact of second-generation antipsychotic medication as an off-label intervention for anorexia nervosa identified evidence that contradicted the expected narrative that discontinuing treatment is due to the undesired metabolic side effects. This is a commonly cited issue among various psychiatric disorders, for example, schizophrenia (Karabulut & Uslu, 2024) and could be perceived as a concern for those affected by eating disorders, since body dissatisfaction is linked to body weight/shape, which is mentioned as a clinical feature in the DSM-5 for various EDs (American Psychiatric Association, 2013; World Health Organisation, 2018). This systematic review and meta-analysis found a discontinuation rate of 28% (95% CI: 19 to 38%) and that unexpectedly personal factors appeared to be a more pertinent reason for discontinuation rather than undesired metabolic effects (Kan et al., 2020). These findings were surprising, as the side effects from these medications are a common reason for poor adherence in other conditions, such as Schizophrenia (Karabulut & Uslu, 2024).

These findings were also consistent with other systematic reviews (DeJong et al., 2012; Fassino et al., 2009) that appraised the dropout rates for psychological therapy and/or medication for patients with EDs that had varying clinical complexity. One of these reviews found dropouts ranged from 20.2% to 51% for inpatients with eating disorders, and 29% to 73% for outpatients with EDs (Fassino et al., 2009). Both reviews found that the baseline body mass index (BMI) was not a clinically relevant factor for predicting treatment dropout, whereas Fassino et al. (2009) found psychological (high impulsivity and fear maturity) and personality traits (low cooperativeness and self-directedness) predicted treatment discontinuation. Also, educational

interventions had higher dropout rates than interpersonal interventions, for example, a 100% dropout rate for dietary advice compared to 20–40% for individual psychotherapy (DeJong et al., 2012). Interestingly, these discontinuation rates were similar to the reported dropout figures for patients with EDs receiving psychiatric medication (37%, 50%, 51%) and offered stepped care treatment approach (59%) (Brown et al., 2018; Kaye, et al., 2001; Walsh, et al., 2006).

This literature above shows that treatment discontinuation in eating disorders could be driven by personal and psychological factors than by anticipated metabolic side effects. Such conclusions challenge assumptions drawn from other psychiatric conditions like schizophrenia, where adherence is frequently linked to medication tolerability.

1.6. Implications of poor treatment adherence

Poor treatment adherence is a challenge among EDs and OCRDs populations. The literature above shows on average, poor treatment adherence, as measured by dropout, affects 42.41% (range 10.24% to 100%) of treatment-seeking people, which may harm themselves and impact society as a whole. These figures are from higher-quality research, for example, RCTs, that typically recruit patients motivated to take part in research and complete a treatment, may inadvertently underplay the importance of how suboptimal treatment can result in poor clinical outcomes (Baran et al., 1995; Kahn, & Pike, 2001; Leeuwerik et al., 2019; Simpson et al., 2021; Wallier, et al., 2009). These differences in dropout rates across study designs raise important questions about whether suboptimal treatment is a concern that receives insufficient attention in empirical research. A lack of focus on dropout rates and their effects on clinical outcomes, particularly a focus on the prognosis of patients who are unable to tolerate a full course of treatment, may result in the issue of suboptimal treatment being an underrepresented discourse in clinical practice.

The literature also shows how personality traits (for example, obsessive-compulsive personality traits, high impulsivity, fear of maturity, low cooperativeness and self-directness) among OCRDs

and EDs patients seem to influence treatment adherence (Fassino et al., 2009; Simpson et al., 2021). These traits could be driven by inflexibility of thinking, which is commonly found in these disorders (Frota Lisboa Pereira de Souza et al., 2024; Simpson et al., 2021). These traits may hinder treatment participation, and a possible way to mitigate these difficulties is to offer an extended course of sessions that are tailored to the patients' needs (DeJong et al., 2012; Fassino et al., 2009; Kan et al., 2020). While this approach maximises the potential benefits of therapy, the research outlines how good treatment adherence, for example, completing CBT homework, results in the improvement of clinical outcomes (Leeuwerik et al., 2019; Simpson et al., 2011, 2021).

1.7 Measuring Treatment Adherence

Treatment adherence is understood differently across disciplines, especially how patient agency and involvement are considered in treatment planning (Biswal et al., 2024; Thompson & McCabe, 2012). This explains why there are several ways it can be measured:

- Clinical Observations, which are obtained during clinical practice.
- Objective Measurements
- Self-Report and Clinician-Administered Scales.

There are no gold standard measures for assessing treatment adherence, which perhaps explains why there are various ways to measure treatment adherence, how it is conceptualised, assessed and the associated psychometric issues (Lam & Fresco, 2015; Sajatovic et al., 2010). For these reasons, it has proven to be challenging to measure treatment adherence effectively.

Clinical Observations and Objective Measurements

Dropout is a clinical observation metric used to assess treatment adherence. However, in the literature described earlier, dropout was defined differently (e.g. did not complete the entire treatment episode, did not attend the post-evaluation session, and discontinued treatment

against the clinician's advice), which hinders the interpretability of how treatment adherence is understood (DeJong et al., 2012; Fassino et al., 2009; Leeuwerik et al., 2019). Another limitation is that clinical observations are not a standardised psychometric tool that can reliably assess and understand treatment adherence. The metric alone may not capture how the patient participates during a treatment course; ergo, it could be an 'all or nothing' instrument, as people can remain in the treatment but not adhere to their treatment plan, so it provides only limited information. It could also be an extreme response to treatment. Similar limitations also pertain to pill counting, pharmacy refill records, and therapy attendance. Although these metrics are simplistic and bear no cost, they do not necessarily reflect whether the participant is taking the prescribed medication or attends the entirety of each appointment (Lam & Fresco, 2015).

There are various objective treatment adherence measurements. This includes electronic monitoring devices that record sessions and biological assays, such as those measuring drug plasma levels. Whilst these metrics are diverse, they are arguably more time-consuming and costly than the abovementioned clinical observation measurements. Also, biological assays are not the most accurate measures, as various factors may influence the interpretation of this measure, for example, metabolic rate and drug-food interaction (Lam & Fresco, 2015; Sajatovic et al., 2010).

Self-report and clinician-rated measurements

In contrast, self-report and clinician-reported measurements possess psychometric properties, providing a subjective understanding of adherence from either the patient's or clinician's perspective. Whilst the clinician's perspective obtained through scales is a pertinent factor for predicting a treatment outcome, both perspectives offer a unique understanding that is pertinent to anticipate the treatment outcome (Leeuwerik et al., 2019; Uher et al., 2012).

Therapy Adherence

Various tools have been used to assess adherence. For example, the Patient EX/RP Adherence Scale (PEAS), a clinician-rated homework rating scale, which has been shown to predict the reduction of OCD symptoms, measures a dimension of CBT adherence (Simpson et al., 2011, 2021). Whilst this offers a meaningful understanding of a specific dimension of treatment adherence, homework completion alone does not reflect therapy adherence as it may not capture the patient's true therapeutic engagement and comprehension of treatment that may influence treatment adherence (Kazantzis et al., 2004). Another approach to assess therapy adherence would be to measure it broadly, which would offer a global understanding. A tool that offers this is the Therapy Adherence Rating Scale, which measures adherence with two components: comprehension/agreement to therapy instructions and compliance (Gumport et al., 2023). This brief 5-item scale was designed to assess adherence to evidence-based therapies, which can be clinician-administered or self-reported, has good psychometric properties and has predictive validity of clinical outcomes. Whilst the scale has been used to assess therapy adherence among emotional disorders, it has not been widely used in research, and there are no studies that have used this scale amongst patients with OCRDs and EDs (Dong et al., 2017, 2018).

Medication Adherence

There are several scales with established psychometric properties that are used to assess medication adherence; for example, Medication Adherence Rating Scale, Morisky Adherence Rating Scale, and Brief Medication Questionnaire (Kazantzis et al., 2004; Lam & Fresco, 2015; Thompson et al., 2000). A widely used scale that has psychometric properties is the Medication Adherence Rating Scale (Thompson et al., 2000), which has predictive validity for clinical outcomes among various mental health disorders, including OCD. Additionally, personality traits are also predictive of how patients report their level of medication adherence (Ansari et al., 2020; Marrero, et al., 2020). This 10-item self-report scale follows a dimensional approach, suggesting that adherence could be understood through attitudes to medication and general illness control (Thompson et al., 2000).

Summary

It is essential to carefully consider how to understand and assess treatment adherence, and this choice should be guided by research questions or to promote collaborative care. While there are various treatment adherence scales, there are no gold standard measurement tools, but scales that typically offer a dimensional understanding of treatment adherence. Despite this, studies usually stick to a single measurement tool for treatment adherence (Lam & Fresco, 2015). The selection of scales is a pragmatic decision. Researchers should ideally use multiple scales as they offer an enhanced understanding of treatment adherence, which should ideally include a patient and clinician perspective.

These considerations set the scene for how to measure treatment adherence, which appears to be linked to clinical outcomes (Leeuwerik et al., 2019; Simpson et al., 2011; Simpson et al., 2021). Since there appears to be no literature examining the link between cognitive inflexibility and treatment adherence among patients with OCRDs or EDs, the next subsection considers the link between cognitive inflexibility and clinical outcomes in these populations. Exploring these insights, in the next section, offers some suggestions and possible links between cognitive inflexibility and treatment adherence.

1.8 Cognitive inflexibility in OCRDs and EDs

It is widely recognised that cognitive inflexibility is a latent trait among OCRDs and EDs, which are categorised by compulsive behaviours, such as stereotypical, repetitive and unwanted behaviours (Clarke et al., 2024; Frota Lisboa Pereira de Souza et al., 2024; Grant & Chamberlain, 2023).

The National Mental Health Institute offers a Research Domain Criteria (RDoC) framework for scientists to focus on psychological and biological systems rather than traditional symptom-based diagnoses, to improve diagnosis, prevention, and treatment strategies. The framework recognises that latent traits can play a role in understanding mental health conditions. The

concept arose initially in the natural sciences and was later used in psychiatry to raise our understanding of the clinical features of mental health disorders and the underlying genotypes. Latent traits are thought to lie in-between phenotypes (clinical features) and genotypes & environmental drivers (Van Eijndhoven et al., 2022). The approach offers a simpler and direct understanding of how genes may influence the onset of a mental health condition (Gottesman & Gould, 2003). Latent traits like cognitive inflexibility are present across mental health disorders that are described as dimensional or on a spectrum (Bearden, Winkler, Karlsgodt, & Bilder, 2017; Van Eijndhoven et al., 2022). Whilst Simpson et al. (2021) suggested that there are genes (e.g. gene BDNF and rs6265) linked to clinical outcome among patients with OCD receiving CBT, a recent systematic review found that at least 23 genes may contribute to the onset of OCD (Chen et al., 2025). Therefore, it is imperative to measure cognitive inflexibility with valid tools, which offer hints over what genotypes are implicated in a psychopathology.

Measurement of cognitive inflexibility

Cognitive inflexibility can be measured through subjective and objective assessment tools. There are subjective tools that offer an insight into cognitive inflexibility from a patient or clinician perspective. For example, the Cambridge-Chicago Compulsivity Trait Scale (Chamberlain & Grant, 2018) is a validated tool that can offer an understanding of cognitive flexibility subjectively. The scale was validated with a large sample that can detect common features of impulsivity and compulsivity across various mental health conditions, including OCD and EDs. The scale considers these traits on a continuum, where elements of reward seeking can become more repetitive and move to more compulsive volitions/behaviours. Whilst this scale has convergent validity with objective measurements of cognitive inflexibility (Chamberlain & Grant, 2018; Tiego et al., 2023), it is widely recognised that people with OCRDs and EDs may possess meta-cognitive deficits, as shown in systematic reviews (Palmieri et al., 2021; Sun et al., 2017). This raises the possibility that those affected by these conditions may not be able to reliably offer this introspection.

Objective measurements for cognitive flexibility, which are thought to drive impulsivity and compulsivity traits, are a more reliable measurement as they are less susceptible to insight and state factors when compared to self-report questionnaires (Baddeley, 2000; Diamond, 2013; Weisholtz et al., 2017). For example, the most widely used task to assess cognitive inflexibility is the Wisconsin Sorting Card Test (WSCT), which is one of the most frequently used tools to assess this construct and produces 8 different measurements of executive function that include perseverative error, which is a valid measurement for cognitive inflexibility. The tool is thought to tap into various other executive functions that include working memory and inhibition, given the complexity of the task (Diamond, 2013; Miles et al., 2021). In contrast, the Intra-Dimensional & Extra-Dimensional Test offers a more specific assessment given the discrete nature of the task, which can systematically assess cognitive flexibility by producing measurements of reversal learning and attentional set-shifting (Diamond, 2013; Owen et al., 1991).

Brain-based correlates of cognitive inflexibility in OCRD and ED

Literature examining behavioural and neuroimaging data for OCD shows that the neurobiology is linked to dysfunctional processing within the cortical-subcortical neural network and frontostriatal circuits (Chamberlain et al., 2005; Vaghi et al., 2017). A review appraising neuroimaging studies concurs with these findings that the cortical-subcortical neural network contributes to OCD phenotypes. There are also various neural networks with increased activations, including the orbitofrontal cortex, cingulate cortex, thalamus, and head of the caudate nucleus (Parmar & Sarkar, 2016). These regions are thought to be linked to flexibility in thinking, evaluating reward, punishment sensitivity and emotional regulation (Chamberlain et al., 2005; Vaghi et al., 2017).

A systematic review examining neuroimaging studies showed that EDs are linked with alterations in reward processing and self-control neural circuitry. There is increased blood flow and volume in the anterior cingulate cortex, insula, and orbitofrontal cortex have and they are more active when expecting and receiving positive feedback from food (Leenaerts et al., 2022).

The striatum also has changes in connectivity and structure, which are linked to compulsive behaviours. Impulsivity issues attributed to EDs are thought to be linked to an attenuated neural connection between the frontal cortex and striatum (Leenaerts et al., 2022).

These neuronal deficits reported among these disorders also extend to first-degree relatives, where imaging studies showed similar deficits among patients with OCD or EDs and their first-degree relatives (Hou et al., 2014; Riesel et al., 2011). These similarities also persisted with task performance that measures cognitive flexibility (Chamberlain et al., 2007; Kanakam & Treasure, 2013; Rajender et al., 2011).

Impact of cognitive inflexibility of OCRDs and EDs on clinical outcomes

The latent trait, cognitive inflexibility, among these conditions is thought to be implicated with compulsivity traits. This trait is a personality trait commonly reported among OCRDs and EDs populations (Menzies et al., 2008), which could possibly influence treatment dropout. There appear to be no studies that have measured the relationship between cognitive inflexibility and therapeutic adherence in OCRDs and EDs populations, which have been shown to influence clinical outcomes among OCD populations (Leeuwerik et al., 2019). The literature below shows that cognitive inflexibility can be linked to the development and clinical outcomes of OCRDs and EDs.

Cognitive inflexibility contributes to the development of various major mental health disorders: OCD, body dysmorphic disorder, anorexia nervosa, binge eating disorder, bulimia nervosa, hoarding disorder, substance use disorder and gambling disorder (Fineberg et al., 2010; Frota Lisboa Pereira de Souza et al., 2024; Roberts et al., 2007). A review examining various studies used various objective cognitive tasks that found deficits in aspects of cognitive flexibility (i.e. set shifting and reversal learning), which influenced the clinical features of the aforementioned mental health conditions (Frota Lisboa Pereira de Souza et al., 2024). These studies reached these conclusions by comparing cognitive inflexibility with either clinical outcomes, neuroimaging data (Arlt et al., 2016; Friederich & Herzog, 2010; Huang & Foldi, 2022; Wildes et

al., 2014) or comparing people with different mental health conditions and/or the general population (Berner et al., 2023; Jefferies-Sewell et al., 2017; Morein-Zamir et al., 2014).

The reviewers (Frota Lisboa Pereira de Souza et al., 2024) also suggested that cognitive inflexibility can predict clinical outcomes for psychological interventions. They reported a study of 38 outpatients with OCD that showed fewer perseverative errors on the California Verbal Learning Task (i.e. better mental flexibility); predicted positive treatment outcomes following a 12-week course of CBT. Whereas for fluoxetine, the results suggested that in the presence of inflexibility of thinking, a better clinical response would be expected. These findings indicate that patients with different cognitive profiles may respond better to certain treatments. (D'Alcante et al., 2012).

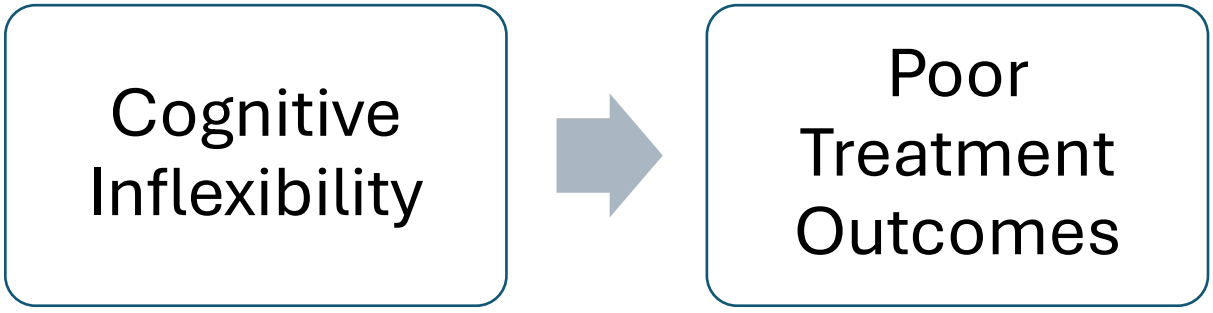

Figure 2: Link between Cognitive Inflexibility and Treatment Outcomes (Frota Lisboa Pereira de Souza et al., 2024). Note. This figure highlights how cognitive inflexibility appears to be a trait that influences poor treatment outcomes. For example, the cognitive resources of a patient may influence how well they respond to a course of treatment as measured by an outcome measure or through observing a particular clinical feature, i.e. the frequency of repetitive behaviour observed by the clinician/patient through the course of treatment.

Simpson et al. (2021) attest to this possible link, as outlined in Figure 3, by suggesting that OCD patients with severe traits of rigidity and inflexibility may influence poor outcomes for those receiving CBT. The researchers reached these conclusions based on their findings from a study where they offered a course of exposure response & prevention and SSRIs medication to 137

adults with OCD. They also found that OCPD traits posed as a barrier to symptom remission as indicated by the clinical outcome measure, Yale-Brown Obsessive Compulsive Scale score. These inflexibility in thinking traits may interfere with the person's learning obtained from the therapy, which is also linked to OCD symptomology and severity (Marincowitz et al., 2022). A similar argument could also be applied to medication, where the individual is asked to follow the recommended dosage, whilst learning to tolerate the various benefits and side effects that can arise from a course of medication. These postulations are consistent with earlier findings that suggest treatment-resistant patients with OCD who present with traits of rigidity and inflexibility are at a higher risk of relapse (Wetterneck et al., 2011).

A retrospective study examined various neuropsychological factors and if they could predict different OCD symptoms among 150 patients who were offered either medication or CBT. The study revealed that poorer alternation learning, as measured by the Object Alternation Test, was linked to compulsive checking behaviours but no other OCD symptoms. The study also found that other cognitive processes, like attention and visuospatial working memory, influenced the other symptoms (Kashyap et al., 2017). These findings support how flexibility in thinking is a pertinent factors that influences clinical outcomes.

Roberts et al., (2010) offer evidence that poor perseverative error (measured by WSCT) is also a factor that contributes to the longer duration of illness among a sample of 270 women with eating disorders. The study suggests that perseverative error is a transdiagnostic factor that influences a treatment outcome. They also found that baseline set shifting was predictive of more severe eating disorder rituals but did not influence BMI. The findings on BMI were replicated in another study. A sample of 83 people with an eating disorder was followed up for six months, who received some form of mental health treatment (Dougherty et al., 2024). The researchers found that perseverative error influenced purging over time, but was not predictive of BMI. In a grouping analysis, this cognitive deficit predictive finding dissipated in participants with bulimia nervosa but persisted in other eating disorders. Whilst the researchers concluded this could be a differential effect amongst different eating disorders, the study also found, as a

primary outcome, that there were no perseverative error differences between these conditions. Tchanturia et al., (2004) findings support these conclusions and show that cognitive flexibility is a pertinent factor when considering clinical outcomes. They found that set shifting was predictive of weight recovery when looking at follow-up data among 18 inpatients who recovered from anorexia nervosa and achieved weight recovery. The study also found that set shifting was linked to predisposing factors, such as childhood perfectionism, which could be a trait influenced by flexibility in thinking.

Another study looked at how a course of Cognitive Remediation Therapy influenced cognitive flexibility and quality of life in a sample of 82 patients with severe and enduring eating disorders. Interestingly, the study found through moderation analysis that patients with poor baseline set shifting benefited more from cognitive remediation therapy, as indicated by their quality of life, than those patients with no baseline cognitive deficits. In comparison, 'treatment as usual' did not replicate these findings (Dingemans et al., 2014). Although cognitive remediation therapy is thought to directly target cognitive flexibility, which is not considered in other psychological therapies that aim to reduce psychological distress, it highlights how cognitive flexibility appears to be a pertinent factor that may very well influence therapeutic adherence.

Summary

The research above aligns with the RDoC framework, which encourages researchers to focus on psychological and biological markers, such as cognitive inflexibility. It is a dimensional approach, where psychopathology is considered trans-diagnostically and makes it a dynamic process, as it allows researchers to consider shared latent traits that may contribute to the onset of various mental health disorders. These studies emphasise the shared link between cognitive inflexibility and clinical features (phenotypes) among these disorders, as well as treatment outcomes for medication and/or psychological therapy. Since cognitive inflexibility may influence the outcome of treatment, it is possible, it may also implicate treatment adherence, given that good treatment adherence has been linked to improved clinical

outcomes among patients with OCRDs (Leeuwerik et al., 2019; Simpson et al., 2011; Simpson et al., 2021) as discussed earlier in sections 1.5 and 1.6. However, there appear to be no published studies exploring the possible link between cognitive inflexibility and treatment adherence, despite the fact that adhering to treatment appears to be a key ingredient for change in psychological interventions, like cognitive behavioural therapy (Blackburn et al., 2001). Owing to there being no studies exploring this possible link, the next section describes how treatment adherence is conceptualised with psychological theory and how cognitive inflexibility may influence adherence.

1.9 Theoretical understanding of treatment adherence

There are various models that offer an understanding of behaviour change, which can assist in understanding treatment adherence. For example, the Transtheoretical Model (Armitage, 2009), the Health Belief Model (Janz & Becker, 1984) and the Self Determination Theory (Ryan & Deci, 2023). However, these models lack a conceptual framework that offers an explicit understanding of treatment adherence among people with mental health disorders. To address these conceptual gaps, Laranjeira et al. (2023) carried out a conceptual systematic review that synthesised 53 papers to develop a framework for understanding treatment adherence. The reviewers used an ecological approach (Crawford, 2020) to conceptualise the various layers of treatment adherence. There are various factors that influence a patient's treatment adherence. This includes their behaviour, social support, clinician's influence (microsystem level), healthcare system (meso/exosystem level) and cultural & social values (macrosystem level), which have been summarised in the figure below.

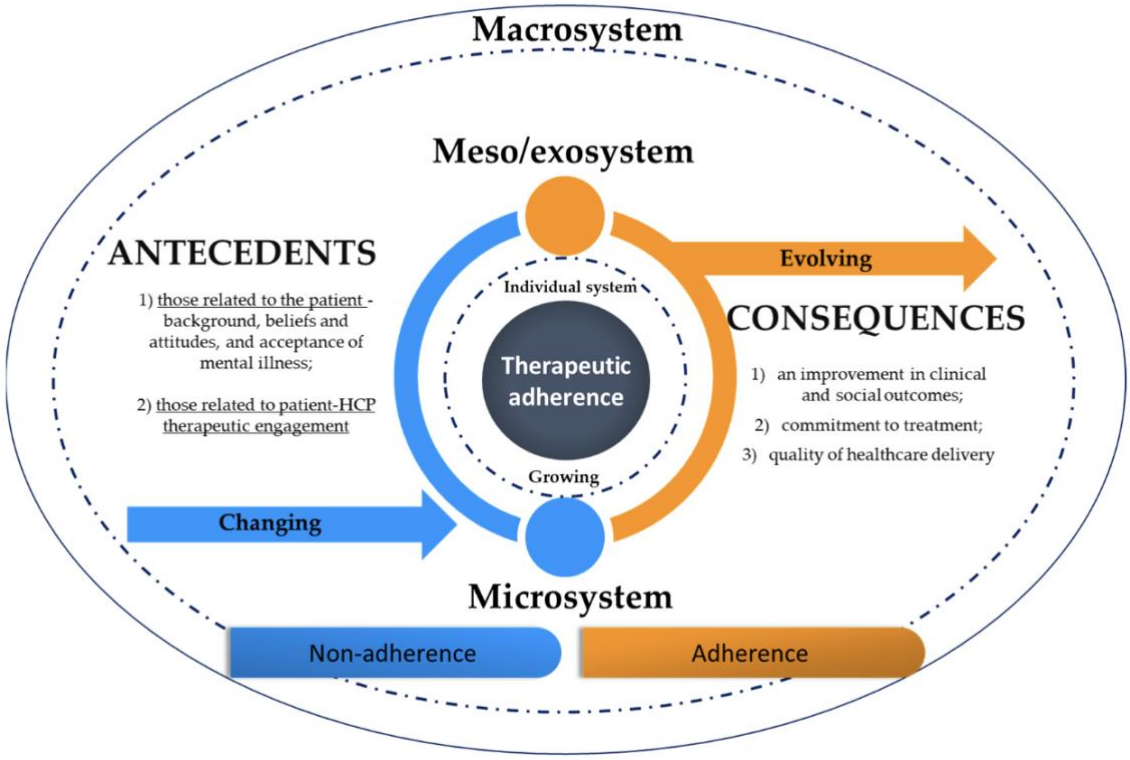

Figure 3: Representation of Therapeutic Adherence Framework (Laranjeira et al., 2023).

Note. The following figure offers a pictorial understanding of treatment adherence, which views it as a dynamic, multidimensional process involving client behaviour, healthcare systems, and socio-cultural factors, focused on maintaining a sustained commitment to treatment plans.

The model defines therapeutic adherence as a recovery-oriented skill to cope with and complete treatment. Achieving therapeutic adherence enables the patient to preserve or foster an improvement in their mental health, which is made possible by self-autonomy, insight, health and psychological wellbeing. These capabilities could be influenced by personal and interpersonal factors.

Antecedents are factors associated with patients, i.e. acceptance of mental illness attitudes, beliefs, personal circumstances and factors relating to therapeutic alliance. These factors influence patients' therapeutic adherence, which is understood as a recovery-oriented skill to cope and comply with a treatment plan. Another antecedent is the therapeutic relationship

between the clinician and patient. The framework also recognises how therapeutic adherence is a dynamic experience that transitions from poor to good adherence. There could also be a rebound effect during this transition, where the client may go against the guidance from the clinician because of how it is presented. A rebound effect may arise when the patient feels threatened or their worldview is challenged by the clinician's approach in delivering a treatment plan. A rebound effect could be addressed through readiness to change, quality of therapeutic alliance, collective decision-making, community support, and quality of healthcare delivery. This dynamic experience allows opportunities for growth and acceptance of a diagnosis. The model suggests there are three consequences for therapeutic adherence: an improvement in outcome measures, fidelity to treatment, and a high standard of care (Laranjeira et al., 2023).

Laranjeira et al.'s (2023) created a framework that offers an understanding of therapeutic adherence for people with mental health disorders receiving treatment. Whilst the framework offers an understanding of therapeutic adherence, there are limitations in its clinical application. The model does not consider how OCRDs and EDs shared cognitive inflexibility traits may influence therapeutic adherence. These traits may interact with how beliefs and attitudes are shaped, which are considered antecedent factors. Further consideration of these traits would have enabled the framework to consider how these shared traits of cognitive inflexibility may influence rigid and repetitive behaviours, resulting in non-adherence and a rebound effect. This omission highlights how the framework does not consider the challenges of patients with severe and enduring mental illnesses (e.g. OCRDS and EDs) adhering to an evidence-based intervention. Although this theoretical framework offers an understanding of treatment adherence, it does not consider the influence of cognitive inflexibility on therapeutic adherence, given the dearth of research.

1.10 Conclusion

In conclusion, this chapter has shown that poor therapeutic adherence, as measured by clinical observation and dropout, is a significant challenge for clinicians and those affected by OCRDs

and EDs. These challenges extend to a wide range of therapeutic interventions that include medication and psychological therapies.

There are challenges in how therapeutic adherence is conceptualised differently by disciplines, which impact how it is understood and measured. Nonetheless, there is some indication of how measuring certain dimensions of therapeutic adherence, i.e. homework compliance, could be a pertinent factor when considering clinical outcomes among those affected by OCRDs and EDs.

Suboptimal therapeutic adherence is an ongoing challenge that is commonly reported among evidence-based interventions offered to individuals affected by OCRDs and EDs. This chapter highlights how there are shared latent traits among OCRDs and EDs, such as cognitive inflexibility. This could be a driving factor for traits of compulsivity and impulsivity, which influence the clinical features of these disorders. Moreover, the chapter presents neuroimaging and objective cognitive evidence that shows flexibility in thinking is a latent trait that influences clinical outcomes in those affected by these disorders. It also shows that good treatment adherence appears to influence positive clinical outcomes, which could also be linked to cognitive resources, like cognitive flexibility.

However, there are no studies that consider how cognitive flexibility can influence therapeutic adherence among people with EDs and OCRDs despite it being known that cognitive inflexibility is highly saturated among these disorders and has a negative impact on the individual and wider society. Since suboptimal treatment adherence results in poor treatment outcomes, understanding how flexibility in thinking may impinge upon a person's ability to participate in treatment is paramount. It has clinical implications that would inform treatment adaptations, improve treatment outcomes and reduce dropout rates among people receiving treatment for their mental health. Establishing the link between cognitive flexibility and treatment adherence would offer evidence that could update the therapeutic adherence framework, making it clinically relevant for mental health disorders with cognitive flexibility deficits (Laranjeira et al., 2023).

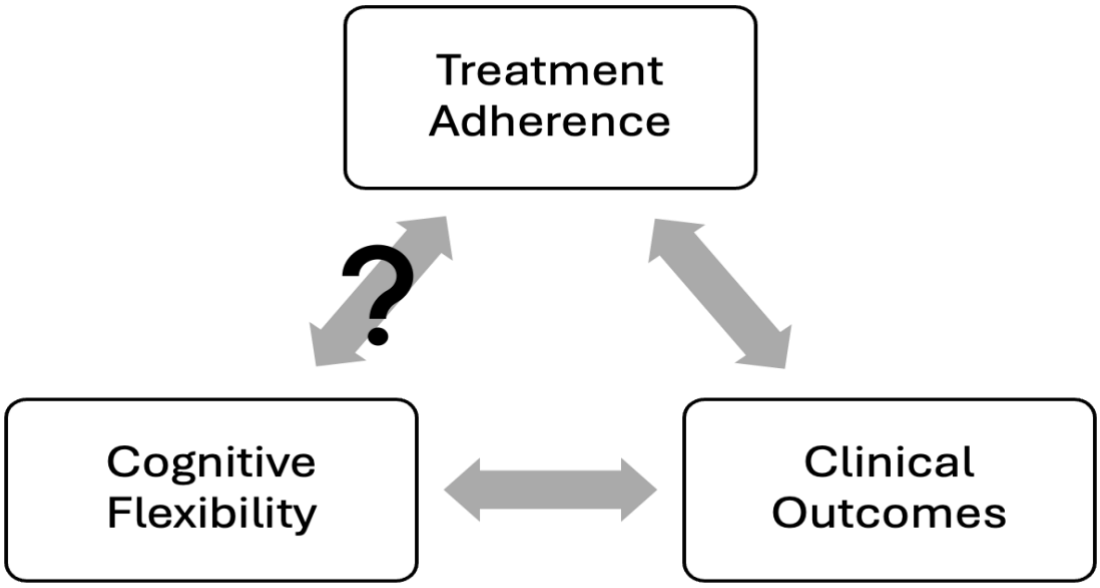

Figure 4: Links between Cognitive flexibility, Therapeutic Adherence & Treatment Outcomes

Note. This figure illustrates the possible link between these various variables, which have been considered in this thesis. As described in this chapter, there is research that demonstrates the link between cognitive flexibility and clinical outcome amongst OCRDs and EDs (Frota Lisboa Pereira de Souza et al., 2024). Moreover, there appears to be some evidence that identifies how optimal treatment adherence to psychological therapies may result in good treatment outcomes (Leeuwerik et al., 2019; Simpson et al., 2011 & 2021). However, there appears to be no published work that has explored the link between cognitive flexibility and treatment adherence among patients with OCRDs or EDs other than Simpson et al., (2021), which hints at this possible link.

In order to advance the field, it would be helpful to understand how cognitive inflexibility affects treatment adherence among those with mental health disorders other than obsessive compulsive related disorder and eating disorders, which both share traits of cognitive inflexibility. Therefore, in the next chapter, a systematic literature review is performed to establish an understanding of how the construct of cognitive flexibility, as measured by

objective tasks, influences treatment adherence to mental health treatments amongst patients with mental health disorders.

Chapter II: Systematic Literature Review

A systematic literature review (SLR) was carried out to understand how cognitive flexibility, as measured by objective tasks, influences treatment adherence for mental health interventions amongst people with mental health disorders, which is prominently reported amongst people with ED and OCRD as described in the previous chapter. The scope of this SLR was broadened to include all mental health disorders, as the number of relevant studies was expected to be few. It has been reported using the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) reporting guidelines (Page et al., 2021) and followed a Synthesis Without Meta-Analysis (SWiM) to analyse the included studies (Campbell et al., 2020). This SLR was preregistered on PROSPERO: CRD42024604253.

2.1 Objectives

The following SLR question was devised: Is there a relationship between cognitive inflexibility and treatment adherence among individuals with mental health disorders? This review question was addressed by following PRISMA and Cochrane guidance, which informed how relevant studies were identified, selected, appraised and synthesised (Higgins & Green, 2008; Page et al., 2021).

Methods

2.2 Inclusion Criteria

The following criteria were used to include or exclude studies in this SLR.

Table 2: PICO (Population, Intervention, Comparison and Outcome)

Population	Adults (≥18 years of age) who had been given a mental health diagnosis at any point in their lifetime
Intervention	Any psychological therapy for mental health diagnosis Any medication for mental health diagnosis
Comparator	Placebo Control Any intervention
Outcomes	Cognitive flexibility Treatment adherence
Other inclusion criteria	Study publication date: 1st January 1950 and 30th November 2024 Study design: Systematic Reviews, Randomised Controlled Trials (RCTs), Cohort Studies, Case-Control Studies, Cross-Sectional Studies, and Case Studies Language: Studies published in English
Exclusion criteria	People under 18 years of age People with a primary diagnosis of a physical health and neurological conditions Qualitative study design

2.3 Information Sources

To ensure a comprehensive literature search, the following search engines were used to identify relevant peer-reviewed articles: Science Direct, PubMed, ProQuest, CINAHL, Cochrane

Library, ProQuest, PsychInfo and Medline. These databases were accessed between 22/10/2024 to 30/11/2024. Once the search strategy and selection process were completed, a reverse snowballing approach was used to identify further relevant studies from included manuscripts (Sayers, 2007).

2.4 Search Strategy

The following search strategy was devised and administered by a trainee psychologist, who conferred with their secondary supervisor, and it was agreed upon. The search strategy was informed by their clinical experiences and an initial literature search.

When searching for the key terms, Cognitive Flexibility and Treatment Adherence the following terms and Boolean Operators were used: "cognitive flexibility" or "cognitive inflexibility" or "flexible thinking" or "inflexible thinking" or "set-shifting" or "fluid intelligence" or "mental agility" or "problem-solving inflexibility" or "problem-solving flexibility" or "mental inflexibility" or "mental flexibility" or "perseveration" or "rigidity" or "cognitive distortion") and ("adherence" or "compliance" or "treatment adherence" or "treatment compliance" or "medication adherence" or "medication compliance" or "therapy adherence" or "therapy compliance" or "treatment loyalty" or "protocol adherence" or "regimen adherence" or "care adherence" or "follow-through" or "treatment conformity" or "concordance" or "homework completion" or "treatment refusal" or "therapy refusal" or "medication refusal" or "dropout" or "discontinuation".

2.5 Selection Process

Citations found from the search strategy were imported into Covidence (Babineau, 2014). This online reference management software excluded any duplicate citations, and then these papers were independently screened by two reviewers: a trainee psychologist and a PhD psychology student. Both reviewers screened for key or associated terms in the titles and abstracts, indicating that the papers met the eligibility criteria. These papers were then fully examined by both reviewers. A moderate and substantial agreement was achieved among the

reviewers at the title & abstract screening (κ= 0.54) and full-text review stage (κ= 0.72). Any disagreements over the inclusion/exclusion of papers at each stage were carefully discussed, and a decision was made, which both reviewers agreed with.

2.6 Data Collection Process

The trainee psychologist extracted data from the included studies using a template (See Appendix I). The following process was used to inform the data extraction process so that this SLR could comment on how these studies reached their conclusions.

- *Author, Year & Country*: The year of publication, the name of the author and the country where the study was conducted.
- *Research Design*: Specify the design and whether the study analysed a secondary dataset.
- *Research Question*: Did the study specify a question focusing on cognitive flexibility and treatment adherence, how was it conceptualised and was it listed as a primary or a subsequent research question?
- *Participant information*: Details of the number of recruited participants, type of mental health disorders, demography (e.g. average age, number of females) and where the participants were recruited (inpatient or outpatient).
- *Intervention*: Details of the intervention. For instance, the name(s) of the prescribed medication/psychological therapy and the number/duration of the doses/sessions.
- *Treatment adherence and cognitive flexibility measure*: Specified how these variables were measured in the study. These variables were defined as outlined below:
    - Cognitive flexibility was understood as the ability to adapt one's thinking, switch between rules/tasks and consider multiple concepts simultaneously. This would be assessed through a tool that can measure this concept either narrowly or broadly. The following objective tools were considered as appropriate measures for cognitive flexibility: the Wisconsin Sorting Card Test (Miles et al., 2021), Trail Making Test (TMT) A-B (Zakzanis et al., 2005), Intra-Dimensional & Extra-Dimensional task (Owen et al., 1991), and Stroop Colour-Word Test (Periáñez et al., 2021).

- Treatment adherence was understood broadly because of the lack of consensus on how to measure it. For this reason, treatment adherence was defined as the extent to which an individual could understand and follow the instructions and/or recommendations given to them as part of their treatment. Treatment adherence pertained to any treatment given to participants with a mental health disorder who received some form of psychiatric medication and/or psychological therapy. The decision to have a broad definition was informed by reviews, which showed how there is a dearth of robust adherence measurement tools and how there is no perfect measure, irrespective of the tool being administered by patient or clinician (Anghel et al., 2019; Lam & Fresco, 2015; Schoenwald & Garland, 2013).

- *Statistical Analysis and Results*: A summary of the included studies' inferential statistics and interpretation of the results was extracted.

Some of the included studies did not analyse the relationship between cognitive flexibility and treatment adherence as their primary outcome(s). Therefore, papers were searched to find the relevant analyses, which were sometimes located in the supplementary material, secondary analysis or a preliminary analysis. These citations were examined to further understand their methodology, and any relevant information was gathered. Any missing information was specified in the data collection tool. Unclear information and queries over methodologies were conferred with a post-doctoral PhD candidate or supervisor, and the decision was made.

2.7 Risk and Quality Appraisal

It was anticipated that the relationship between cognitive flexibility and treatment adherence was under-researched. For this reason, to maximise the number of included studies, a broad search strategy was used, which raised the possibility of including studies with diverse research designs. There is a consensus that including multi-methods research in systematic reviews can address complex health service research questions (Harrison et al., 2021).

A widely used tool in previous reviews is the Quality Assessment Tool for Studies with Diverse Designs (QuADS). This 13-item tool was used to appraise the quality and risk of studies that used different methodologies (See Appendix II). It asks the rater to assess the quality of the study by using a scoring system (0-3) and produces a score ranging from 0-39, which was converted into a percentage score. This tool has face and content validity, and the trainee psychologist used it to evaluate the included studies (Harrison et al., 2021).

The PhD student reviewed 8 out of 13 (61.54%) of the included studies. The reviewers discussed any score discrepancies with these papers, which assisted the trainee psychologist, who rated all the 13 included papers. Due to time constraints, the PhD student couldn't quality appraise the remaining five papers (See Appendix I), which have not been reported in this SLR.

2.8 Data Synthesis Without a Meta-Analysis (SWiM) Methodology

A SWiM methodology was carried out as the search strategy yielded diversity in the included studies, making it not possible to traditionally meta-analyse the extracted data (Campbell et al., 2020). The included study that used diverse study designs recruiting patients with different mental health conditions, offered different interventions to these recruited patients and selected different measures to assess treatment adherence. There was also variability in how results were interpreted and reported. These studies often omitted pertinent descriptive and inferential statistics, particularly when statistically nonsignificant results were reported between the outcome variables.

These methods were guided by the Cochrane Handbook (McKenzie & Brennan, 2022) and were used to evaluate the link between cognitive inflexibility and treatment adherence among people with different mental health conditions who received some form of mental health treatment. The trainee psychologist also conferred with their supervisors, a technical analyst from the NICE and a Post-Doctoral PhD Student to ensure the SWiM method was appropriate for answering the SLR question and was validly constructed and administered.

Narrative Synthesis: After carrying out the search strategy and screening of papers, studies were grouped by condition and symptomology. The grouping of studies was agreed upon by the trainee psychologist and secondary supervisor and aligned with the SWiM approach (Higgins & Green, 2008). The decision to group with this approach was guided by the commonalities observed in the included studies. Synthesising studies by specific conditions and symptomology enabled the SLR to offer clinical insights that show commonalities and differences between and within these groups (Campbell et al., 2020). These studies were reported in tables, which were organised in descending order by QuADS score.

Studies were grouped by the participants' primary condition and symptomatology into two overarching categories:

1) Patients with Disorders of Impulse Control and Compulsivity
2) Patients with Schizophrenia

The decision to group studies that investigated diverse disorders of impulse control and compulsivity symptomology[6] was informed by literature suggesting these disorders possess similar impulsivity and compulsivity traits that are thought to be influenced by laten traits, like cognitive inflexibility (Grant & Chamberlain, 2023; Menzies et al., 2008). Cognitive inflexibility is a transdiagnostic trait marker that may contribute to the development of compulsive behaviours (such as stereotypical, repetitive and unwanted behaviours) and the development of various major mental health disorders: OCD, body dysmorphic disorder, anorexia nervosa, binge eating disorder, bulimia nervosa, hoarding disorder, substance use disorder and gambling disorder (Fineberg et al., 2010; Frota Lisboa Pereira de Souza et al., 2024; Roberts et al., 2007).

Whilst this understanding does not include personality disorders, the most recent Diagnostic and Statistical Manual of Mental Disorders sees perfectionism (American Psychiatric

[6] This included patients with substance misuse, gambling disorder and personality disorder with forensic history.

Association, 2013) as a lower-order component of compulsivity, which is also a dimension of personality disorders (Ayearst et al., 2012). Perfectionism traits are also commonly linked to Obsessive-Compulsive Personality Disorder, which is thought to be on a continuum and can also co-occur with OCD (Ayearst et al., 2012; Fineberg et al., 2007).

A vote-counting procedure was conducted, based on the direction of effect shown between cognitive inflexibility and treatment adherence in each of the included studies. To understand the directional effect of all the included inferential results, a standardised score was converted to another standardised score that captured the directional effect, i.e. converting a t-score to a z-score[7]. The statistical significance of results was not considered in the vote-counting procedure (McKenzie & Brennan, 2022). The included studies' results and conclusions were then classified into 4 categories:

I. **Negative effect-shown classification** grouped studies that offered evidence suggesting that cognitive inflexibility has a detrimental effect on treatment adherence. For example, a negative statistic score was found, with, for example, a beta coefficient (e.g. $\beta = -0.5$). There were no arbitrary threshold statistical scores used to ascertain the direction of effect in a statistical test score, except for statistical scores showing a near-zero link.
II. **Positive effect-shown classification** followed the same assumptions as the former classification, but assumed that cognitive inflexibility had a positive effect on treatment adherence as indicated by a positive statistic score.
III. **Mixed effect-shown classification** grouped studies providing results that used different outcome measures that offered contradictory results. For example, a study used two different measures of cognitive flexibility and produced results with a differential effect on treatment adherence.

[7] A z-score was obtained using the following formulae; z= (T-score - 50) / 10, Z = (1.14 – 50)/10

IV. **No effect-shown classification** grouped studies that offered results showing no effect or a negligible effect between cognitive inflexibility and treatment adherence. A negligible effect is a statistical score showing a near-zero link.

The results from the vote-counting procedure were plotted onto a bar plot on Microsoft Excel.

Combining p-values is a statistical method used to combine the independent test p-values from multiple tests or studies into a single p-value that can be used to test a null hypothesis. Fisher's method for combining p-values was used as per guidance from the Cochrane Handbook for Systematic Reviews, which is typically carried out when it is not possible to carry out a meta-analysis (McKenzie & Brennan, 2022). Fisher's method for combining p-values (see the figure below) was calculated in Microsoft Excel (McKenzie & Brennan, 2022). Three tests were computed to assess for statistical significance for all 13 included studies, category one studies (Disorders of Impulse Control and Compulsivity), and category two studies (Patients with Schizophrenia).

$$X^2 = -2\sum_{i=1}^{k} \ln(P_i).$$

Figure 5: Fisher Method for Combining P Values

Fisher's method is recommended for data synthesis when studies report results using various types of statistical tests and outcome variables (Loughin, 2004; McKenzie & Brennan, 2022). This was the case in the included studies where different statistical tests (e.g. types of regression models, correlational analyses and t-tests) were used to analyse the outcome variables assessing the link between cognitive inflexibility and treatment adherence.

Results

2.9 Study Selection

The search strategy identified a total of 2,198 studies. 736 duplicates were removed, and after examining titles & abstracts, 1,415 papers were excluded. Of the 47 studies subject to full-text review, 34 studies did not meet the eligibility criteria. For further details, please see the PRISMA flowchart (see Figure 6). 13 studies were included that used a cognitive task assessing cognitive flexibility and a variable that assessed treatment adherence.

Six studies were not included in the data synthesis following further discussions between the reviewers. An experimental study was removed as the inferences were drawn from a highly adhered to intervention that improved cognitive flexibility, which was not observed in the control group (Lock et al., 2013). Another study was excluded because it was not clear how the medication use variable was defined, which predicted verbal cognitive flexibility (Jalal et al., 2018). Two studies were excluded as they used various executive function tasks, including measures from WSCT-64 Card Version and then combined them as a composite score, making it not possible to draw inferences (Aharonovich et al., 2003; Robinson et al., 2002). Two studies were also considered for inclusion but were excluded as they recruited a physical health sample (Crocker et al., 2018) and also did not report results relating to the outcome variables of interest in their results (Diaz Baquero et al., 2022).

Several papers measuring cognitive flexibility subjectively were identified during the selection process (e.g. Capel et al., 2024; Macri & Rogge, 2024; Ong et al., 2022), which prompted consideration of the clinical relevance of broadening the SLR question. The reviewers decided not to deviate from the original research question as it would detract from the primary focus of this thesis.

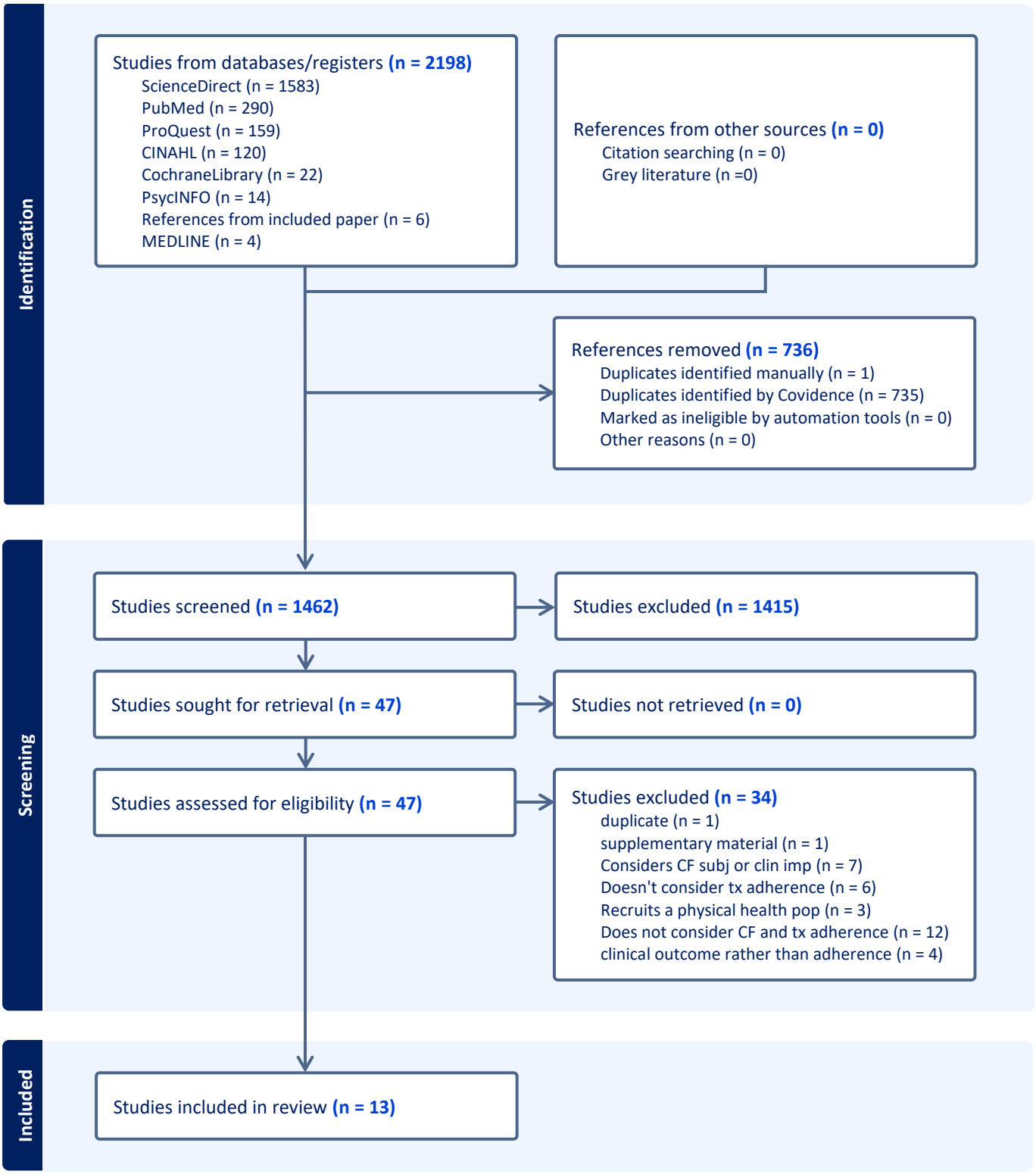

Figure 6: PRISMA Flow Chart

2.10 Description of Study Characteristics

13 studies were included in this review, which recruited 2,448 participants (703 females and 1,745 males, average age 38.15 & Standard Deviation 9.71). 9 out of 13 studies recruited outpatients (n=1,199), three studies recruited inpatients (n=387), and one study did not specify the type of recruited patient (n=862). The studies were carried out in different countries, including the United States of America (n=4), Spain (n=3), Germany (n=3), Hong Kong (n=2) and Egypt (n=1). These studies were grouped into two categories: disorders of impulse control and compulsivity (n= 1,108) and patients with schizophrenia (n= 1,340). A further description of the included studies is summarised in a table (See Appendix III).

The most frequently reported adherence measurement was dropout, which was defined in various ways. This included missed two or more consecutive weeks, terminated treatment before completing the number of offered sessions, the whole treatment episode was not completed, missed three or more sessions without notifying the clinician, did not complete the entire intervention, no follow-up data were obtained after 30 days, and no definition was provided.

A variety of study designs were used, including longitudinal study (n=4), cohort study (n=3), cross-sectional study (n=3) and RCT (n=3). Three studies reported a secondary analysis.

Category Two: Patients with disorders of impulse control and compulsivity (n=8)

Six studies assessed adherence to psychological therapy, one study assessed medication adherence, and one study assessed adherence to medication and therapy. There was considerable variation in how treatment adherence was assessed and measured through clinical observations. This included whether the patient attended postbaseline appointments, the mean percentage of pills taken, and the percentage of empty pill bottles returned. Dropout was also another clinical observation used to assess treatment adherence, but there was considerable variability in how it was defined, which included not completing the entire intervention, missing two or more consecutive weeks, declining treatment before completing a

treatment episode, no follow-up data were obtained after 30 days and missed ≥ three sessions without notifying their clinician. One study classified a dropout as 'non-completer of therapy' but did not specify how this was calculated.

The included studies typically used different cognitive measures to assess cognitive flexibility and its influence on treatment adherence. The tasks included: WSCT-128 card version (n=3), TMT Part B-A form (n=3), Stroop Interference test (n=4), and a composite score using various scales measuring cognitive flexibility (n=2; I. WSCT- 128 card version number of correct responses & Emotion Decoding Task and II. VDS backwards, TMT B & TMT difference score).

Category 2: Patients with schizophrenia (n=5)

These studies assessed treatment adherence to medication either with a clinical interview (n=1), clinician rated questionnaire (n=1, Brief Adherence Rating Scale (BAR; Byerly et al., 2008) or participant-administered questionnaire (n=2, BARS and Rating of Medication Influences Scale) or a composite score obtained by various measures [n=1; BARS, Global Clinical Impression Scale (Kadouri et al., 2007), medication possession ratio based on pharmacy refill records in the past 12 months and pill counting at home by clinician].

4 studies used different versions of the WSCT (n=2 WSCT-64 card version, and n=2 WSCT-128 card version), and one study used a composite score to assess cognitive flexibility (Backwards Verbal Digit Span, TMT B & TMT B-TMT A). These studies used these cognitive tasks to assess how cognitive flexibility influenced treatment adherence

2.11 Quality and Risk of Bias in Studies

The included studies were evaluated using a QuADS checklist that can evaluate the quality and level of bias of multi-method health research. This tool showed that overall, the evidence was acceptable at best quality. The average score (avg. 23.56, 60.42%, Std. 3.05, Range 20-31, see Appendix IV) of the included papers just fell below the cut-off score (26), which indicated that sufficient information was provided about the study. Therefore, this suggests most included

studies would have benefited from further detail in their published manuscripts to enhance the level of quality and address possible bias issues (Harrison et al., 2021).

Only three studies scored more than 26 on the QuADS checklist (Aharonovich et al., 2006; Álvarez-Moya et al., 2011; Romero-Martínez et al., 2021), which were included in Category One: patients with disorders of impulse control and compulsivity (average 25.13, Std. 3.48 & range 22.21-28.04). Category 2: patients with schizophrenia were lower in QuADS score than Category One (average 22.00, Std. 0.71 & range 21.12-22.88).

Most studies provided a clear conceptual understanding of the literature that informed a research question, aims and study design. However, the rationales provided for participant recruitment and choosing a data collection method would have benefited from further detail on how the studies administered the cognitive tasks and other scales. Most manuscripts simply reported the number of participants that took part in the study and omitted details of how many patients were invited to take part and where and when they took part in the study. Moreover, the included studies did not explicitly consider how appropriate the sampling was for addressing the research question. Most studies provided a brief outline of the data collection procedure, but often did not disclose details, which impinges on the possibility of study replication. Whilst the included studies provided sufficient detail on how their statistical plans, which seemed appropriate to answer their research questions, further detail would have offered further transparency. Moreover, only two studies provided sufficient detail in their recruitment process, whereas most of these studies simply reported the number of participants who took part.

Another notable weakness in most studies was their insufficient detail in how they chose their selected analytical method, how the analyses were run and a critique of the approach. Moreover, no study provided any explicit consideration of how stakeholders' input was considered when developing their research design.

2.12 Results of Individual Studies

The inferential statistics for the 13 included studies are organised by classification and descending QuADs score and are reported below (See Appendix V).

Category One: Disorders of Impulse Control and Compulsivity (n=8)

Romero-Martínez et al., (2021) carried out a logistic regression that found a composite score (correct responses from the WSCT-128 card version and emotion decoding) was a statistically significantly explanatory variable that predicted dropout from court-mandated CBT (*Wald 10.51, p ≤0.001, Odds Ratio (OR) 0.45, 95% CI 0.28-0.72)* among a sample of 424 patients with a personality disorder and forensic history. A preliminary analysis revealed that dropout was statistically significantly correlated with total error (r = 0.18, $p \leq 0.001$) and Perseverative Error (r = 0.13, $p = \leq 0.05$). Additionally, the preliminary analysis also found that the intervention dose statistically significantly correlated with total error from the above-mentioned task (r= -0.18, $p \leq 0.001$) and Perseverative Error (r= -0.20, $p \leq 0.01$).

Aharonovich et al., (2006) also ran a logistic regression and linear regression that found no statistically significant variables that predicted therapy dropout (Perseverative Error: OR = 0.98, p 0.213, 95% CI 0.96-1.01 Perseverative Response: OR= 0.99, p 0.348, 95% CI 0.96-1.01) and how long a patient with substance use disorder stayed in CBT (Perseverative Error: β= 0.11, p 0.390 Perseverative Response: β= 0.00 p 0.980).

Álvarez-Moya et al., (2011) carried out a logistic regression and linear regression that revealed statistically insignificant explanatory variables (Set Shifting: β= 0.03, p 0.560, OR = 1.03, 95% CI 0.93 - 1.15. Perseverative Error: Wald= –0.453, p 0.190, OR = 0.64, 95% CI 0.33 - 1.25) that did not predict therapy dropout among a sample of 88 gambling disorder patients.

Teichner et al., (2002) ran a *t*-test and found a statistically nonsignificant group difference (t 1.14, p 0.055, z -4.89) in dropout rates in a sample of 94 substance disorder patients who

received an intensive therapy program. Patients were grouped based on set-shifting performance and were classified either as cognitively intact or cognitively impaired.

Fagan et al., (2015) ran a Poisson regression that revealed that inhibition was a statistically significantly explanatory variable that predicted treatment adherence (Attendance: β= 0.04, OR= 0.04, $p \leq 0.039$, Percentage of Pills taken: β= 0.01, OR= 1.01, $p \leq 0.020$ and Percentage of Pill bottles returned: β=0.02, OR= 1.02, $p \leq 0.049$) to Lamotrigine or placebo among a sample of 120 substance use disorder outpatients.

Mallorquí-Bagué et al., (2018) ran a Cox regression and logistic regression that found Perseverative Error was a statistically significant explanatory variable that predicted CBT dropout (β= 0.04, $p \leq 0.046$, OR= 1.05) and low therapy compliance (β= 0.11, $p \leq 0.050$, OR= 0.06). Also, Response Error was a statistically significant explanatory variable that predicted low compliance to CBT (β= -0.09, $p \leq 0.021$, OR= 0.04).

Kamp et al., (2019) ran a logistic regression that found inhibition was a statistically nonsignificant explanatory variable (p = 0.28) that did not predict dropout from psychoeducation among a sample of 108 substance use disorder inpatients.

Streeter et al., (2008) conducted a logistic regression, which found that performance on the Stroop task was a statistically significant explanatory variable (x^2 (3) = 12.6, $p \leq 0.006$) that predicted treatment completion among a sample of 74 substance use disorder outpatients who received CBT, augmented with a psychiatric medication (Venlafaxine/Trimipramine/Reserpine/Tiagabine) or placebo.

Category 2: People with Schizophrenia (n=5)

Lui et al., (2021) carried out a Spearman correlation that investigated the association between perseverative error and treatment adherence using a composite score (1. Brief Adherence Rating; 2. Global Clinical Impression scale; 3. Medication possession ratio based on pharmacy

refill records in the past 12 months; (4) Pill counting at home by a clinician) among a sample of 90 Schizophrenic outpatients receiving psychotic medication. The study found a statistically nonsignificant correlation between these variables (*r* (2,88) = 0.146, p 0.170).

Lam et al., (2013) ran a hierarchical regression that found perseverative error measured by the WSCT-128 card version, was a statistically significant explanatory variable that predicted treatment adherence as measured by a baseline Medication Management Ability Assessment. (β = -0.20, t -2.50, p ≤ 0.02). Whereas category score performance from the same scale was not a statistically significant explanatory variable (β = 0.08, t 0.88, p 0.38). These results were found among a sample of 82 inpatients with schizophrenia who received a course of atypical antipsychotic medication.

Vauth et al., (2004) ran a stepwise forward regression and found that perseverative error, as measured by the WSCT-128 card version was statistically significantly explanatory variable (β = 0.14, p ≤ 0.04) that predicted the influence of others on the treatment compliance among 197 inpatients with schizophrenia receiving a course of typical or atypical antipsychotic medication.

El-Missiry et al., (2015) conducted a logistic regression that found various measurements of WSCT-128 Card Version had different predictive effects on treatment adherence (Brief Adherence Rating Scale) among a sample of 109 outpatients with Schizophrenia who received a course of atypical and/or typical antipsychotic medication. The percentage of total errors was the only statistically significant explanatory factor (β = -0.42, p ≤ 0.030, OR = 0.66, 95% CI. 0.45 - 0.96), whereas perseverative measurements were statistically nonsignificant explanatory variables (1. Percentage Perseverative Responses: β = 0.22, p 0.81, OR = 0.80, CI 95% 0.135 - 4.806 (2) Percentage Perseverative Error: β = 0.479, *p* 0.75, OR = 1.614, 95% CI 0.084 - 31.190).

Senner et al., (2023) ran a multiple linear regression, which revealed a composite score measuring executive function (that included Verbal backwards digit span, TMT B & TMT B-TMT

A) was statistically nonsignificant in predicting treatment adherence as measured by a self-reported brief adherence rating scale (β = -0.001, p 0.978).

2.13 SWiM of Inferential Statistics

2.13.1 Vote counting based on directional effect

A vote-counting-based procedure was used to assess the directional effect shown between cognitive inflexibility and treatment adherence. 12 out of 13 Studies were grouped into the following classifications: Negative effect-shown classification, Positive effect-shown classification, Mixed effect-shown classification and No effect-shown classification. One study was not included in the vote-counting-based procedure because a statistically nonsignificant p-value was the only reported statistic to examine the possible link between cognitive flexibility and treatment adherence. Therefore, it was not possible to assess the directional effect of this result (Kamp et al., 2019). The figures below show the 12 out of 13 included studies for this data synthesis (see figures VII and VIII).

Negative Effect Studies (n=6)

Six out of the 12 included studies in this analysis showed there is a negative directional effect. This suggests that cognitive inflexibility influences a measure of treatment adherence in 50% of studies. Five of these negative effects were from category one: patients with disorders of impulsive control and compulsivity, except for one study, which was in category two: patients with schizophrenia. These studies either used a cohort/longitudinal design (n=4) or an RCT (n=2).

Four of these give studies from category one showed a negative effect between cognitive inflexibility and poor treatment adherence among patients with Substance Use Disorder (n=2), Gambling Disorder (n=1) or Personality Disorders with a Forensic history (n=1) receiving some form of CBT. The other category one study showed a negative effect between these two variables, when lamotrigine or a placebo was administered to patients with Substance Use

Disorder and Bipolar Disorder (n=1). The study from category two, which found a negative directional effect, prescribed conventional or atypical antipsychotic medication to patients with schizophrenia (n=1).

These studies used a variety of cognitive tasks (i.e. WSCT, TMT B-A and Stroop interference test) to assess cognitive flexibility. Four of these studies assessed treatment adherence by using a clinical observation metric (dropout), and two of these studies measured treatment adherence with a self-report questionnaire [ROMI Scale (Weiden et al., 1994) and Brief Adherence Rating Scale (Byerly et al., 2008)].

Mixed Effect Studies (n=4)

4 out of these 12 studies offered more than one observation, which found mixed results between cognitive inflexibility and treatment adherence. There was an equal split of mixed-effect studies between the category one studies and category two studies. These studies used either a cross-sectional/cohort design (n=3) or a randomised clinical trial (n=1). Two of these studies were from category one and offered some form of CBT to either patients with substance use disorder (n=1) or gambling disorder (n=1). The other two studies offered a typical or atypical antipsychotic medication to patients with schizophrenia.

Three of these studies used different metrics from the WSCT (i.e. perseverative errors, perseverative responses, and categories completed). One of these studies used the trail making test and WSCT-128 card version to assess cognitive flexibility. Two studies assessed treatment adherence with clinician-rated tools (i.e. medication management ability assessment and Brief Adherence Rating Scale), and two studies used a clinical observation (dropout) to measure treatment adherence.

Positive Effect Studies (n=1)

A cross-sectional design that aimed to find a differential effect of cognitive processes on medication adherence amongst a sample of schizophrenia outpatients found a statistically

nonsignificant positive directional result. The study measured medication adherence using a composite score, which consisted of scores from clinician-rated tools (i.e. Clinical Global Impression Scale and Brief Adherence Rating Scale) and clinical observations (pharmacy refills and pill counting). Cognitive flexibility was measured by the WSCT-128 card version.

No effect studies (n=1)

One longitudinal study produced a statistically nonsignificant, negligible beta coefficient effect between cognitive flexibility and treatment adherence, which was measured using a composite score consisting of measures assessing executive function and cognitive flexibility and a self-report questionnaire assessing medication adherence amongst a sample of patients with schizophrenia or bipolar disorders.

Summary

The vote counting data synthesis found that cognitive inflexibility appears to negatively influence therapy adherence for patients with disorders of impulse control and compulsivity in as much as four out of seven studies indicated a negative direction of relationship between cognitive inflexibility and therapy adherence to some form of CBT. One of these studies assessed the medication adherence of patients with disorders of impulse control and compulsivity. This analysis cannot say with confidence if these findings also extend to prescribed medication for category one patients. There were also two mixed-effect studies from category one patients with disorders of impulse control and compulsivity, which offered a course of therapy.

Four out of five studies that recruited patients with schizophrenia were mixed-effect, positive or no effect studies. Only one study recruiting patients with schizophrenia showed that cognitive inflexibility negatively influenced medication adherence. This makes it unclear whether the former conclusion extends to patients with schizophrenia who were prescribed antipsychotic medication.

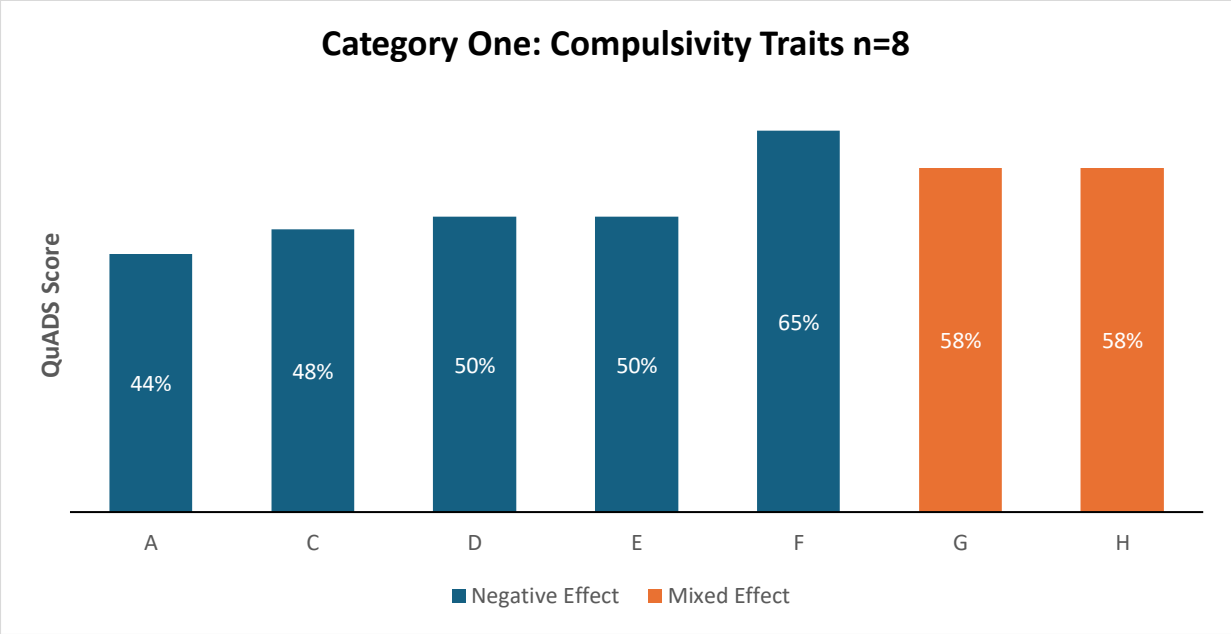

Figure 7: Vote counting based on directional effect for Category one

Note. *Kamp et al., (2019) was not included in this figure as a p-value was the only reported statistic exploring the link between cognitive flexibility and treatment adherence. A = Streeter et al., (2008); C = Mallorquí-Bagué et al., (2018); D = Fagan et al., (2015); E = Teichner et al., (2002); F = Romero-Martínez et al., (2021); G = Aharonovich et al., (2006); H = Álvarez-Moya et al., (2011).*

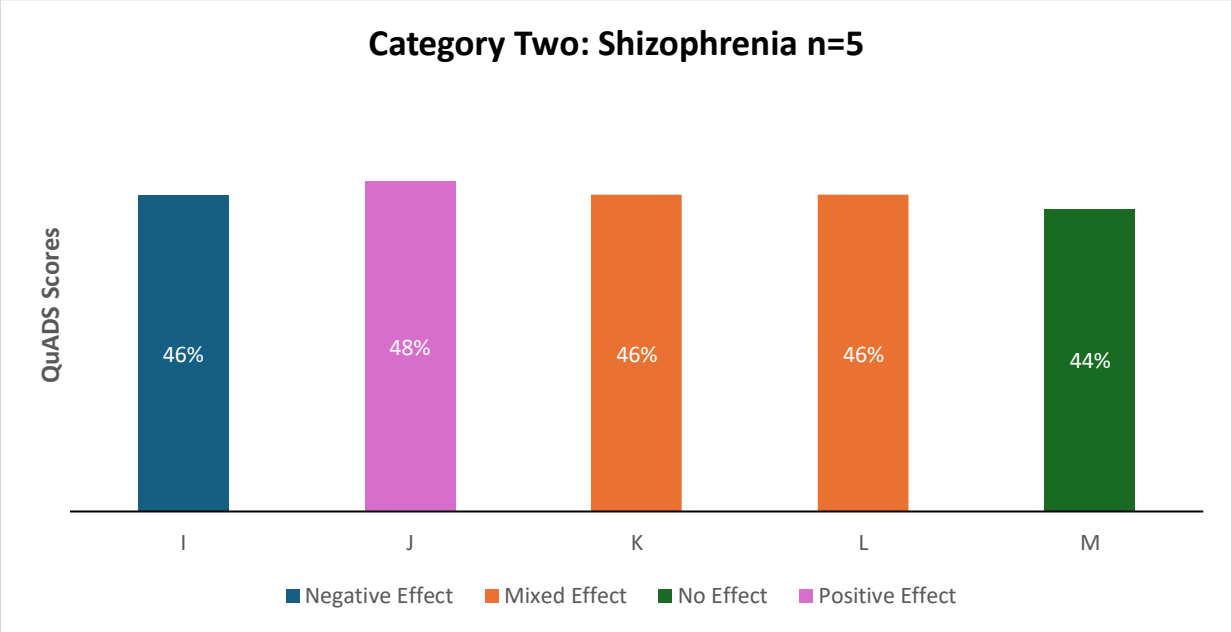

Figure 8: Vote counting based on directional effect for Category two

Note. *I = Vauth et al., (2004); J = Lui et al., (2021); K = Lam et al., (2013); L = El-Missiry et al., (2015); M = Senner et al., (2023).*

2.13.2 Combining P Values

The Fisher method was used to combine independent p-values from various tests used in the included studies. Three tests were run, which combined all the p-values from the 13 included studies, studies from category one: disorders of impulse control and compulsivity (*n*=8) and category two: schizophrenia (*n*=5). The combination of p values from the included studies (n=13) suggests there is evidence that cognitive inflexibility negatively affects treatment adherence for patients with mental health disorders receiving some form of mental health treatment ($p \leq 0.001$ from a Chi^2 test, 30 observations). This was also the case when combining the P values from studies (n=8) recruiting patients with disorders of impulse control and compulsivity ($p \leq 0.001$ from a Chi^2 test, 22 observations).

However, when combining the P values for studies recruiting patients with schizophrenia (n=5), there was evidence to accept the null hypothesis ($p=0.13$ from a Chi^2 test, 8 observations). This suggests that cognitive inflexibility does not adversely affect treatment adherence among patients with schizophrenia, but the former analysis suggests the contrary for patients with disorders of impulse control and compulsivity.

Discussion

2.14 Interpretation of results

This SLR argues there is a link between cognitive inflexibility and treatment adherence. This specifically applies to outpatients with disorders of impulse control and compulsivity undergoing some form of CBT treatment. These findings do not extend to patients with Schizophrenia and outpatients with disorders of impulse control and compulsivity who were offered medication alone.

The combining p-value synthesis showed that cognitive inflexibility adversely affects treatment adherence among studies recruiting patients with disorders of impulse control and compulsivity, but there were differences in the vote-counting procedures. Two of these studies found a mixed effect between cognitive inflexibility and adherence to CBT. These studies recruited gambling disorder patients (n=86) and substance use disorder patients (n=56) receiving CBT (Aharonovich et al., 2006; Álvarez-Moya et al., 2011). These studies had relatively small sample sizes, which were not sufficient enough to detect a small effect size with the regression models that assessed the link between cognitive flexibility and treatment adherence. Also, multiple explanatory variables were entered into the regression models, which may have raised the possibility of these results being underpowered to reliably detect small effects with the respective analyses. This may have increased the possibility of a false negative result (Frankot et al., 2023).

Another study that recruited a larger sample of gambling disorder outpatients (n=115) found objective measurements of cognitive flexibility influenced dropout and therapy compliance to 16 weekly sessions of 90-minute CBT. The researchers suggested that impulsivity and compulsivity deficits found in this study are interconnected, which adversely affects treatment adherence as well as increases the possibility of relapse. It is possible, the impulse control problems reported among gambling disorder patients may shift from reward-driven behaviours to more compulsive behaviours, which is reinforced by positive and negative feedback, and is a

factor contributing to suboptimal treatment (Mallorquí-Bagué et al., 2018). This conceptualisation may extend to the studies recruiting substance use disorder patients that share similar brain circuitry and traits to gambling disorder, as well as other OCRDs (Fineberg et al., 2009; Frota Lisboa Pereira de Souza et al., 2024).

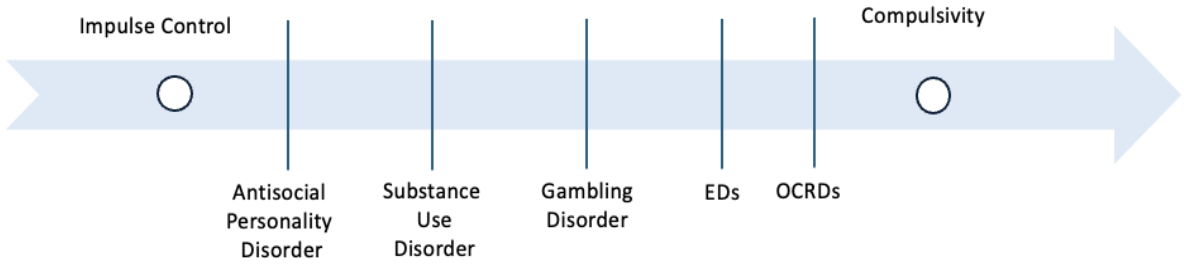

Figure 9: Spectrum of Disorders with Impulse Control & Compulsivity

Note. This figure illustrates a spectrum of disorders characterised by cognitive inflexibility, a trait that appears to influence a patient's ability to tolerate a mental health intervention. A spectrum of impulse control and compulsivity disorders is widely recognised and may arise from underlying impulsivity and compulsivity traits (Hollander et al., 2005). For example, impulsive behaviours may, over time, become increasingly repetitive and evolve into compulsive patterns (Grant & Chamberlain, 2023). While the disorders are presented in a linear order, it is probable that cognitive resources may vary between individuals. As such, two patients diagnosed with the same mental health disorder may have markedly different cognitive profiles .

Two RCTs that recruited outpatients with substance use disorder (n=120, n=74) found similar results showing the link between cognitive inflexibility and adherence to various forms of treatment, which were Lamotrigine or placebo (Fagan et al., 2015) or a course of CBT with Venlafaxine/Pramipexole/Reserpine/Tiagabine (Streeter et al., 2008). These RCTs used a complex cognitive task measuring inhibition, cognitive flexibility & working memory, which found that lower baseline performance on the Stroop interference task was linked to poor

treatment adherence, as understood through different clinical observations. These latent traits deficits may have driven the impulse control difficulties noticed within substance disorder outpatients who showed signs of poor treatment adherence. Also, these findings suggest that performance on this cognitive task is a pertinent clinical factor that influences behaviours like attending therapy sessions and/or taking the necessary number of pills and returning pill bottles, which would indicate good treatment adherence (Fagan et al., 2015; Streeter et al., 2008). It further highlights the need for healthcare professionals to actively consider cognitive deficits with their patients during clinical practice, as it offers opportunities to tailor care that promotes treatment adherence, which has been shown to increase the possibility of better clinical outcomes (Leeuwerik et al., 2019). Another possible confounding factor with the aforementioned relationship was the continued cocaine use by patients. Neither study did not reported any adverse side effects from the prescribed medications, nor did they consider if these undesired therapeutic effects contributed to treatment discontinuation (Fagan et al., 2015; Streeter et al., 2008). This raises the possibility of side effects being a contributing factor that may have influenced treatment discontinuation

This spectrum may also extend to men with personality disorders with a forensic history (violence against an intimate partner). Patients with higher rates of perseverative errors were more likely to drop out of the court-mandated CBT than those with fewer perseverative errors. Interestingly, the study also found that preservative error rates were higher amongst those who reoffended, and those who were generally violent were more likely to drop out of therapy than perpetrators of violent crimes focusing on their family member(s) (Romero-Martínez et al., 2021). These results suggest how perseverative errors may also be a trait that influences impulse control amongst forensic behaviours and how increased rates of perseveration may influence more compulsive behaviours, resulting in repetitive forensic behaviours (Meijers et al., 2017; Tonnaer et al., 2016).

These findings highlight how diverse disorders of impulse control and compulsivity seem to be interrelated and are driven by latent traits, like cognitive inflexibility (see above Figure 9).

Perhaps it is challenging for these patients to adapt existing patterns of cognition and behaviour, which is a prerequisite for psychological therapies (such as CBT) that involve making cognitive and behavioural changes. Even the prospect of embarking on treatment independently can result in disengagement. This postulation is consistent with the Therapeutic Adherence Framework (Laranjeira et al., 2023). This framework suggests that events perceived as threatening result in a rebound effect, which promotes poor therapeutic adherence. The level of insight and beliefs (factors described as antecedents in the framework) could be encumbered by cognitive inflexibility, which could be driving behaviours contributing to poor adherence amongst patients with disorders of Impulse Control & Compulsivity Conditions.

Teichner et al. (2002) suggested that offering an intensive rehabilitation therapy program may mitigate disengagement amongst cognitively impaired patients, resulting in improved clinical outcomes. The findings highlight how the intensity of support may offer a cognitive scaffolding that reduces the exposure of the individual's cognitive vulnerabilities among patients with substance use disorder. Perhaps this suggests that outpatient/community settings expose these specific cognitive deficits, as there is a greater expectation on patients to receive care with less care coordination involvement.

In contrast to the findings for patients with disorders of impulse control and compulsivity, cognitive inflexibility may not be a pertinent factor that influences medication adherence amongst inpatients with schizophrenia. This was reflected in the vote-counting procedure, which showed unclear results, and the combined p-value was statistically nonsignificant. While it is plausible that cognitive flexibility influences medication adherence among patients with Schizophrenia (El-Missiry et al., 2015), there is a range of cognitive impairment across multiple domains, including verbal and visual memory (Buchanan et al., 2005) that may influence treatment adherence. These deficits are often more severe and global than other major psychiatric conditions and the general population (Gebreegziabhere et al., 2022; Vöhringer et al., 2013).

These various cognitive deficits give context to the findings from one of the included studies (Vauth et al., 2004) that found cognitive inflexibility in a sample of 197 inpatients with schizophrenia was predictive of others' involvement in their rehabilitation care. These findings reflect the routine clinical practice where providers typically offer a coordinated care plan that assists patients with schizophrenia in following their treatment plan, which includes medication adherence. Carer involvement in a patient's treatment plan and offering CBT to patients can enhance medication adherence (Can & Budak, 2025; Donohoe, 2006; Glecia & Li, 2024; Liman et al., 2024). This is reflective of how biopsychosocial interventions are recommended by NICE guidelines for patients with schizophrenia (NICE, 2014). This comprehensive care may offer cognitive scaffolding that supports patients with schizophrenia to improve treatment adherence.

In summary, this SLR shows that cognitive flexibility is a pertinent factor that appears to influence treatment adherence amongst outpatients with disorders of impulse control and compulsivity receiving CBT, but does not extend to medication adherence. Moreover, cognitive flexibility may not be a crucial factor for patients with schizophrenia adhering to antipsychotic medication, given the widespread cognitive impairments and level of care provided to these people, which could protect against these vulnerabilities.

2.15 Critique of the included studies

There are various strengths and limitations to this SLR. This is the first review of its kind that has scrutinised the effects of cognitive inflexibility on treatment adherence and has evaluated a range of gold standard and second-level evidence studies (Wallace et al., 2022). This enhances the clinical inference made in this work, which was obtained using a SWiM methodology (Campbell et al., 2020; McKenzie & Brennan, 2022). Also, patient recruitment for the included studies was mostly carried out in economically developed nations. Therefore, these findings are relevant to healthcare systems that serve a diverse population, for example, the United Kingdom (Office for National Statistics, 2024).

The quality of the included studies could be described as acceptable at its best. There were various strengths in how these studies chose pertinent cognitive flexibility and statistical tools, which were guided by their research questions and rationale. There were limitations to these studies, particularly regarding how validly these cognitive flexibility measurements were administered, as limited information was provided about the testing conditions of these psychometric tools. There was also insufficient transparency in how their statistical analyses were conducted, particularly what type of entry of variables was used in the regression models (Peng & So, 2002) and often descriptive and inferential statistics were omitted. Also, there was inconsistency in what regression statistical metrics were used to demonstrate the influence of an explanatory variable on an outcome variable. Moreover, few studies reported collinearity statistics or commented on the robustness of their regression models with the overall fit of the model or its level of explanatory power of the variance observed in the model, which limits the inferences that can be made on their results (Peng & So, 2002). Also, no study reported power calculations to inform their sample size, which could have mitigated the possibility of reporting an underpowered study and the risk of a false positive result (Faul et al., 2007). These considerations may impact the inferences that can be made from this SLR.

Another limitation in the included studies is how they measured treatment adherence. Most studies measured this through clinical observation metrics, i.e., dropout and number of sessions attended. This approach does not align with a consensus of reviews that outline there is no gold standard method for assessing this construct (irrespective of it being administered by a clinician), and ideally, multiple tools should be used to assess treatment adherence (Lam & Fresco, 2015; Laranjeira et al., 2023; Schoenwald & Garland, 2013). The assessment of treatment adherence for studies recruiting patients with disorders of impulse control and compulsivity primarily depended on clinical observations (e.g. dropout), which cannot offer a comprehensive psychometric measurement. Moreover, dropout could be seen as an extreme measurement of treatment adherence, which does not necessarily capture the patient's agency (Laranjeira et al., 2023). Whereas studies recruiting patients with schizophrenia, standardised

tools were used to measure medication adherence. Ideally, researchers should use at least two measures that include a standardised psychometric measurement of treatment adherence.

2.16 Critique of the review processes

This SLR was registered on PROSPERO (CRD42024604253), which meant the process of completing this work was planned, where a research question, search strategy and SWiM method were selected from the outset. There were some limitations in the review process as it was a fast, streamlined version of an SLR that was completed as part of a thesis whilst the trainee psychologist was enrolled on a doctorate in clinical psychology at the University of Hertfordshire. Using this approach enabled the trainee psychologist to conduct an SLR that used several methodological approaches from a systematic review. This meant it was not feasible to follow the entire data extraction procedure set by Cochrane, given the finite time availability (Higgins & Green, 2008). Whilst every effort was made to maintain the transparency in the methodology, expediting the review process could have increased the risk of bias, for example, the search strategy and study selection used may have inadvertently excluded relevant studies.

A research team could not be involved in completing this systematic literature review. It was informed by Cochrane Rapid Review guidance, where a PhD student assisted the trainee psychologist through the screening and quality rating of studies (Garritty et al., 2024). Harrison et al., (2021) advised that a seven step checklist should be used when rating the quality of studies with the QuADS, which involves a team of at least three researchers. To mitigate this, the trainee psychologist conferred with the PRISMA guidelines when reporting the SLR and sought support from supervisors, a technical analyst from NICE, and a Postdoctoral PhD student to raise its rigour.

The combining of p-values can assess statistical significance with an imperfect dataset, which has its limitations. The metric cannot offer information on the magnitude of the effect and distinguish between studies that have different sample sizes or levels of bias. Moreover, when

p values are combined from small sampling or fewer studies, failure to reject null hypotheses should not be interpreted as evidence of no effect in all studies (Loughin, 2004; McKenzie & Brennan, 2022). Although the results obtained from the combining p-values of category two studies recruiting patients with Schizophrenia were interpreted cautiously, which were in line with vote-counting results.

The vote-counting procedure cannot capture the magnitude of the effect. To counteract this limitation, the trainee psychologist attempted to create an Albatross plot that offers an estimated inspection of underlying effect sizes and can detect indications of heterogeneity across studies (Harrison et al., 2017). The trainee psychologist attempted to plot this graph using Microsoft Excel and Python, but these attempts produced invalid contour lines that could not truly support the actual magnitude of the effect. Therefore, this plot was not included in this write-up (See Appendix VI). This highlights another limitation of conducting a streamlined SLR.

2.17 Concluding remarks

This SLR screened 1,415 studies and identified 13 studies appropriate for data synthesis. These findings highlight cognitive flexibility as a clinically relevant factor that influences therapy adherence among patients with disorders of impulse control and compulsivity. These conclusions do not apply to medication adherence among the abovementioned patients and those with schizophrenia. This research topic is still in its infancy, and these conclusions should be interpreted with caution when addressing mental health needs that can derive from suboptimal care (Leeuwerik et al., 2019; Simpson et al., 2011, 2021).

Whilst there are limitations regarding the quality and number of studies included in this SLR, it appears that cognitive inflexibility could be a biomarker that increases the vulnerability of patients not adhering to a therapeutic intervention over a treatment episode. Investigating this further using more rigorous methodologies could generate further evidence and questions over the understanding of cognitive biomarkers that influence suboptimal mental health treatment.

This sets a clear rationale for the next chapter. It presents a methodology for a cross-sectional study that systematically assessed the link between cognitive inflexibility and treatment adherence amongst people with OCRDs and EDs. These conditions were selected as they are characterised by cognitive inflexibility, that have poor treatment adherence and clinical outcomes.

Chapter III: Methodology

3.1 Aims and Objectives

This cross-sectional study answered the following interlinked research objectives:

1. To what extent is cognitive inflexibility linked with adherence to psychiatric medication and psychological therapies in individuals with OCRDs and EDs when considering the influence of other aspects of neuropsychological functioning (failure to maintain set, non-perseverative error, total error and reaction time), a proxy for intellectual functioning (level of academic attainment)?
2. An exploratory analysis: Does cognitive inflexibility influence adherence to psychiatric and psychological therapies among individuals with OCRDs and EDs, when considering the influence of state and trait factors as well as individual differences?

The measures used in this study were carefully selected by the trainee psychologist and the secondary supervisor to systematically answer the set research objectives, whilst ensuring that the set of questionnaires and a test could be well tolerated and completed validly by the recruited participants between 15-20 minutes. An online version of the Wisconsin Sorting Card Test -64 card version was used to measure flexibility in thinking objectively (Chelune & Baer, 1986). This objective task has been shown to sensitively discriminate cognitive flexibility score performance between clinical and normative populations (Arango-Lasprilla et al., 2015; Miles et al., 2021). It would enable this thesis to be the first study of its kind to broadly explore how executive function, as well as cognitive inflexibility, influences treatment adherence. Moreover, using only the WSCT enabled this work to not include any additional objective tasks measuring executive function (Miles et al., 2021). This ensured that the study's operating procedure would not unnecessarily expand beyond the scope of this work or require more time and effort from the prospective participants. Moreover, the Wisconsin Sorting Card Test-64 card version is an

objective task widely used in cognitive psychology research and does not bear any additional cost, which would make it feasible to carry out this work (Miles et al., 2021). The trainee psychologist chose not to include the Intra-Dimensional/Extra-Dimensional Set Shift (ID/ED) Test as a measurement of cognitive inflexibility, as it would not have been possible to measure various forms of executive function, nor financially feasible due to the licensing cost of using the task. Since inferences from this test may lack ecological validity in measuring flexibility in thinking, the Compulsive Personality Assessment Scale was used as a subjective measure, which has construct validity with an objective task that measures cognitive inflexibility (Fineberg et al., 2015, 2021; Gadelkarim et al., 2019; Gecaite-Stonciene et al., 2020).

Using these measures offered a holistic understanding of flexibility in thinking. There are no gold standard self-rated tools for measuring treatment adherence amongst psychological and psychiatric therapies, the selection of the Treatment Adherence Rating Scale and Medication Adherence Rating Scale (MARS) was based on their psychometric properties, construct validity, and their valid use in research (Gumport et al., 2023; Lam & Fresco, 2015; Thompson et al., 2000).

To consider other patient factors which have previously been shown to affect treatment adherence, prospective participants will be asked to complete a series of questions (Personal Circumstance Questionnaire), which aims to understand their level of educational attainment, employment status, when and where they received their mental health treatment, age, gender, and sex at birth. The WHO-5 Wellbeing Index Scale was chosen to measure psychological wellbeing because it has good psychometric properties and can be administered easily, and has strong face validity (Topp et al., 2015).

3.2 Quantitative Design

A prospective, cross-sectional design was used to examine whether cognitive flexibility or other selected explanatory factors (mentioned below) influenced adherence to psychological therapy or psychiatric medication among participants with OCRDs and/or EDs. The design choice was

informed by the philosophical approach, empiricism. This approach advocates that knowledge is obtained through observations, allowing for opportunities to collect data through tools, which is valid and quantifies a phenomenon (Longworth, 2009). The study was also pre-registered onto the Open Science Forum (https://osf.io/5hwb7/) before the study proceeded with analysing the results reported in this study.

The design aimed to understand how cognitive flexibility may influence treatment adherence amongst a diverse population that had accessed mental health treatments, whilst also considering state and trait factors. A sampling procedure was used to specifically capture a mixed group of individuals with OCRDs and EDs. These disorders were selected because they are characterised by high levels of cognitive inflexibility (Frota Lisboa Pereira de Souza et al., 2024; Grant & Chamberlain, 2023; Weisholtz et al., 2017). This design promotes ecological validity, given that there was no experimental manipulation and a diverse sampling was selected. Although this cross-sectional approach cannot establish causation, it identifies relationships between explanatory and outcome variables (Bewick et al., 2005).

3.3 Participant Recruitment Procedure

A purposive sampling procedure was used to recruit participants with OCRDs and/or EDs. To facilitate participant recruitment, the trainee psychologist liaised with voluntary organisations, foundations, charities, treatment centres, and research registries worldwide. These organisations distributed a research advert (See Appendix VII) via their communication channels to prospective participants. This included word of mouth, website, email, internal communication channels and social media platforms.

These consumer organisations included Triumph Over Phobia UK, Hoarding UK, OCD Action, Body Dysmorphic Disorder Foundation, Orchard OCD, First Steps ED, British Eating Disorders Society, International OCD Foundation, Call for Participants, MQ Mental Health, Eating Disorder Hope, the Eating Disorders Resource Centre, the National Eating Disorders Association, the National Eating Disorder Collaboration, The Renfrew Treatment Centre and the National

Association of Anorexia Nervosa & Associated Disorders. In addition to this, the trainee psychologist also promoted the research advert through various social media platforms, which included Reddit, Instagram, LinkedIn, Facebook and Twitter.

Inclusion Criteria

Participants took part in the study if they reported having a mental health diagnosis of either OCD, Body Dysmorphic Disorder, Olfactory Reference Disorder, Hypochondriasis, Hoarding Disorder, Body-Focused Repetitive Behaviour Disorders, Skin-Picking Disorder, Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder, Avoidant Restrictive Food Intake Disorder, PICA or Rumination-Regurgitation Disorder (American Psychiatric Association, 2013; World Health Organization, 2019). Participants aged 18 years or above, who had received some form of mental health treatment, were invited to take part. This included some form of psychological therapy and/or psychiatric medication.

This study did not consider treatment adherence to a specific form of psychological therapy or psychiatric medication, as the study was interested in understanding treatment adherence broadly. This sampling procedure enabled to answer the study's research questions to be answered. Although the extant literature is sparse, people with these disorders are characterised by cognitive inflexibility and have poor treatment adherence and clinical outcomes (Fassino et al., 2009; Fineberg et al., 2019; Leeuwerik et al., 2019; Linardon et al., 2018; Santana et al., 2013).

3.4 Ethical Considerations

This study was approved on 22/02/2024 by the University of Hertfordshire Health, Science, Engineering and Technology Ethics Committee with Delegated Authority (ECDA) UH protocol number: 05541 and also received ethical approval from the Health Research Authority and Health and Care Research Wales on 03/10/2024 (See Appendix IX). Receiving these ethical clearances indicated that the standard operating procedure and the supporting documentation that outlined the study obtained valid informed consent and did not hinder participant safety.

Moreover, it highlights that the research used a scientifically rigorous design, which was compliant with relevant regulations and ethical guidelines set by the University of Hertfordshire and the British Psychological Society (Oates et al., 2021). The study also reached various agreement approvals with the various consumer organisations that assisted in the promotion of the study with participants (See Appendix IX). The project received a modest budget, which was used to assist in the preparation of the data and promotion of the survey (See Appendix X).

Confidentiality and anonymity

All the information gathered by Gorilla Experiment Builder was an anonymised dataset and could not be traced back to the participant (Anwyl-Irvine et al., 2018). The collected data were securely stored on the University of Hertfordshire's secure server, and the participants were informed that the provided data would be presented in combined form in a thesis, research meetings, and peer-reviewed journals. Steps were taken to maintain confidentiality, which was in line with the UK General Data Protection Regulation (GDPR) and Data Protection Act 2018. The data will be stored for up to five years on a University of Hertfordshire secure server.

Whilst it was not anticipated that this study could contribute to harm amongst participants, the trainee psychologist was aware that the participants invited to take part in this study may have severe and/or enduring mental illnesses. For the possibility of an adverse event arising when the participant took part in this online survey, the participants were encouraged to disclose these difficulties with their involved healthcare practitioners, as stated in the debrief information sheet. In addition to this, participants were signposted to mental health charities (Samaritans) and psychological wellbeing resources. (See Appendix VIII).

3.5 Coproduction of Research

To maximise the study's impact and research quality, steps were taken to involve stakeholders so that they could contribute to the coproduction of this study. This was carried out in various ways; stakeholders participated in discussions that influenced the study design, research advert design and the online survey creation.

The trainee psychologist attended several virtual meetings with various individuals affected by OCD, personally and professionally, who assisted by commenting on the research design and the promotion and delivery of the survey. The trainee psychologist had discussions with a senior cognitive behavioural therapist on 08/10/2023, where they discussed how to measure treatment adherence, which informed the decision-making to select the chosen treatment adherence scales. The trainee psychologist had discussions with a representative with lived experiences of OCD from OCD Orchard on the 21/03/2024, who offered insights into cognitive flexibility in OCD and study design/protocol. They offered favourable feedback and assisted in the promotion of the survey. The trainee psychologist also liaised with two additional experts by experience on 06/05/2024 and 05/06/2024, who offered favourable feedback. They also facilitated and signposted the trainee psychologist to consumer organisations that promoted the survey. This included Triumph Over Phobia UK, OCD Action, and the International OCD Foundation.

Additionally, a representative from IT Salnes (itsalnes.com/) assisted in the online survey creation and transformed the incorrect WSCT responses into perseverative errors, non-perseverative errors and failure to maintain set (Miles et al., 2021). The trainee psychologist also liaised with two individuals with experience in receiving therapy and marketing & design. This support improved the quality of the research advert.

3.6 Procedure

Participants were invited to partake in an online survey through a research advert that introduced them to the topic of study. They needed to use a computer or smartphone to complete the survey, which was made available via a platform called Gorilla Experiment Builder. This streamlined platform is widely used in research and is user-friendly for researchers and participants. The platform ensures data security by using data encryption and follows industry-standard security protocols to safeguard sensitive information (Anwyl-Irvine et al., 2018).

Once the participants accessed the online survey, they were introduced to the purpose of the study through a participant information sheet (See Appendix VIII). Once they were fully informed of the purpose of the study, they were asked to give their written consent to participate in the study, obtained through a consent form. If they chose not to participate, they could close the survey at any point. The online platform assigned participants a unique code, which maintained participant anonymity. Once the data were collected, there was no way to identify the data from the participants. Their voluntary participation lasted between 15-20 minutes. They were requested to complete the measures listed below and were then provided a debrief sheet (See Appendix VIII).

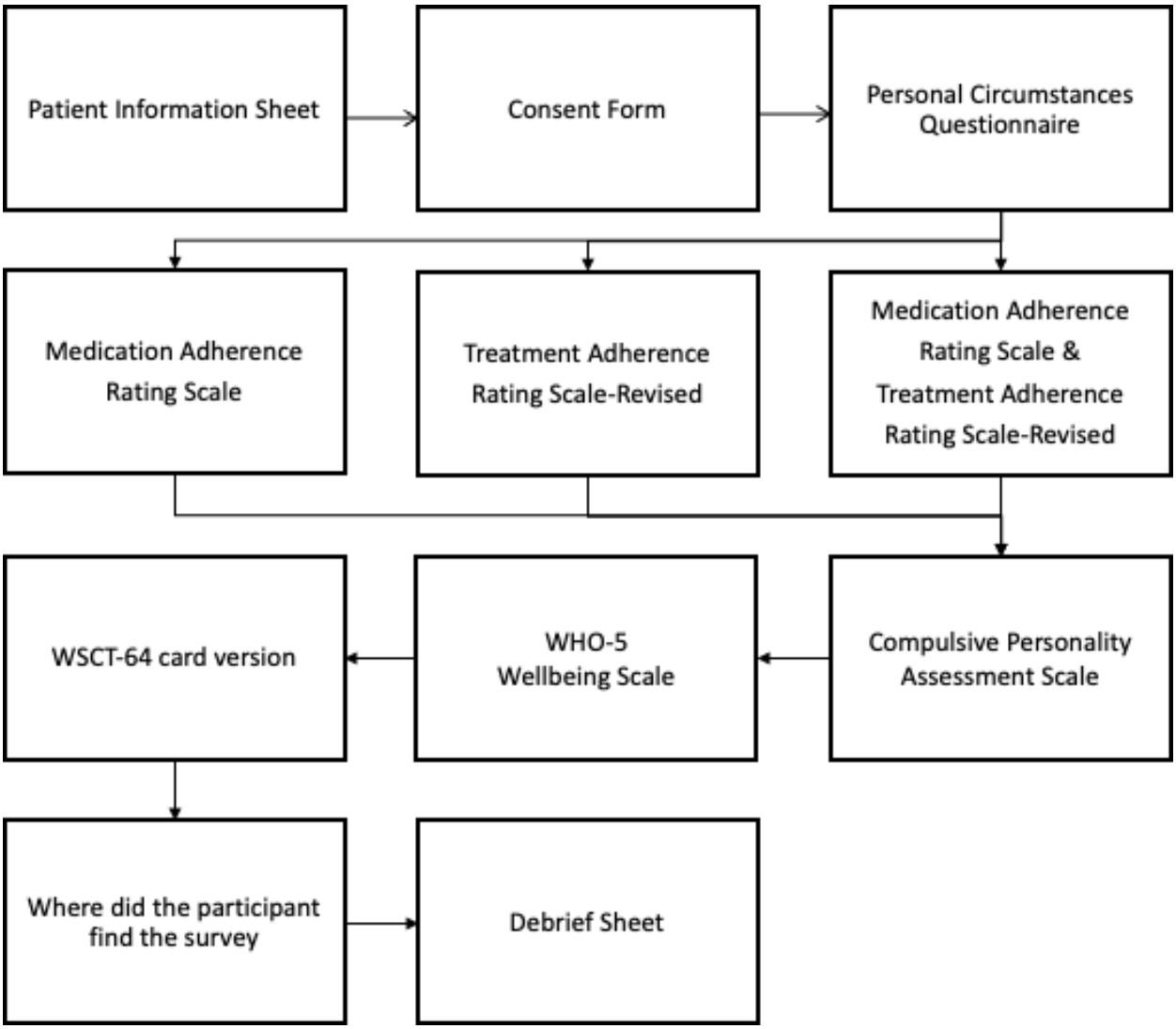

Figure 10: Standard Operating Procedure

***Note**. WSCT (Wisconsin Sorting Card Test), WHO (World Health Organisation). After participants had completed the PCQ, depending on what reported treatment they had received, branching logic tailored what adherence scales they were asked to complete.*

Informed Consent Materials

1. **Patient Information Sheet.** Before the participant agreed to complete the survey, they were informed of the purpose of the study, that participation is voluntary, and that they needed to complete a series of questions and a test lasting between 15-20 minutes. They were informed about the anonymity; confidentiality of their data, and it will be stored

securely on the University of Hertfordshire's server. Once the participants had agreed to the requirements of the study, they were invited to fill out the **Consent Form.** This form asked participants to confirm that they understood the purpose of the study, their participation was voluntary, and they could withdraw at any point. Furthermore, they were informed that the data they had shared could not be removed because it was collected anonymously and could not be traced back to them. Once the participant had confirmed this, they took part in the online survey (Please see Appendix VIII for relevant documents listed in the standard operating procedure).

Self-Reported Tools

1. **The Personal Circumstances Questionnaire (PCQ)** is an 11-item scale that captures the participant's age, gender, sex at birth, ethnicity, employment status and highest level of education. It also captures what diagnoses of EDs and/or OCRDs the participants had received from a healthcare professional. The questionnaire also asks participants if they had received psychological therapy and/or psychiatric medication, as well as where and when they had received this treatment. Based on their reported treatment history, participants were asked to complete either the medication adherence rating scale, the treatment adherence rating scale revised or both scales. The PCQ was designed by the trainee psychologist and secondary supervisor.
2. **Treatment Adherence Rating Scale-Revised** (TARS; Gumport et al., 2023) is a five item self-report scale that provides an understanding of the participant's experiences of receiving talking therapy, how well they thought they understood the talking therapy and if they were able to complete the treatment. Participants were asked to answer each question using an interval scale of 0 to 100, with a maximum score of 500. The higher the score, the better the therapy adherence. The original questionnaire was designed to understand therapy adherence for each session, whereas the revised tool aimed to understand therapy adherence over the course of a psychological treatment. The trainee psychologist carried out these revisions after obtaining consent from the author (Dong et al., 2018). The internal consistency from our observations recorded from the revised scale was considered good

(Cronbach's α: 0.82) and was similar to the internal consistency for the original Treatment Adherence Scale (Cronbach's α: 0.87). Unexpectedly, this study produced a one-factor confirmatory analysis model, which suggested our revisions influenced the two Confirmatory Factorial Analysis (CFA) model, which were found in the original scale: agreement/understanding and compliance (Gumport et al., 2023). Despite this, the scale has face validity for measuring therapy adherence, which extends to the participants recruited in this study.

3. **Medication Adherence Rating Scale** (MARS; Thompson et al., 2000) is a 10-item self-report scale that captures an understanding of how well the participant completed a course of psychiatric medication using a binary scale of Yes (one) and No (zero). The maximum total score for the MARS is 10, which indicates good adherence with psychiatric medication. Poor medication adherence is signified by a score of zero. The scale was designed to assess medication adherence amongst patients with various mental health disorders and has been described as a non-intrusive and quick measure (Ansari, et al., 2020; Marrero, et al., 2020). The initial validation study for the scale showed it had an acceptable internal consistency (Cronbach α: 0.75; Thompson, et al., 2000). However, the internal consistency of the scale used in this study was lower (Cronbach's α = 0.61). This study also produced a three factor CFA model similar to the validation study (Thompson, et al., 2000; 1. Medication Adherence Behaviour, 2. Attitude Toward Taking Medication and 3. Negative Side Effects & Attitudes to Psychotropic Medication).
4. **WHO-5 Wellbeing Index Scale** (Top et al., 2015) is a five item self-report scale that captures a participant's perceived psychological wellbeing. It is a widely used tool in research; easily administered and asks non-intrusive questions. Each item is scored on a scale of zero (At no time) to five (All of the time), and the maximum score for the scale is 25. The raw score is then multiplied by four, resulting in a percentage score ranging from 0 to 100 (WHO, 1998). A lower score indicates poorer psychological wellbeing, less than 50 suggests poor psychological wellbeing, and a score lower than 28 indicates possible signs of depression (Omani-Samani et al., 2019). The measure has strong face validity, and the observations recorded from this scale showed an acceptable internal consistency (Cronbach's α = 0.78),

which is similar to the internal consistency reported in other studies for this scale (Cosma et al., 2022). A one-factor CFA model was also found within this data, which is consistent with what was also found in an earlier study (Bjørnnes et al., 2022).

5. **The Compulsive Personality Assessment Scale** (CPAS; Fineberg et al. 2007) is an eight item self-report scale that measures the severity of obsessive-compulsive personality traits, which have been mapped onto the DSM-5 diagnostic criteria for Obsessive Compulsive Personality Disorder. Each item is scored on a scale of zero to four (negligible - very severe), and the maximum total score is 32. The scale can distinguish these traits between the general population and clinical population (Gecaite-Stonciene et al., 2020). The CPAS had acceptable internal reliability in a previous study (Cronbach's $\alpha = 0.75$; Gecaite-Stonciene et al., 2020), which was similar to the observations found in this study (Cronbach's $\alpha = 0.72$). The CPAS was validated against an objective measure of cognitive inflexibility (Interdimensional - Extradimensional task) and used amongst different clinical populations (Fineberg et al., 2022). A confirmatory factorial analysis was conducted in this study, which found that there were two distinct aspects of the scale. The trainee psychologist and secondary supervisor defined these aspects as cognitive (Preoccupation, Perfectionism, Workaholism, Over-conscientiousness, Need for control, and Rigidity) and behavioural (Miserliness and Hoarding), which were treated as subtotal scores. Using these sub-scores offers a dimensional understanding of compulsivity rather than the total score, which can be used to screen for an Obsessive-Compulsive Personality Disorder.

Objective Cognitive Task

6. **The Wisconsin Sorting Card Test– 64 Card Version** (WSCT; Chelune & Baer, 1986; Miles et al., 2021) is an objective test that measures various neuropsychological functions; that include cognitive flexibility (perseverative error), executive functioning (non-perseverative error and failure to maintain set) and processing speed (reaction time recorded as milliseconds). It is a card-matching task consisting of 8 series that each of which has eight trials. In every trial, a response card is presented above 4 stimulus cards, which display a shape. The shapes on the stimulus cards vary by colour (blue, green, red or yellow), form

(circles, crosses, stars or triangles) and number (one, two, three or four). In every trial, the participants are asked to match the response card to one of the four stimulus cards without specific instructions other than being asked to match the card, and they had to work out the correct rule. If the participant's response matches the rule set in the trial, they will get a green 'thumbs up' if the answer is correct or a grey 'thumbs down' if the answer is incorrect. The participant is informed if their answer is correct or incorrect, which can be used as feedback to determine the sorting rule. For example, a response card with three green circles can be matched according to number (three), colour (green) or form (circle). The sorting rule changes every series without warning. The data produced from the task yielded reaction times and the frequency of correct and incorrect responses. The incorrect responses were transformed into perseverative error, non-perseverative error and failure to maintain set, using an algorithm in Microsoft Excel, implemented with Java logic. Perseverative error is a measure of cognitive inflexibility and of primary focus in this study. The other measures offered a broader assessment of executive function (Miles et al., 2021).

7. **Where did they find the Survey?** Participants were asked how they came across the survey. This question was answered with a free-text response.
8. **Debrief Sheet.** Once the participant completed the online survey, they were presented with a debrief sheet. This sheet offers details on the purpose of the study, how the data provided will be stored anonymously on a University of Hertfordshire secure server. Participants were also provided information on how to receive generic support with their wellbeing.

3.7 Statistical Analysis

A power analysis on G*Power 3.1 (Faul et al., 2007) was run to determine the sample needed for this study for a prior linear multiple regression: fixed mode, R^2 from zero. To identify if the study would be sensitive enough to yield a statistically significant small effect size for a linear multiple regression. The effect size f^2 was set at 0.15, the significance level at 0.05, the power at $1-\beta = 0.95$ and the number of variables was set at five. The power analysis indicated that a

total sample size of N= 138 would be necessary to detect a small effect in this study, which could have been detected in our two respective models that scrutinised therapy adherence (n=181) and medication adherence (n=166).

Collinearity diagnostics (SPSS v29) were carried out to see if there was any collinearity amongst the inputted explanatory variables, which could impede the inferences made from these regression models (see Table 3). There was no concern of collinearity among these variables since the tolerance and variance inflation factor (VIF) were less than one and five (Miles, 2014).

Before the regression models were computed, the therapy adherence and medication adherence scores were transformed from a scaled variable to a binary variable. Therapy Adherence scores were transformed based on the median score (360). Therapy Adherence Scores ≤ 360 were converted to zero, whereas scores of ≥ 361 were converted to one. There were no specific guidelines on how to interpret this relatively novel scale (Gumport et al., 2023). The total Medication adherence scores were converted from a scaled score to a binary score. Scores of ≤ five were converted into zero, and scores of six to 10 were converted into one. The midpoint score (five) was considered an appropriate way to split this scale as it could be considered as poor and good medication adherence. Descriptive and frequency statistics were computed for the outcome and explanatory variables.

Two enter binary logistic regressions were run to answer the 1st research question: Does cognitive inflexibility influence adherence to psychiatric medication and psychological therapies whilst considering other measures of neuropsychological functioning? Perseverative Error, Non-Perseverative Error, Failure to Maintain Set and the highest level of education were entered to explain the variance of the respective adherence measures. The highest level of education was entered as a categorical variable and was considered a proxy variable for intelligence (Van Hootegem et al., 2023). Undergraduate Degree was set as the reference category because it was the most commonly occurring education level. Total Error was not entered into the regression models as it was anticipated that it would correlate highly with the

other measurements from the WSCT-64 card version. In addition to this, Spearman Rank Correlation was computed to calculate the correlations between the outcome variables, perseverative error, and the other explanatory variables, which were either nominal, ordinal or interval variables.

To answer question two (An exploratory analysis: Does cognitive inflexibility influence adherence to psychiatric and psychological therapies among individuals with obsessive-compulsive or related disorders and eating disorders, when considering the influence of state and trait factors as well as individual differences?), two forward stepwise regressions were run to explore if any state or trait factors are linked with adherence to mental health treatment amongst individuals with OCRDs and EDs, while considering perseverative error. 18 potential explanatory variables (mentioned below) were entered, which were included and/or excluded from the model if they did not meet the inclusion criteria of reaching a statistical significance ($p \leq 0.05$). Age Groups, Gender, Sex at Birth, Ethnicity, Highest level of education obtained, and employment status were entered as categorical variables. The reference category for these categorical variables was selected based on the most frequently observed category (See Table 2). Failure to Maintain Set, Non-Perseverative Error, Perseverative Error, Reaction Time, Wellbeing Index Scale Percentage Score, number of comorbidities and when the participant received the psychiatric medication/psychological therapy were entered as interval variables. The CPAS subscale scores, cognitive and behavioural, were entered as separate variables that enabled this analysis to capture different aspects of flexibility in thinking (Gadelkarim et al., 2019). The following binary variables were also entered if the participant reported a diagnosis of OCRDs or EDs (Yes; One or No; Zero) and if they had received psychological therapy/psychiatric medication as an outpatient/privately (Zero) or as an inpatient (One).

To examine the significance of these results, the Hosmer & Lemeshow test, p values and Nagelkerke R^2 and Cox & Snell R^2 values were used to understand the overall model. The Hosmer & Lemeshow test was used to gauge the goodness-of-fit of each logistic regression model, whereas Nagelkerke R^2 and Cox & Snell R^2 were used to assess how well the model

could explain the proportion of variance in each model. To examine the effect of an explanatory variable on an outcome variable, β coefficients, p values, odds ratios and 95% confidence intervals were used (Peng & So, 2002).

Table 3: Collinearity Diagnostics for Regression Models

	Enter Binary Regression: Medication Adherence		Enter Binary Regression: Therapy Adherence		Forward Stepwise Binary Regression: Therapy Adherence	
	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
Perseverative Errors	0.75	1.33	0.74	1.35	0.98	1.02
Failure to Maintain Set	0.95	1.06	0.93	1.08		
Non-Perseverative Errors	0.59	1.70	0.64	1.57		
Reaction Time	0.77	1.29	0.81	1.23		
Highest Educational Level	0.92	1.09	0.96	1.04		
Wellbeing Index Scale Score					0.99	1.01
Sex at Birth					0.99	1.01
Employment Status					0.98	1.02

Note. Variation Inflation (VIF)

Chapter IV: Results

The analysis reported in this chapter addresses the study's two research questions, which systematically explore the possible link between cognitive inflexibility and treatment adherence in individuals with OCRDs and EDs. The first question seeks to explore if there are any other neuropsychological functions, including cognitive inflexibility, that influence treatment adherence. Whereas the second question explores if any other state and trait factors influence treatment adherence, whilst considering the influence of cognitive inflexibility.

In total, 852 prospective participants accessed the online survey, and 23.71% (*n*= 202) of them participated in the study. See Tables 4 and 5, which provide a summary of the included participants' demographic characteristics, frequency of mental health disorders and reported wellbeing, personality, perseverative error performance and other neuropsychological scores

Participants reported a variety of places where they found the survey, which has been summarised in Table 3.

The participants who completed the study came from different parts of the world. Gorilla Experiment identified the participants' time zones when they accessed the survey using JavaScript. 80.2% of the participants completed the survey from North & South America, Central Europe and the United Kingdom as indicated by these respective time zones: -05:00 UTC (17.33%), -04:00 UTC (26.24%), +00:00 UTC (4.46%) and +1:00 UTC (32.18%). The remaining participants completed the survey in other parts of the world (19.8%): -08:00 UTC (0.50%), -07:00 UTC (5.94%), -06:00 UTC (2.48%), -03:00 UTC (0.99%), +02:00 UTC (4.95%), +03:00 UTC (1.98%), +05:30 UTC (1.49%), +08:00 UTC (0.50%), +10:30 UTC (0.50%) and +12:00 UTC (0.50%).

Table 4: Where the participants found the survey

Where They Found the Survey		(n)	%
Instagram	Social Media	50	24.63
Renfrew Treatment Centre	Renfrewcenter.com	40	19.70
International OCD Foundation	Iocdf.org	12	5.91
BDD Foundation	Bddfoundation.org	9	4.43
National Eating Disorders Association	Nationaleatingdisorders.org	9	4.43
Facebook	Social media	9	4.43
Email	Other	9	4.43
Google	Search Engine	8	3.94
OCD Action	Ocdaction.org.uk	7	3.45
Did Not Disclose	Other	7	3.45
Orchard OCD	Orchardocd.org	5	2.46
LinkedIn	Social Media	5	2.46
Word Of Mouth	Other	5	2.46
Call For Participants	Callforparticipants.com	5	2.46
MQ Mental Health	Mqmentalhealth.org	5	2.46
OCD Advantage Forum	Skool.com/the-ocd-advantage-7537	4	1.97
Reddit	Social Media	4	1.97
Twitter	Twitter.com	1	0.49
National Association Of Anorexia Nervosa and Associated Disorders	Anad.org	1	0.49
Beat Eating Disorder	Beateatingdisorders.org.uk	1	0.49
Binge Eating Disorder Association Workplace (Via NEDA)	Nationaleatingdisorders.org	1	0.49
British Eating Disorder Society	Breds.org.uk	1	0.49
Eating Disorder Hope	Eatingdisorderhope.com	1	0.49
FEAST-ED	Feast-ed.org	1	0.49
Eating Disorder Website	Unknown	1	0.49
First Steps ED	Firststepsed.co.uk	1	0.49
National Eating Disorders Collaboration	NEDC.com.au	1	0.49

4.1 Descriptive Statistics

202 participants (Average Age 33.87, Standard Deviation 11.97 & Range 11.97 – 71.48) completed a series of self-report questionnaires and an objective task that measured compulsivity traits, psychological wellbeing, cognitive flexibility, and information that captured an understanding of their circumstances. One participant was excluded from the study as they were under the age of 18. The data for 201 participants was included in this analysis to answer the two research questions. The table five and six summarises and presents the collected data as frequency and descriptive statistics. Most of these participants described their gender as Female (83.6%) and their sex at birth as Female (92.5%). They also mostly described their ethnicity as White (80.6%) and studied up to an undergraduate level (42.8%). 63.18% of participants reported having a diagnosis of OCD, and only 7.5% of participants reported having one mental health disorder. In total, 169 (83.66%) participants reported having OCRDs, and 92 (45.54%) participants reported having EDs.

181 out of 201 (90.05%) participants completed the TARS, which measured adherence to some form of psychological therapy (average total score 349.48, range 92-500 and Std 87.09). 122 out of 181 participants were receiving psychological therapy, 13 of them had stopped psychological therapy in the last three months, six participants had stopped therapy in the past six months, and a further 24 participants had finished therapy in the last 12 months. 10 of them had discontinued psychological therapy over 12 months ago. Most of them received this therapy in an outpatient or private clinic (*n*=163, 90.1%), and a smaller proportion received this care in an inpatient service (*n*=18, 9.9%).

166 out of 201 (82.59%) participants included in this analysis completed the MARS, which measured adherence to a course of psychiatric medication (average total score 6.16, range 0-10 and Std 2.13). 141 out of 166 of these respondents were receiving medication, while eight had stopped a course of medication in the past three months, six had stopped medication in the past six months and another 10 within the past 12 months. One participant had stopped medication for over 12 months. Most of these patients received

psychiatric medication in an outpatient or private clinic (n=149, 89.8%), and a smaller proportion received this care in an inpatient service (n=17, 10.2%).

Table 5: Demographic Characteristics and Frequency of Mental Health Disorders

Demographic Characteristics	**n (%)**		***n* (%)**
Age Groups		Mental Health Disorders	
18-25	57 (28.4)	OCD	127 (63.18)
25-34[1]	74 (36.8)	Body Dysmorphic Disorder	53 (26.37)
35-49	40 (19.9)	Trichotillomania	16 (7.96)
50 and above	30 (14.9)	Hypochondriasis	20 (9.95)
		Body Focus Disorder	16 (7.96)
Gender		Skin Picking Disorder	29 (14.43)
Female[1]	168 (83.6)	Anorexia Nervosa	59 (29.35)
Male	15 (7.5)	Bulimia Nervosa	21 (10.45)
Transgender/non-conforming	15 (7.5)	ARFID	21 (10.45)
Preferred not to respond	3 (1.5)	Pica	1 (0.50)
Sex at Birth		Number of Reported OCRD and ED	
Female[1]	186 (92.5)	1	15 (7.5)
Male	13 (6.5)	2	36 (17.9)
Preferred not to respond	2 (1.0)	3	41 (20.4)
Ethnicity		4	51 (25.4)
White[1]	162 (80.6)	5	25 (12.4)
Black	9 (4.5)	6	19 (9.5)
Asian	16 (8.0)	7	9 (4.5)
Mixed	10 (5.0)	8	5 (2.5)
Other	2 (1.0)		
Preferred not to respond	2 (1.0)		
Education		Employment Status	
GCSEs/O-Levels/IGCSEs	3 (1.5)	Out of Work	47 (23.4)
A-Levels and Equivalent	34 (16.9)	Part Time	46(22.9)
Trade Certification	9 (4.5)	Full Time[1]	70 (34.8)
Industry-Recognised Certifications	4 (2.0)	More than Full Time	19 (9.5)
Undergraduate Degree[1]	86 (42.8)	Retired	8 (4.0)
Postgraduate Degree	61 (30.3)	Prefer not to Respond	11 (5.5)
Preferred not to respond	4 (2.0)		

Note. [1] Refers to the reference category variable, which is set in the logistic regression models. Avoidant Restrictive Food Intake Disorder (ARFID), Obsessive Compulsive Disorder (OCD),

Table 6: Wellbeing, Personality, Perseverative Error and Other Neuropsychological Scores

Wellbeing & Personality traits	**Avg. (Std.)**	**WSCT-64 Card Version**	**Avg. (Std.)**
WHO-5 – Wellbeing Index	37.99	Perseverative Error	6.13 (5.46)
Percentage Score	(16.85)		
CPAS – Total Score	14.84 (5.34)	Failure to Maintain Set	2.46 (3.15)
CPAS – Behavioural Items	2.31 (1.83)	Non-Perseverative Error	15.39 (4.83)
CPAS – Cognitive Items	12.53 (4.50)	Reaction Time (secs)	2.23 (1.15)

Note. Wisconsin Sorting Card Test (WSCT), World Health Organisation (WHO) & Compulsive Personality Assessment Scale (CPAS).

Below, Table six summarises a series of Spearman's Rank Correlations between the outcome variables, perseverative error on the WSCT-64 Card Version and the other explanatory variables listed below. 65 correlations were computed, and nine of these results were statistically significant. No statistically significant correlations were found between the MARS and any of the explanatory variables listed in the table below. Whereas the TARS yielded a statistically significant negative, weak correlation with Perseverative Error on the WSCT-64 Card Version (rs = -0.16, n = 180, $p \leq 0.031$) as well as with the cognitive component of the CPAS (rs = -0.19, n =180, $p \leq 0.011$). Statistically significant positive weak correlations were also found between the TARS and two explanatory variables: Sex at Birth (rs = 0.18, n = 182, $p \leq 0.014$) and WHO-5 Wellbeing Index Percentage Score (rs = 0.15, n = 180, $p \leq 0.038$).

Perseverative Error also produced statistically significant positive correlations with the other neuropsychology variables obtained from the WSCT-64 Card Version. This included Failure to Maintain Set (rs = 0.28, n = 201, $p \leq 0.001$), Non-Perseverative Error (rs = 0.54, n = 201, $p \leq 0.001$), Total Error (rs = 0.88, n = 201, $p \leq 0.001$) and Reaction Time (rs = 0.21, n = 201, $p \leq 0.003$). Perseverative Error also yielded a statistically significant weak correlation with Employment Status (rs = -0.15, n = 201, $p \leq 0.03$).

Table 7: Spearman Rank Correlation Analyses with Outcome and Explanatory Variables

	Medi cation Adherence	Therapy Adherence	Perseverative Error
Treatment Adherence Score	**-**	**-**	**-0.16***
Medication Adherence Score	-	-0.09	0.03
Failure to Maintain Set	-0.04	-0.08	**0.28****
Non-Perseverative Errors	0.08	-0.01	**0.54****
Total Errors	0.05	-0.12	**0.88****
Reaction Time	0.06	0.04	**0.21***
Age	0.04	0.09	-0.00
Sex at birth	-0.05	**0.18***	0.04
Gender	0.04	0.09	0.05
Ethnicity	0.12	0.11	-0.08
Level of Education	0.01	-0.01	-0.01
Employment Status	0.02	0.02	**-0.15***
OCRD	-0.10	0.05	-0.04
ED	-0.04	0.11	-0.07
Number of comorbidities	-0.11	0.05	-0.12
Duration since last therapy received	-0.03	-0.05	0.02
Therapy received as an inpatient	-0.02	0.11	-0.12
Duration since last medication received	0.06	-0.14	-0.04
Medication received as an inpatient	-0.06	0.04	0.04
Wellbeing Index Percentage Score (WHO- 5)	-0.05	**0.15***	-0.05
Cognitive Items (CPAS)	0.01	**-0.19***	0.03
Behavioural Items (CPAS)	-0.02	-0.09	0.00

Note. $^{*} \leq 0.05$, $^{**} \leq 0.01$

4.2 Inferential Analysis for Question One

Two enter binary logistic regressions were run, which included perseverative error, non-perseverative error, failure to measure, reaction time, and educational status in these

models, to see if they were linked to adherence to a form of psychological therapy or psychiatric medication. The Hosmer-Lemeshow goodness-of-fit tests were performed to see if these logistic regressions had good, predicted probabilities consistent with the observed outcome. These tests identified that there was evidence of goodness of fit between the model predictions and the observed outcomes (Therapy Adherence Scale; χ^2 (8) = 11.60, p = 0.170 and Medication Adherence Scale; χ^2 (8) = 10.94, p = 0.205). Whereas the Nagelkerke R^2 and Cox & Snell R^2 values raise questions about the explanatory power of these models, and perhaps additional variables could be needed to strengthen the inferences of the model. The Nagelkerke R^2 value was 0.101 for the treatment adherence model and 0.032 for the medication adherence model. The Cox & Snell R^2 value was 0.076 for the treatment adherence scale and 0.023 for the medication adherence scale.

Table 8: Inferential Analysis for Question one - Medication Adherence

	β	SE	Sig.	Odds Ratio	95% C.I	
					Lower	Upper
Perseverative Error	0.02	0.04	0.550	1.02	0.95	1.10
Failure to Maintain Set	-0.05	0.05	0.324	0.95	0.85	1.05
Non-Perseverative Errors	0.01	0.05	0.785	1.01	0.92	1.11
Reaction Time	0.00	0.00	0.800	1.00	1.00	1.00
Educational Level						
Undergraduate Degree (Reference Category)						
GCSE & Equivalent	20.45	28358.75	0.999	758211638.31	0.00	-
A-Levels & Equivalent	-0.16	0.48	0.741	0.85	0.33	2.20
Trade Qualifications	-0.33	0.80	0.677	0.72	0.15	3.42
Industry Certificates	0.48	1.22	0.692	1.62	0.15	17.72
Postgraduate Degrees	-0.16	0.40	0.688	0.85	0.39	1.88
Prefer not to respond	0.40	1.20	0.737	1.50	0.14	15.67

Note. Variable(s) entered on step 1: Perseverative Errors, Failure to Maintain Set, Non-Perseverative Errors, Reaction Time, Educational Level. Beta Coefficient (β), Standard Error (SE), Statistical Significance (Sig.) & Confidence Interval (C.I).

None of the entered variables in the logistic regression model for medication adherence yielded statistically significant correlates (See Table 8). Whereas, perseverative error was associated with therapy adherence in the respective regression model (See Table 7), which produced a negative beta coefficient; β = -0.11, p ≤ 0.003, SE = 0.04, OR = 0.89, 95% CI. 0.83 - 0.96. Interestingly, the explanatory variable, non-perseverative error (β = 0.07, p 0.073, SE = 0.04, OR = 1.08, 95% C.I. 0.99 - 1.17), almost produced a statistically significant positive coefficient. This was unexpected given there was a statistically significant strong positive correlation between Perseverative Error and Non-Perseverative Error (See Table 9).

Table 9: Inferential Analysis for Question one - Therapy Adherence

	β	S.E.	Sig.	Odds Ratio	95% C.I Lower	95% C.I Upper
Perseverative Error	**-0.11**	**0.04**	**0.003**	**0.89**	**0.83**	**0.96**
Failure to Maintain Set	-0.05	0.05	0.382	0.96	0.86	1.06
Non-Perseverative Errors	0.07	0.04	0.073	1.08	0.99	1.17
Reaction Time	0.00	0.00	0.379	1.00	1.00	1.00
Educational Level						
Undergraduate Degree (Reference Category)						
GCSE & Equivalent	-1.18	1.28	0.355	0.31	0.02	3.76
A-Levels & Equivalent	-0.11	0.44	0.800	0.89	0.38	2.12
Trade Qualifications	0.30	0.79	0.705	1.35	0.29	6.34
Industry Certificates	-0.82	1.26	0.513	0.44	0.04	5.17
Postgraduate Degrees	0.20	0.37	0.586	1.22	0.59	2.54
Prefer not to respond	-0.44	1.05	0.676	0.64	0.08	5.07

Note. Variable(s) entered on step one: Perseverative Errors, Failure to Maintain Set, Non-Perseverative Errors, Reaction Time, Educational Level. Beta Coefficient (β), Standard Error (SE), Statistical Significance (Sig.) & Confidence Interval (C.I).

The results for these models suggest that the logistic regression model fits the data well, as per the Hosmer-Lemeshow test. However, the explanatory power of these models, as indicated by the Nagelkerke, and Cox & Snell R^2 values, were rather small, which suggests that their influence was relatively modest and that including additional factors in these models could have contributed to more mathematically robust models for understanding the phenomena of adherence to psychological therapy or medication. Despite these limitations in these models, the study found evidence showing how perseverative error may influence adherence to psychological therapies, but not to medication.

4.3 Inferential Analysis for Question Two

To answer question two of this study, which also intended to consider trait and state factors, as well as perseverative error, two forward stepwise binary logistic regressions were run. The first logistic regression assessed the explanatory variables for medication adherence. Despite appraising 18 potential explanatory variables, none were entered into this model as they did not meet the inclusion criteria ($p \leq 0.05$).

A Stepwise Binary Logistic Regression was also performed to identify the explanatory variables for therapy adherence. 18 explanatory variables were entered into the respective model, which produced a final, four step model predicting therapy adherence. The model adopted a forward selection approach, with a significance level of $p \leq 0.05$ for entry and removal of variables. A Hosmer-Lemeshow goodness-of-fit test was conducted, and it was found that there was evidence of goodness of fit between the model predictions and the observed outcome; Therapy Adherence Scale; χ^2 (8) = 9.539, p = 0.299. The Nagelkerke R^2 and Cox & Snell R^2 values were larger in size when compared to the initial model for Therapy Adherence. The Nagelkerke R^2 value was 0.247, and the Cox & Snell R^2 value was 0.185.

The final regression model included four explanatory variables. Interestingly, perseverative error continued to present as a statistically significant variable associated with therapy adherence with a negative beta coefficient: $\beta = -0.07$, $p \leq 0.038$, SE = 0.03, OR = 0.93, 95% CI. 0.87 – 1.00. Psychological Wellbeing was also associated with therapy adherence with a statistically significant positive beta coefficient: $\beta = 0.03$, $p \leq 0.008$, SE = 0.01, OR = 1.03,

95% CI. 1.01 – 1.05. Male sex at birth also produced a statistically significant positive beta coefficient (β = 1.68, p ≤ 0.018, SE = 0.03, OR = 5.36, 95% CI. 1.34 – 21.40). Interestingly, self-reporting a mental health diagnosis (OCRD or ED), sub-scores from the CPAS and the number of received diagnoses were not entered in the therapy adherence model. Whilst this is consistent with most of the correlation analyses, which produced statistically nonsignificant associations. Except for the cognitive sub-scale score from the CPAS, which produced a statistically significant association with therapy adherence.

Table 10: Inferential Analysis for Question Two - Therapy Adherence

	β	S.E.	Sig.	Odds Ratio	95% C.I.	
					Lower	Upper
Perseverative Error	*-0.07*	*0.03*	*0.038*	*0.93*	*0.87*	*1.00*
Sex at Birth						
Female (Reference Category)						
Male	*1.68*	*0.71*	*0.018*	*5.36*	*1.34*	*21.40*
Preferred not to respond	21.83	28082.53	0.999	3037984434.39	0.00	-
Employment Status						
Full-Time (Reference Category)						
Out of Work	0.13	0.43	0.758	1.14	0.49	2.66
Part-Time	0.07	0.43	0.879	1.07	0.46	2.50
More than Full-Time	0.96	0.60	0.108	2.61	0.81	8.40
Retired	21.65	14373.34	0.999	2515328142.67	0.00	-
Prefer not to Respond	1.15	0.74	0.119	3.16	0.74	13.49
Wellbeing Index Percentage Score (WHO-5)	0.03	0.01	0.008	1.03	1.01	1.05

***Note**. Variable entered in step one: WHO%; Variable entered in step two: Perseverative Errors; Variable entered in step three: Sex at birth; and Variable entered in step four: Employment.* Beta Coefficient (β), Standard Error (SE), Statistical Significance (Sig.) & Confidence Interval (C.I).

The findings from this model showed how the data fits well as per the Hosmer-Lemeshow test and also yielded a larger *p*-value compared to the previous model examining therapy adherence pertaining to question one. This trend continues when examining the R^2 values, which produced an increase in size, which suggests improved explanatory power.

In summary, the therapy adherence model shows that perseverative error associated with therapy adherence. This model also suggests that psychological wellbeing and male gender identified at birth is associated with therapy adherence. Unexpectedly, our models could not find any variables that were linked to medication adherence.

4.4 Summary of Results

These results offer empirical evidence from two binary logistic regressions adopting different methods that show good, predicted probabilities and are consistent with the outcome variable, therapy adherence. Although there could be some limitations with the explanatory power of these models that suggest further scrutiny is needed over the entered explanatory variables, both models for therapy adherence showed that a unit increase in perseverative error was linked to a decrease in self-report adherence to psychological therapy. Interestingly, a unit increase in psychological wellbeing as measured by the WHO-5 questionnaire was linked to a unit increase in therapy adherence and unexpectedly, male gender at birth also yielded a statistically significant coefficient for this respective model. Moreover, the stepwise regression for therapy adherence included employment status, which produced a statistically nonsignificant beta coefficient but did produce a statistically significant negative correlation with perseverative error. The cognitive sub-scale score on CPAS produced a statistically significant negative correlation with therapy adherence, which was not entered into the stepwise regression model for therapy adherence. None of the regression models found that receiving therapy as an inpatient, education level and self-reporting a diagnosis of OCRD or ED were pertinent factors that related to therapy adherence. This inferential analysis did not find any explanatory variable that were associated with medication adherence.

Chapter V: Discussion

5.1 Overview of results

This cross-sectional study highlights that perseverative error is associated with poor therapy adherence among a sample of 181 participants who reported having OCRDs and/or EDs. The study also found self-reported psychological wellbeing and male sex linked to good treatment adherence.

Two regression models found this evidence, which is supportive of the set research questions for this study. The first regression model explored whether there were any cognitive processes, including perseverative error, that influenced therapy adherence. The model found that higher rates of perseverative error was linked to poor therapy adherence. None of the other entered variables from the WSCT-64 card version or the proxy for intellectual functioning (educational level) were found to be statistically significant explanatory variables. Interestingly, non-perseverative error almost achieved a statistically significant positive beta coefficient. Reaching statistical significance would have meant that other executive functions were implicated in therapy adherence. These findings support the first research question that an increased rate of perseverative error, a recognised measure of cognitive inflexibility, influences poor therapy adherence among various disorders characterised by compulsivity and impulsivity traits.

The second regression model explored the influence of various state and trait factors, including perseverative error, on therapy adherence. The regression model found that higher rates of perseverative error continued to be a factor that influenced poor therapy adherence. This model also found that good psychological wellbeing was associated with good therapeutic adherence. Moreover, it also found that male sex at birth was associated with good therapy adherence.

Neither regression model found supportive evidence to establish a link between cognitive inflexibility and medication adherence.

5.2 Relevance of the findings

These novel findings highlight that flexibility in thinking is a biomarker among people with OCRDs and EDs, which hampers their ability to follow the guide offered by the practitioner, which may negatively impact on therapy adherence. The process of therapy expects patients to make mental shifts during sessions, which poses a significant challenge for these patients. Understandably, these patients are conditioned (positive and negative feedback) to rigidly adhere to their beliefs and perspectives that are incongruent with the opportunity for change that requires flexibility in thinking (Diamond, 2013; Frota Lisboa Pereira de Souza et al., 2024; Mallorquí-Bagué et al., 2018). This poses a barrier to reaching therapeutic remission, given that good treatment adherence can result in improved posttreatment clinical outcomes (Leeuwerik et al., 2019; Simpson et al., 2021; Kan et al., 2020).

The above is a plausible explanation for therapy dropout rates for these disorders (DeJong et al., 2012; Fassino et al., 2009; Leeuwerik et al., 2019; Linardon et al., 2018). These inferences are supported by other studies that recruited patients with disorders of impulse control and compulsivity,[8] that found inflexibility of thinking influenced poor treatment adherence. These findings suggest that flexibility in thinking is a shared cognitive factor that is relevant to treatment adherence among various disorders. The extant literature studying therapy adherence used clinical observation metrics (i.e. dropout and weeks in treatment) for assessing adherence and looked at specific clinical populations (Álvarez-Moya et al., 2011; Fagan et al., 2015; Romero-Martínez et al., 2021; Streeter et al., 2008). Whereas this study included an objective cognitive task, which offers additional insights into the role of cognitive inflexibility as one of the limiting factors for therapy adherence, which is a shared transdiagnostic challenge for people with obsessive-compulsive and eating disorder psychopathology. This study assessed treatment adherence using two self-report scales, thus offering a dimensional approach that offers a more nuanced understanding of it. This could assist in the decision-making of clinicians when developing a treatment plan. This approach has not been explored before, and there are limitations in comparing different types of datasets, which offer a binary and more nuanced understanding of treatment

[8] This includes, substance disorder, gambling disorder and personality disorders with a forensic history.

adherence. Nevertheless, these challenges may also extend to other mental health disorders.

Another interesting finding in this research is that better psychological wellbeing was associated with good treatment adherence. Therefore, perceived life satisfaction could be an important factor to consider when clinicians are preparing patients for treatment. This is supported by studies that found a course of antidepressants improved the initial mood and wellbeing of patients with major depressive disorder, which enables them to undergo a course of CBT (Bayliss & Holttum, 2015; Tolin, 2017). Another explanation for this inference could be that talking therapy improves psychological wellbeing, which is supported by the statistically significant positive correlation between these variables reported in this study. There is an abundance of literature that recognises this finding (Marcus et al., 2014; van Agteren et al., 2021).

An unanticipated finding was that male sex at birth was associated with good therapy adherence when compared to the reference category, Female. These findings suggest a sex difference which was not anticipated. It is commonly known in EDs research that men are underrepresented (Solmi et al., 2024), and men with OCD often receive care much later than the onset of the disorder when compared to women (Zandt et al., 2025). Therefore, these findings highlight the importance of gender/sex analyses, given that the sex, male, is often underrepresented in OCRDs and EDs research. Offering further research that elucidates our understanding of sex and gender differences is essential, given that these poor treatment outcomes have a detrimental effect on people with these disorders (de la Cruz et al., 2024; Fineberg et al., 2019; Solmi et al., 2024) and the wider society (Jenkins, 2022; Kochar et al., 2023).

The reported regression models found that education level, disorder classification, receiving treatment as an inpatient and employment status was not linked to treatment adherence. Perseverative error has been shown to influence vaccine hesitancy among the general public during the COVID-19 pandemic. The link between inflexibility of thinking and treatment compliance also applies to a range of physical health conditions (Baluku et al., 2023; Dawson & Golijani-Moghaddam, 2020; Fineberg et al., 2022). These findings recognise

perseverative error as a transdiagnostic factor (Frota Lisboa Pereira de Souza et al., 2024), which interacts with an individual's ability to adhere to a therapy.

This study found no evidence that perseverative error was linked to medication adherence. There could be three possible hypotheses that explain these statistically nonsignificant findings. First, adhering to therapy may require a level of shared trust, which is facilitated through a therapeutic alliance (Laranjeira et al., 2023), and cognitive inflexibility, as reported in this work, may pose a greater barrier for a recipient who is expected to have a more active role in the therapeutic process. Whereas, a person prescribed a psychiatric medication may play a less active role during the intervention, which may not expose these cognitive deficits. Secondly, the recruited sample may have received a variety of different medications and dosages, which were prescribed for different clinical reasons. The therapeutic response (benefits and side effects) could be diverse given these possibilities (Healy, 2022). This raises queries about whether the scale was sensitive enough to identify the possible link between perseverative error and treatment adherence in a group of people receiving medication for perhaps different reasons. The Medication Adherence Scale may also lack predictive power, as each item in the scale has a binary response. This could influence the psychometric properties or its sensitivity to detect varying degrees of adherence (Tueller et al., 2016). This point is supported by previous studies that recruited patients with severe mental health disorders who received medications for a specific therapeutic outcome and found a link between flexibility in thinking and treatment adherence, which was measured using standardised scales (Lam et al., 2013; Vauth et al., 2004), such as Medication Management Ability Assessment (Depp et al., 2008) and Rating of Medication Influence Scale (Weiden et al., 1994).

5.3 Strengths and limitations

This is the first study that has explored the link between flexibility in thinking and treatment adherence among a sample of people with OCRDS and EDS. It was carried out as a cross-sectional study. The obtained data derived from a relatively large sample of EDS and OCRDS, which exceeded the recommended sample size as indicated by a power analysis, which was

calculated to detect a small effect size (Faul et al., 2007). Ergo, this minimised the risk of a false positive result.

This study recruited a diverse group of adults who were aged between 18 to 71 and had completed the study from various parts of the world. Moreover, 7.5% of the participants reported themselves as transgender or to a nonconforming gender. On average, these participants scored higher or below the general population or clinical threshold scores on the CPAS, WHO-5 Wellbeing Scale and perseverative error scores (Arango-Lasprilla et al., 2015; Gadelkarim et al., 2019; Omani-Samani et al., 2019). This suggests the recruited sample may have clinical features that are suggestive of the self-reported disorders. Although it is worth acknowledging, this study did not verify if the recruited participants were diagnosed with these disorders through a clinical assessment or by confirming through patient health records.

A limitation with the sample was that the majority of participants reported that they were female (83.6%) and received a university education (73.1%). Therefore, this limits the study's generalisability and its possible clinical relevance to other genders and communities that could be less inclined to access higher. Overrepresentation of a gender in mental health research has been shown to influence diagnosis and treatment, which may skewing findings when samples are not representative (Recio-Barbero & Pérez-Fernandez, 2019; Bacigalupe et al., 2024). Similarly, this study did not capture data on the economic status of participants, there is empirical evidence that shows how economically disadvantaged people are less likely to have access to academic opportunities, such as higher education, as well as experience poorer mental health outcomes, which may increase the chance of them requiring to access mental health services (Lowther-Payne et al., 2023). This suggests that the sample recruited in this study may not reflect the various cohorts that may typically access mental health services, given that these severe mental illnesses have been shown to negatively impact functional and occupational outcomes (Jenkins, 2022; Kochar et al., 2023).

Education level produced a statistically nonsignificant predictive variable, which would suggest that globally, intellectual functioning does not influence treatment adherence but rather specific cognitive resources, like cognitive flexibility are implicated. However, it is important to recognise how it is an imperfect proxy for understanding intellectual functioning. The researchers took the decision to use this imprecise measure rather than including other measures in the standard operating procedure. They thought using this imperfect approach would optimise recruitment and adherence to protocol as introducing further cognitive task could have added additional task expectations for participants, which could have contributed to further dropout. However, there are limitations in using educational level as a proxy for intellectual functioning, since the included conditions in this study can often hamper access to education due to the early onset of mental illness, hospitalisation, and functional impairment (Fineberg et al., 2019). These adversities may contribute to stigma and illness-related barriers that may disrupt access to higher education opportunities (Corrigan, 2018), which makes it an imperfect measure for understanding intellectual functioning among these severe mental illnesses. Using another cognitive task may have offset this limitation.

Another underrepresented cohort in this study is Black, Asian and other minorities, who are disproportionately affected by higher dropout rates (Farooqi et al., 2022). Whilst these communities are typically underrepresented in research, there is empirical evidence that highlights how there are ethnic differences in the clinical features of people with OCD (Wang et al., 2021; Wheaton et al., 2013; Wilson & Thayer, 2020). Whilst our exploratory regression analysis did not detect ethnicity differences, the majority of participants described themselves as ethnically white (80.6%), who were recruited from across the world. Further research that includes more proportionate minoritised participation would further elucidate if any other factors may influence therapeutic adherence.

Although the treatment adherence scales used in this research have good psychometric properties and have been used in empirical research, there are factors to consider when interpreting these findings. First, the therapy adherence scale used in this research produced a one-factor analysis solution that was like the exploratory factor analysis found in the validation study, which produced a one-factor solution with a sample of major

depressive disorder patients who received cognitive therapy (Gumport et al., 2023). Whilst the validation study later found a two-factor confirmatory analysis for this scale, with a sample of people with sleep disturbances (understanding/comprehension of therapy and compliance with therapy), this study found a one-factor solution. These results suggest how this scale can be validly administered across various mental health disorders receiving a variety of psychological therapies, but also how the differences in psychometric properties in the respective samples show that further attention is required in understanding therapy adherence among different mental health populations.

Another possible reason why there could be differences in the psychometric properties could be the way the scale was administered. In the initial validation study, the treatment adherence rating scale was administered as a repeated measure, pencil and paper task that was carried out during the course of a psychological therapy (Gumport et al., 2023). Whereas the recruited participants in this study completed the scale retrospectively as a one-off independent measure. The administration of these scale differences raises two issues over its use in this study. Completing this scale retrospectively in isolation from an intervention may result in a possible recall bias where the participant's perceptions of the therapy process may change through a course of time. Moreover, this scale was administered as a self-report and obtaining another perspective of therapy adherence (e.g. clinician measurement or close one) may offer a contextual understanding of therapy adherence (Lam & Fresco, 2015).

The trainee psychologist recognised that there are various limitations in how these scales were administered as an online self-report independent measure. Unfortunately, there were financial and time limitations that impacted the process of this thesis, which also influenced the scale choice and administration of the protocol. Ideally, the trainee psychologist would have preferred to use the Morisky Adherence Scale (Morisky et al., 2008), which has been widely used in research, but this was not possible due to the licensing cost for using this scale (moriskyscale.com/student-pricing.html). The chosen scale had similar questions to the Morisky adherence scale and could be used without any additional cost (Sajatovic et al., 2010). The choice of scale selection was pragmatic and highlights that including further scale selection would have offered more of a contextual

understanding of treatment adherence (Lam & Fresco, 2015). Whilst this may have strengthened the inferences made in this research, including further scales, may have impacted how well participants could tolerate completing an online survey, voluntarily.

The trainee psychologist and secondary supervisor carefully designed the online survey that could be completed in 15-20 minutes. There is compelling evidence that highlights research participation in this population is challenging, given that the average dropout rate of treatment-seeking people who were recruited onto trials is 29% (range 18% to 100%) (DeJong et al., 2012; Fassino et al., 2009; Johnco et al., 2020; Kan et al., 2020; Leeuwerik et al., 2019; Linardon et al., 2018; Soomro et al., 2008). Furthermore, the dropout rates in primary care mental surveys (10.3% to 61%) (Booker et al., 2021) are slightly lower than the non-completion response rates for this study, which was 76.29%. These non-completion rates highlight the challenges of recruiting a representative sample of treatment-seeking patients who have received some form of psychological and/or psychiatric treatment. This is also made evident by the steps the trainee psychologist took to promote research participation by liaising with 17 different consumer organisations and four social media sites, which are reported in the methodology and results chapters. Therefore, it is possible that the participants recruited to this study may not represent treatment-seeking patients who are likely to adhere poorly to the treatment offered to them in mental healthcare services. This underscores how participant recruitment with this population is challenging and the limitations of using a cross-sectional survey to collect data from this sample.

The proxy measure for cognitive inflexibility, perseverative error (Wisconsin Sorting Card test-64 card version; Miles et al., 2021), is widely used in research that has shown flexibility in thinking deficits among patients with OCRD and ED (Frota Lisboa Pereira de Souza et al., 2024), which was replicated in this research. Whilst the WSCT-64 card version has been widely accepted in research, a common consensus over the scale is that it is a complex task that produces 8 different measurements (Miles et al., 2021). This study found that participants, on average, had disproportionately higher rates of non-perseverative error than other metrics from the WSCT-64 card version, which was not anticipated. There could be two possible explanations for these results. First, the recruited participants could have other forms of dysexecutive function, which could include deficits in working memory

and/or disinhibition. Since these executive functions are perhaps closely interlinked with flexibility in thinking (Diamond, 2013), it is possible that these participants had other cognitive deficits, which were not considered in this study. To ascertain the possible involvement of other executive functions, this study could have benefited from utilising other cognitive measures that discretely measure flexibility in thinking and/or include additional tasks known to measure inhibitory control and working memory (Baddeley, 2000; Landry & Mitchell, 2021; Owen et al., 1991; Periáñez et al., 2021). The latter approach informed the statistical analysis plans in previous research (Deshpande, 2015; Thompson et al., 2006). Adopting this approach would have enabled this work account to specifically measure flexibility in thinking or for other possible executive functions that are used in a complex task. A second explanation for these disproportionate scores could be that this complex task was introduced at the end of the survey, which posed difficulties in tolerating the task and/or sustained attention (Miles et al., 2021). An approach to address this could be to counterbalance the procedure to minimise the effect of inattentiveness and cognitive fatigue experienced by participants.

5.4 Theoretical and Clinical Implications

The findings from this study offer compelling evidence showing the link between flexibility in thinking and treatment adherence. However, the associated explanatory power, beta coefficients and odds ratios are small, which suggests there could be other latent traits (i.e. working memory or inhibition) and/or contextual factors that may also influence treatment adherence. These findings highlight how therapy adherence is a multifaceted concept that could be influenced by various factors (Laranjeira et al., 2023). This study highlights that the integration of neuropsychological skills, like flexibility in thinking, with the Therapeutic Adherence Framework would improve our understanding of treatment adherence. This study also highlights that a comprehensive, cross-disciplinary theoretical shared understanding of treatment adherence would enable researchers and clinicians to assess and monitor the concept meaningfully (Laranjeira et al., 2023; Lehner et al., 2007; Sajatovic et al., 2010). Although the therapeutic adherence framework offers a comprehensive understanding of treatment adherence, this work has not been translated into clinical settings (Laranjeira et al., 2023).

The theoretical considerations for these disorders offer further context in how the successful completion and treatment adherence are ongoing challenges among these populations and service providers, which requires immediate attention. Given that these conditions have a considerable cost to society (Jenkins, 2022; Kochar et al., 2023), these findings suggest that flexibility in thinking is a biomarker that influences treatment adherence among patients with severe mental illnesses. Considering it in routine practice could offer improved clinical outcomes. Perhaps introducing latent traits as a minimum data set outcome measure would enable the NHS (Glover, 2000) to offer more tailored, efficacious and tolerable care to mental health patients. For instance, the routine gathering of this data may allow services to understand whether tracking these latent traits at assessment would be a predictive factor for treatment adherence in clinical practice. Establishing this link with patients in the NHS would enable healthcare providers to optimise healthcare experiences by maximising the possibility of therapeutic interventions yielding a positive outcome. It would also offer clinicians another objective tool to inform their choice of treatment plan and improve patient experience.

5.5 Suggestions for further research

This study offers preliminary evidence that establishes the link between cognitive inflexibility and therapy adherence among people with OCRDs and EDs. Given that these findings are from cross-sectional observations, further replication of these findings using a prospective design is needed. Carrying out a prospective design using a repeated-measure approach would enable an intervention trial to identify if baseline cognitive resources could predict treatment adherence or clinical outcomes for a course of psychological and/or psychiatric therapy. Adopting this approach would enable this work to make clear inferences of causality between cognitive resources and adherence, which was not possible in this cross-sectional study. Although a retrospective design could explore this link, it would raise issues and queries over the quality of data and recall bias. Future research should examine the link between cognitive inflexibility and treatment adherence among various clinical populations receiving some form of treatment. Ideally, a study replicating a similar methodology, as an additional procedure in a randomised trial, would confirm whether this

concept pertains to specific evidence-based intervention(s) and among mental health populations. Further research would also benefit from additional measurements of treatment adherence and cognitive flexibility so that these concepts are considered more thoroughly (Lam & Fresco, 2015).

There appear to be no gold standard measures that are widely used in the assessment of adherence to mental health treatment that include therapy and/or psychiatric medication (Lam & Fresco, 2015; Lehner et al., 2007). Given the lack of consensus in the field, perhaps further qualitative research could invite cohorts of clinicians and patients for semi-structured interviews to obtain their understanding of treatment adherence and develop a theory to understand adherence in the context of the NHS. A qualitative approach could assist in the development of a valid and reliable treatment adherence rating scale.

5.6 Conclusion

This study reveals interesting findings stating deficits in flexibility in thinking are linked to therapy adherence reported among OCRDs and EDs populations. This highlights cognitive inflexibility represents as a factor linked to therapy adherence and is a novel biomarker for personalised care. Clinicians should be attentive to the signs of cognitive inflexibility to inform their clinical decision-making and treatment selection, to enhance treatment outcomes. This relationship is applicable trans-diagnostically and may translate to the general public, given that this study did not find employment status, age, ethnicity, educational level, and the proxy variable for complexity were not relevant factors that were linked to therapy adherence. This study also found that good psychological wellbeing was associated with therapy adherence, which is consistent with previous findings. Surprisingly, though, male sex at birth was associated with better therapy adherence than female. Whilst this is an interesting conclusion, further research is needed to understand these sex differences.

This study did not find that perseverative error was associated with medication adherence. It is anticipated that this could be a result of the scale lacking sensitivity to notice how perseverative error may influence medication adherence. Since the possible prescribed

medications and dosages would have been heterogeneous, the scale would have measured various therapeutic effects. This may have impacted the specificity of the scale. This was not a concern when assessing therapy adherence, given that the scale was recommended for assessing adherence to evidence-based therapies (Gumport et al., 2023).

These findings also offer a relevant biomarker for understanding therapeutic adherence and how theories of treatment adherence would benefit from considering the role of inflexibility in thinking. Moreover, findings highlight the limitations of understanding and assessing treatment adherence, which require further revision. Additional empirical research is needed that refines how treatment adherence is understood and assessed across disciplines. Although the novel biomarker findings are compelling and clinicians should consider cognitive flexibility when offering treatment plans, this research area requires further examination, particularly with a prospective design.

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Appendix I- Data Collection Process

The following link offers access to an excel document that was used to extract data for the SLR. The heading below were used to extract data.

https://docs.google.com/spreadsheets/d/1HWGSti52hr-iH72dicVR9z6KhuJYZNka/edit?usp=sharing&ouid=116340734686655292139&rtpof=true&sd=true

No
Author
Year
Country
Research Question
Q considers CF&TA
Group
MH Disorder
Setting
No of Participants
No of Females
% of females
No of Men
Average Age
SD Age
Study Design
Analysis type
Intervention
Type
Dose
Adherence

Cognitive Flexibility Measure
Analysis (1)
Inferential Statistics
Comments
Result
Result, Number
QAATDS
QAATDS%

Appendix II Quality Rating Tool - Criteria from Harrison et al.'s (2021) QuADS Framework

QuADS Criteria	0	1	2	3
1. **Theoretical or conceptual underpinning to the research**	No mention at all.	General reference to broad theories or concepts that frame the study. e.g. key concepts were identified in the introduction section.	Identification of specific theories or concepts that frame the study and how these informed the work undertaken. e.g. key concepts were identified in the introduction section and applied to the study.	Explicit discussion of the theories or concepts that inform the study, with application of the theory or concept evident through the design, materials and outcomes explored. e.g. key concepts were identified in the introduction section and the application apparent in each element of the study design.

2. Statement of research aim/s	No mention at all.	Reference to what the sought to achieve embedded within the report but no explicit aims statement.	Aims statement made but may only appear in the abstract or be lacking detail.	Explicit and detailed statement of aim/s in the main body of report.
3. Clear description of research setting and target population	No mention at all.	General description of research area but not of the specific research environment e.g. 'in primary care.'	Description of research setting is made but is lacking detail e.g. 'in primary care practices in region [x]'.	Specific description of the research setting and target population of study e.g. 'nurses and doctors from GP practices in [x] part of [x] city in [x] country.'
4. The study design is appropriate to address the stated research aim/s	No research aim/s stated or the design is entirely unsuitable e.g. a Y/N item survey for a study seeking to undertake exploratory work of lived experiences. .	The study design can only address some aspects of the stated research aim/s e.g. use of focus groups to capture data regarding the frequency and experience of a disease.	The study design can address the stated research aim/s but there is a more suitable alternative that could have been used or used in addition e.g. addition of a qualitative or quantitative component could strengthen the design.	The study design selected appears to be the most suitable approach to attempt to answer the stated research aim/s.

5. Appropriate sampling to address the research aim/s	No mention of the sampling approach.	Evidence of consideration of the sample required e.g. the sample characteristics are described and appear appropriate to address the research aim/s.	Evidence of consideration of sample required to address the aim. e.g. the sample characteristics are described with reference to the aim/s.	Detailed evidence of consideration of the sample required to address the research aim/s. e.g. sample size calculation or discussion of an iterative sampling process with reference to the research aims or the case selected for study.
6. Rationale for choice of data collection tool/s	No mention of rationale for data collection tool used.	Very limited explanation for choice of data collection tool/s. e.g. based on availability of tool.	Basic explanation of rationale for choice of data collection tool/s. e.g. based on use in a prior similar study.	Detailed explanation of rationale for choice of data collection tool/s. e.g. relevance to the study aim/s, codesigned with the target population or assessments of tool quality.

7. The format and content of data collection tool is appropriate to address the stated research aim/s	No research aim/s stated and/or data collection tool not detailed.	Structure and/or content of tool/s suitable to address some aspects of the research aim/s or to address the aim/s superficially e.g. single item response that is very general or an open-response item to capture content which requires probing.	Structure and/or content of tool/s allow for data to be gathered broadly addressing the stated aim/s but could benefit from refinement. e.g. the framing of survey or interview questions are too broad or focused to one element of the research aim/s.	Structure and content of tool/s allow for detailed data to be gathered around all relevant issues required to address the stated research aim/s.
8. Description of data collection procedure	No mention of the data collection procedure.	Basic and brief outline of data collection procedure e.g. 'using a questionnaire distributed to staff'.	States each stage of data collection procedure but with limited detail or states some stages in detail but omits others e.g. the recruitment process is mentioned but lacks important details.	data were gathered such that the procedure could be replicated.

9. Recruitment data provided	No mention of recruitment data.	Minimal and basic recruitment data e.g. number of people invited who agreed to take part.	Some recruitment data but not a complete account e.g. number of people who were invited and agreed.	Complete data allowing for full picture of recruitment outcomes e.g. number of people approached, recruited, and who completed with attrition data explained where relevant.
10. Justification for analytic method selected	No mention of the rationale for the analytic method chosen.	Very limited justification for choice of analytic method selected. e.g. previous use by the research team.	Basic justification for choice of analytic method selected e.g. method used in prior similar research.	Detailed justification for choice of analytic method selected e.g. relevance to the study aim/s or comment around of the strengths of the method selected.

11. The method of analysis was appropriate to answer the research aim/s	No mention at all.	Method of analysis can only address the research aim/s basically or broadly.	Method of analysis can address the research aim/s but there is a more suitable alternative that could have been used or used in addition to offer a stronger analysis.	Method of analysis selected is the most suitable approach to attempt answer the research aim/s in detail e.g. for qualitative interpretative phenomenological analysis might be considered preferable for experiences vs. content analysis to elicit frequency of occurrence of events.
12. Evidence that the research stakeholders have been considered in research design or conduct.	No mention at all.	Consideration of some the research stakeholders e.g. use of pilot study with target sample but no stakeholder involvement in planning stages of study design.	Evidence of stakeholder input informing the research. e.g. use of pilot study with feedback influencing the study design/conduct or reference to a project reference group established to guide the research.	Substantial consultation with stakeholders identifiable in planning of study design and in preliminary work e.g. consultation in the conceptualisation of the research, a project advisory group or evidence of stakeholder input informing the work.

13. Strengths and limitations critically discussed	No mention at all.	Very limited mention of strengths and limitations with omissions of many key issues. e.g. one or two strengths/limitations mentioned with limited detail.	Discussion of some of the key strengths and weaknesses of the study but not complete. e.g. several strengths/limitations explored but with notable omissions or lack of depth of explanation.	Thorough discussion of strengths and limitations of all aspects of study including design, methods, data collection tools, sample & analytic approach.

Appendix III: Study Characteristics

Study Characteristics

Study	MH Disorder	n	% of females	Intervention	Outcome: Adherence	Cognitive Flexibility tool
Romero-Martínez et al., (2021)	Personality Disorders & Forensic history	424	0	Psychological Therapy	**Dropout** (Did not complete the entire intervention)	**Composite Score:** WSCT-128: number of correct Reponses & Emotion Decoding Task correct responses and perseverative errors
Aharonovich et al., (2006)	SUD [1]	56	23.21	Psychological Therapy	**1. Dropout** (Missed two or more consecutive weeks) 2. Weeks in treatment	**WSCT-128 card version:** Perseverative Error Perseverative Responses
Álvarez-Moya et al., (2011)	Gambling Disorder	88	7.95	Psychological Therapy	**Dropout** (Terminated treatment before completing the number of offered sessions)	**WCST-64 card version** categories **TMT Part B-A**

Fagan et al., (2015)	SUD[1] & Bi-Polar Disorders	120	39.17	Medication	1. Number of attended postbaseline appointment 2. Mean % of pills taken 3. % of pill bottles returned	**Stroop Word** **Stroop Word/Colour** **Stroop interference**
Kamp et al., (2019)	SUD[2]	108	Not Specified	Psychological Therapy	**Dropout** (The whole treatment episode was not completed)	**TMT Part A-B** **Stroop interference test**
Mallorquí-Bagué et al., (2018)	Gambling Disorder	115	0	Psychological Therapy	**Dropout** (Missed three or more sessions without notifying the clinician)	**WSCT-128 card version:** Perseverative Error, Response Error & Categories Completed.
Streeter et al., (2008)	SUD [1]	74	29.73	Psychological Therapy & Medication	**Dropout** (No definition provided)	**Stroop Colour-Word Interference Task**
Teichner et al., (2002)	SUD	94	31.91	Psychological Therapy	**Dropout** (No follow-up data were obtained after 30 days)	**TMT Part B-A** (difference score)
El-Missiry et al., (2015)	Schizophrenia	82	51.22	Medication	**Medication Management Ability Assessment**	**WCST-128 card version** % Total Error

						% Perseverative Response % Perseverative Responses % Perseverative Error
Lam et al., (2013)	Schizophrenia	197	39.09	Medication	**ROMI Scale** (3 factors reasons for compliance: influence of others, prevention and medication affinity)	**WCST-128 card version** Perseverative Error
Lui et al., (2021)	Schizophrenia	90	52.22	Medication	**Composite Score of measurements:** 1. Brief Adherence Rating 2. Global Clinical Impression scale 3. The medication possession ratio based on pharmacy refill records in the past 12 months 4. Pill counting at home by clinician	**WCST-128 card version** Perseverative Error
Senner et al., (2023)	Schizophrenia or bipolar disorder	862	44.78	Medication	**Adapted BARS** (Self-assessed)	**EF Composite score** BVDS,TMT B & TMT B-A (difference score)
Vauth et al., (2004)	Schizophrenia	109	29.36	Medication	**BARS** (Clinician administered)	**WCST-128 card version**

	% of Errors, Preservative responses, % perseverative responses & % preservative error.

Note. 1. Cocaine Dependence. 2. Methamphetamine, Trail Making Test (TMT), Wisconsin Sorting Card Test (WSCT), (VDS), Brief Adherence Rating Scale (BARS) (Byerly et al., 2008), Rating of Medication Influences (ROMI) Scale (Weiden et al., 1994) and Backwards Verbal Digit Span (BVDS)

Appendix IV QuADS Appraisal Tool

QuADS Appraisal Tool

	1. Concept	2. Aims	3. Settings & Population	4 Study Design	5. Sampling	6. Data Collection	7. Format & Content of Data	8. Data Collection Procedure	9. Recruitment	10. Analytic Method	11. Analysis	12. Stakeholders	13. Strengths & Limitations	Total (%)
Category 1: Conditions typically showing compulsivity traits n=8														
(Romero-Martínez et al., 2021)	3	3	3	2	3	2	3	3	2	3	3	1	0	31 (79.49)
(Aharonovich et al., 2006)	3	3	2	2	2	2	2	2	1	3	3	0	3	28 (71.79)
(Álvarez-Moya et al., 2011)	3	3	3	3	2	3	3	1	1	3	2	0	1	28 (71.79)
(Teichner et al., 2002)	3	2	3	2	2	2	2	1	1	0	3	0	3	24 (61.54)
(Fagan et al., 2015)	3	3	3	2	1	2	2	1	1	1	3	0	2	24 (61.54)
(Mallorquí-Bagué et al., 2018)	3	3	3	3	2	0	2	1	1	1	3	0	1	23 (58.97)
(Kamp et al., 2019)	3	2	3	3	1	2	1	1	1	1	3	0	1	22 (56.41)

(Streeter et al., 2008)	2	3	3	3	1	0	2	2	1	1	3	0	0	21 (53.85)

Continued.

	1. Concept	2. Aims	3. Settings & Population	4 Study Design	5. Sampling	6. Data Collection	7. Format & Content of Data	8. Data Collection Procedure	9. Recruitment	10. Analytic Method	11. Analysis	12. Stakeholders	13. Strengths & Limitations	Total (%)
Category 2: Patients with schizophrenia n=5														
(Lui et al., 2021)	2	2	2	2	2	1	2	1	1	2	3	1	2	23 (58.97)
(Lam et al., 2013)	2	2	3	2	1	2	1	2	1	1	3	0	2	22 (56.41)
(Vauth et al., 2004)	3	3	3	3	1	1	3	0	1	1	3	0	0	22 (56.40)
(El-Missiry et al., 2015)	3	3	3	3	1	2	3	1	1	0	0	0	2	22 (56.41)
(Senner et al., 2023)	2	3	3	2	2	0	2	0	1	1	3	0	2	21 (53.85)

Appendix V - Summary of Inferential Statistics from Included Studies

Summary of Inferential Statistics from Included Studies

Cognitive Flexibility Measure	Outcome: Adherence	x^2	t	r	Adj. R^2	Beta	Wald	SE	OR	Lower 95%CI	Upper 95%CI	*P* - value
Category 1: Disorders of Impulse Control and Compulsivity (n=8)												
Romero-Martínez et al., (2021)												
WSCT number of correct responses & Emotions	Dropout						10.51	25.00	0.45	0.28	0.73	0.001
Total Error	Dropout			0.18								0.001
Perseverative Error	Dropout			0.13								0.050
Total Error	Intervention Dose			-0.18								0.001
Perseverative Error	Intervention Dose			-0.20								0.010
Aharonovich et al., (2006)												
Perseverative Error	Dropout								0.98	0.96	1.01	0.213
Perseverative Responses	Dropout								0.99	0.96	1.01	0.348
Perseverative Error	Week in Treatment					0.11						0.390
Perseverative Responses	Week in Treatment					0.00						0.980
Álvarez-Moya et al., (2011)												

Set Shifting	Dropout			0.03		0.05	1.03	0.93	1.15	0.560
Perseverative Error	Dropout				– 0.453	0.34	0.64	0.33	1.25	0.190
			Teichner et al., (2002)							
Set Shifting	Dropout		1.14							0.055
			Fagan et al., (2015)							
SCW	Attendance			0.04			0.04			0.039
SCW	% of Pills taken			0.01			1.01			0.020
SCW	% of Pill bottle Returned			0.02			1.02			0.049
			Mallorquí-Bagué et al., (2018)							
Perseverative Error	Dropout			0.04		0.03	1.05			0.046
Response errors	Dropout			-0.09		0.04	0.91			0.021
Perseverative Error	Low Compliance			0.11		0.06	1.12			0.050
			Kamp et al., (2019)							
Stroop	Dropout									0.280
			Streeter et al., (2008)							
Stroop	Completed treatment	12.60								0.006
			Lui et al., (2021)							
Perseverative Error	Composite Score		0.15							0.170
			Lam et al., (2013)							
Perseverative Error	ROMI Scale		-0.25	-0.20						0.020
Category	ROMI Scale		0.88		0.08					0.380
			Vauth et al., (2004)							
Perseverative Error	Influence of other		0.02	0.30	0.14					0.040

% Perseverative Error	BARS		0.48		1.51	1.61	0.08	31.19	0.750
			El-Missiry et al., (2015)						
% Total Error	MMA		-0.42		0.19	0.66	0.45	0.96	0.030
% Perseverative Response	MMA		0.22		0.91	0.80	0.14	4.81	0.811
% Perseverative Responses	MMA		0.22		0.91	0.80	0.14	4.81	0.811
% Perseverative Error	MMA		0.479		1.511	1.614	0.084	31.190	0.750
			Senner et al., (2023)						
EF composite score	BARS	-0.03	0.00		0.03				0.980
			Romero-Martínez et al., (2021)						
WSCT number of correct responses & Emotions	Dropout			10.51	25.00	0.45	0.28	0.73	0.001
Total Error	Dropout	0.18							0.001
Perseverative Error	Dropout	0.13							0.050
Total Error	Intervention Dose	-0.18							0.001
Perseverative Error	Intervention Dose	-0.20							0.010
			Aharonovich et al., (2006)						
Perseverative Error	Dropout					0.98	0.96	1.01	0.213
Perseverative Responses	Dropout					0.99	0.96	1.01	0.348
Perseverative Error	Week in Treatment		0.11						0.390

Perseverative Responses	Week in Treatment		0.00					0.980
			Álvarez-Moya et al., (2011)					
Set Shifting	Dropout		0.03		0.05	1.03	0.93	1.15	0.560
Perseverative Error	Dropout			– 0.453	0.34	0.64	0.33	1.25	0.190
			Teichner et al., (2002)					
Set Shifting	Dropout		1.14						0.055
			Fagan et al., (2015)					
SCW	Attendance		0.04			0.04			0.039
SCW	% Pills taken		0.01			1.01			0.020
SCW	% Pill bottle Returned		0.02			1.02			0.049
			Mallorquí-Bagué et al., (2018)					
Perseverative Error	Dropout		0.04		0.03	1.05			0.046
Response errors	Dropout		-0.09		0.04	0.91			0.021
Perseverative Error	Low Compliance		0.11		0.06	1.12			0.050
			Kamp et al., (2019)					
Stroop	Dropout								0.280
			Streeter et al., (2008)					
Stroop	Completed treatment	12.60							0.006

<u>Category 2: People with Schizophrenia (n=5)</u>

Lui et al., (2021)

Perseverative Error	Composite Score		0.15						0.170
			Lam et al., (2013)						
Perseverative Error	ROMI Scale	-0.25	-0.20						0.020
Category	ROMI Scale	0.88			0.08				0.380
			Vauth et al., (2004)						
Perseverative Error	Influence of other		0.02	0.30	0.14				0.040
% Perseverative Error	BARS				0.48	1.51	1.61	0.08	31.19	0.750
			El-Missiry et al., (2015)						
% Total Error	MMA				-0.42	0.19	0.66	0.45	0.96	0.030
% Perseverative Response	MMA				0.22	0.91	0.80	0.14	4.81	0.811
% Perseverative Error	MMA				0.48	1.511	1.614	0.084	31.19	0.750
			(Senner et al., (2023)						
EF composite score	BARS	-0.03			0.00	0.03				0.980

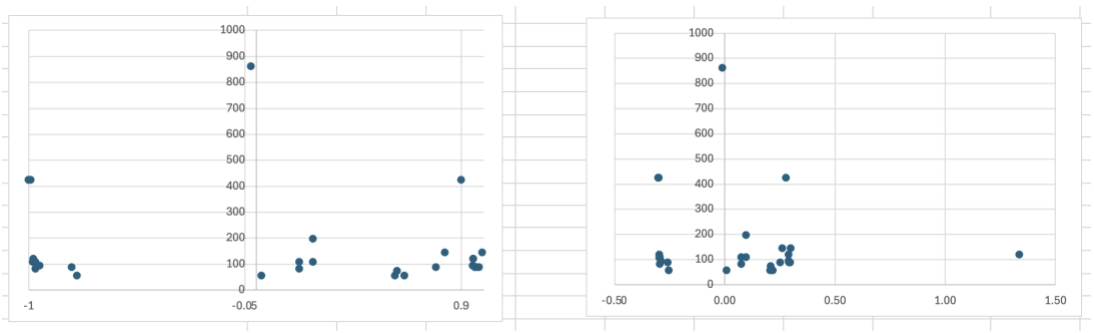
Note. SE (Standard Error), OR (Odds Ratio), CI (Confidence Interval), SCW (Stroop Colour Word Test), ROMI (Rating of Medication Influences Scale), BARS (Brief Adherence Rating Scale), MMA (Medication Management Ability Assessment), EF (Executive Function).

Appendix VI – Attempts in creating the Albatross Plot

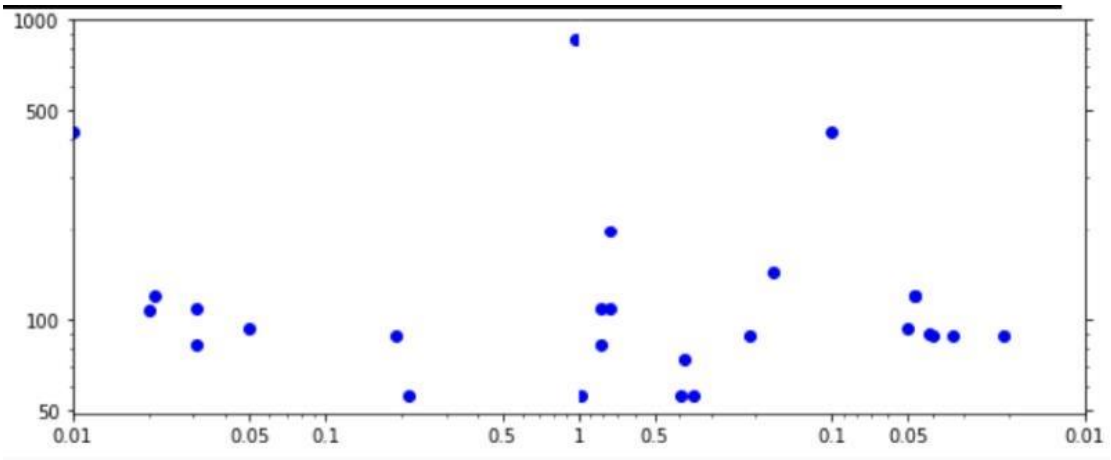
Assistance was sought from a post-doctoral PhD student, a cognitive psychologist, the plot's developer blog (https://seanharrisonblog.com/2017/10/29/albatross-plots-part-1/), and attempts were made to contact the developer of the plot for further guidance. Also, the trainee psychologist referred to the Cochrane Handbook (Higgins & Green, 2008).

See below attempted plots and related correspondence.

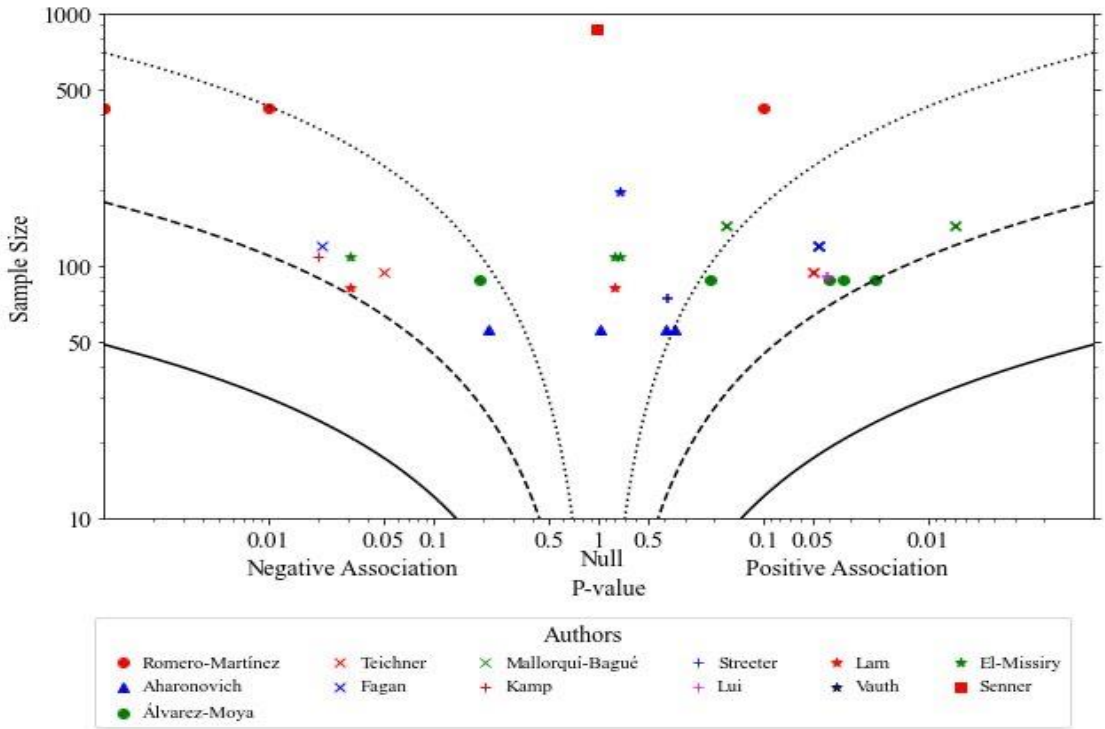
Unsuccessful attempts in creating the plot on Excel



Unsuccessful attempts in creating the plot on Python



Unsuccessful attempts in creating the plot on Python.



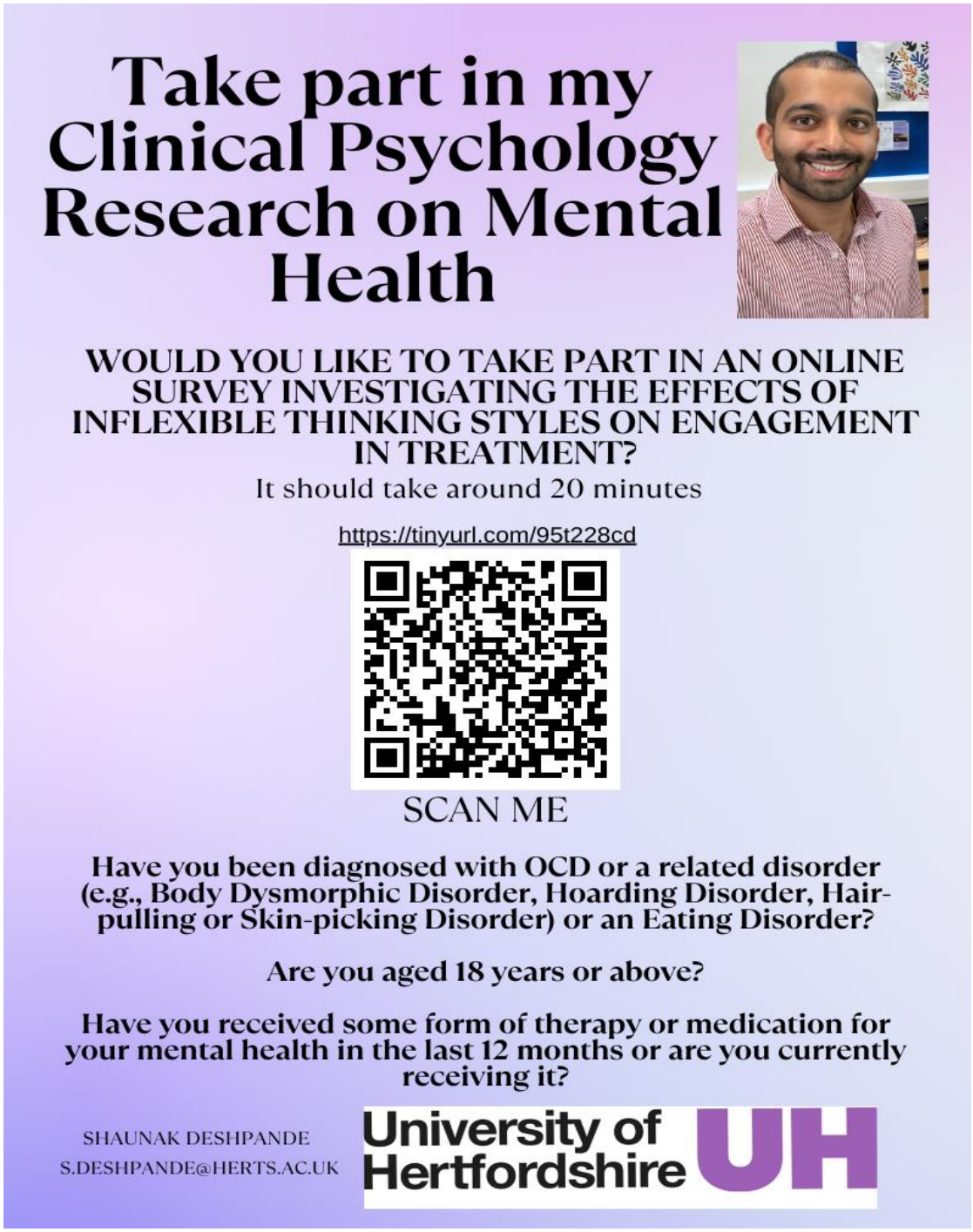
Se below link for related correspondence;

https://drive.google.com/drive/folders/1oPTNc_9W7RUFegJH8rHHcNJKjf0-X2qu?usp=drive_link

Appendix VII – Research Poster/Advert

Please see access link to see Research Poster/Advert, which were used.

Poster distributed to consumer organisations.



Poster shared with Renfrew Treatment Centre

Take part in my Clinical Psychology Research on Mental Health

WOULD YOU LIKE TO TAKE PART IN AN ONLINE SURVEY INVESTIGATING THE EFFECTS OF INFLEXIBLE THINKING STYLES ON ENGAGEMENT IN TREATMENT?

It should take around 20 minutes

https://tinyurl.com/95t228cd

SCAN ME

Have you been diagnosed with OCD or a related disorder (e.g., Body Dysmorphic Disorder, Hoarding Disorder, Hair-pulling or Skin-picking Disorder) or an Eating Disorder?

Are you aged 18 years or above?

Have you received some form of therapy or medication for your mental health in the last 12 months or are you currently receiving it?

SHAUNAK DESHPANDE

S.DESHPANDE@HERTS.AC.UK

University of Hertfordshire UH

"THE RENFREW CENTER IS COMMITTED TO PROVIDING CURRENT AND/OR FORMER PATIENTS WITH OPPORTUNITIES TO VOLUNTEER TO PARTICIPATE IN EATING DISORDER RESEARCH STUDIES. THE PERMISSION PROVIDED BY THE RENFREW CENTER FOR RECRUITMENT OF RESEARCH PARTICIPANTS IS NOT AN EXPLICIT ENDORSEMENT OF A PARTICULAR RESEARCH STUDY AND DOES NOT REPRESENT A DIRECT OR BROAD PARTNERSHIP WITH THE PRINCIPAL INVESTIGATOR(S) OR THEIR INSTITUTION.

Poster approved by the NHS ethics committee.

Take part in my Clinical Psychology Research on Mental Health

WOULD YOU LIKE TO TAKE PART IN AN ONLINE SURVEY INVESTIGATING THE EFFECTS OF INFLEXIBLE THINKING STYLES ON ENGAGEMENT IN TREATMENT?

It should take around 20 minutes

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SCAN ME

Have you been diagnosed with OCD or a related disorder (e.g., Body Dysmorphic Disorder, Hoarding Disorder, Hair-pulling or Skin-picking Disorder) or an Eating Disorder?

Are you aged 18 years or above?

Have you received some form of therapy or medication for your mental health in the last 12 months or are you currently receiving it?

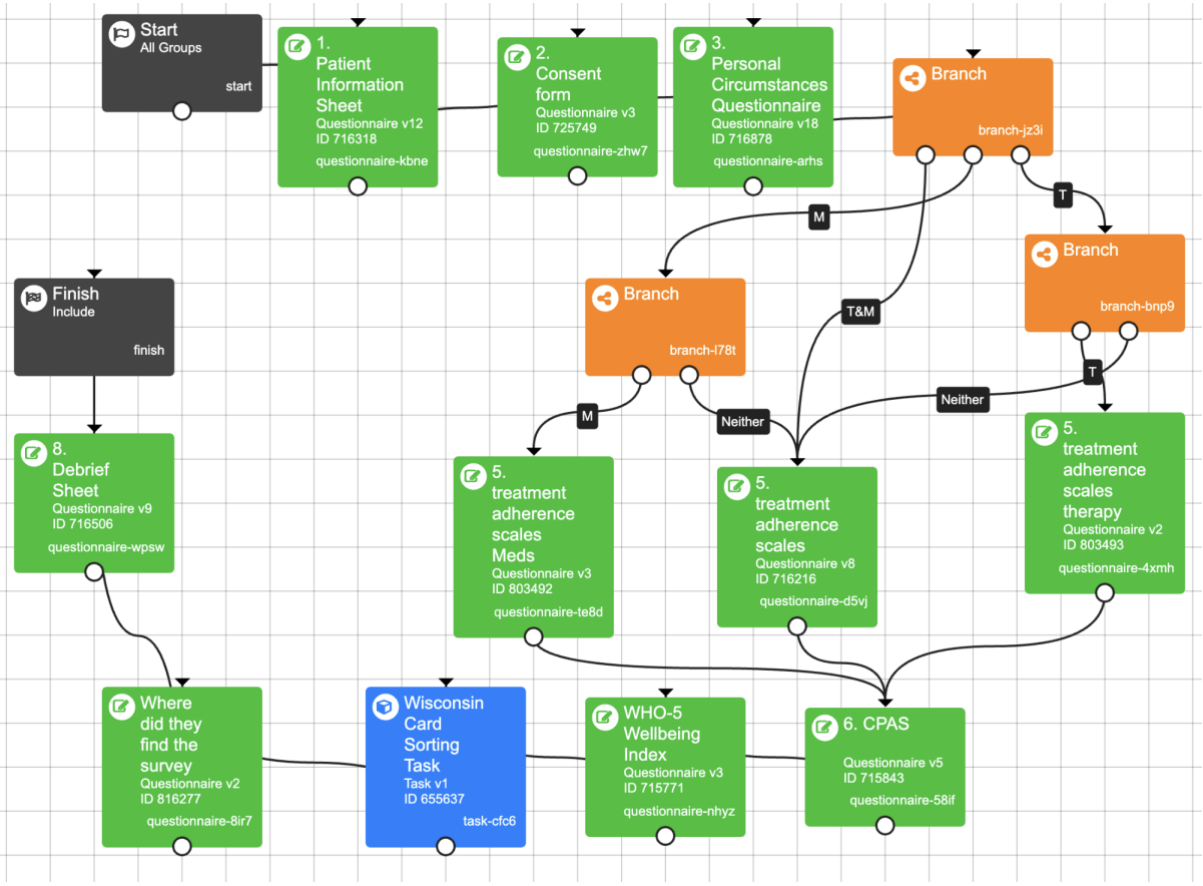
SHAUNAK DESHPANDE
S.DESHPANDE@HERTS.AC.UK
VERSION 1: 27/05/2024

University of Hertfordshire UH

Research Advert used to promote on Social Media.

Appendix VIII – Standard Operating Procedure for the Online Survey

The following branching logic was used on Gorilla Experiment Builder when navigating the participants through the information sheets, questionnaires and task. A template of each respective questionnaire has been presented below.



1a. **Participant information sheet**

Is inflexibility in thinking a determinant for adhering to mental health therapies?

Hello, my name is Shaunak Deshpande. I am a trainee clinical psychologist. As part of my doctoral training in clinical psychology at Hertfordshire University, I invite you to participate in my research exploring how flexibility in thinking can influence well-being and adherence to therapies.

It is essential for you to have the necessary information about this research before deciding whether or not to participate. Please read through this information, and if you have any questions, feel free to contact us (contact details are provided below).

****What is the purpose of this study?****

There is little research that explores this topic despite those receiving mental health therapies often face difficulties during treatment and poor treatment outcomes. This research aims to understand how flexibility in thinking influences participation in mental health treatments and its effects on well-being. We will ask you to complete some questions exploring personality traits, well-being, and treatment adherence, as well as a puzzle measuring flexibility in thinking.

****Do I have to take part?****

As a participant in this research, we ask that you answer these questions as truthfully as possible by giving the most relevant rating of your situation. Participation is voluntary, so you are not required to complete the survey. *You can withdraw anytime without a reason*; you only need to close the internet browser.

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

You can take part in this research if you are aged 18 or above and have received some form of mental health treatment in the last 12 months. This includes receiving some form of talking therapy or psychiatric medication.

You also should have been diagnosed by a mental health professional with one or more of the following mental health disorders: obsessive-compulsive disorder (OCD) or a related disorder such as body dysmorphic disorder, olfactory reference disorder, hypochondriasis (health anxiety), hoarding

disorder, hair-pulling disorder, skin-picking disorder, or an eating disorder such as anorexia nervosa, bulimia nervosa, binge eating disorder, avoidant restrictive food intake disorder and PICA.

****How long will my part in the study take?****

The survey can be completed via smartphones, tablets, and personal computers/laptops. The survey will usually take around 30 minutes to complete.

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

Should you choose to participate, we recommend you find a quiet room where you will not be disturbed for the duration of the study (about 30 minutes). You will be asked questions about your personal circumstances and mental health. You then will be asked to complete ****some questionnaires measuring psychological well-being, personality traits, adherence to mental health treatments, and a puzzle measuring flexibility in thinking**.**

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

We do not expect the survey to be distressing; you may withdraw from the survey at any point by simply closing the internet browser. In doing so, no information you have disclosed up to that point will be recorded.

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

Your contribution to this research will help us to raise our understanding of how flexibility in thinking influences well-being and adherence to treatments, with potential for guiding development of more effective approaches for treating these disorders. **In case you are struggling with your mental wellbeing you will also receive access to an information leaflet that will direct you to various self-help resources that could support you with your mental wellbeing. The information provided in this document is provided by the World Health Organisation (WHO), Centre For Disease (CDC) and NHS**.

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

All information that you provide will be anonymised. This means the responses to the questions asked to you cannot be traced back to you. All data from the study will be securely stored on the Hertfordshire University server. Your data and those of others who have participated could be presented in combined form in a thesis, research meetings, and peer-review journals. Steps will also be taken to maintain confidentiality in line with the General Data Protection Regulation (GDPR) when handling data, and data will be stored for five years and then deleted. If you wish to view the research

findings, you can view them in Hertfordshire University's research archive in the final quarter of 2025 by searching my name.

****Should I expect to receive any feedback on my results? ****

We cannot give personalised feedback on your performance, and results cannot be used to make a clinical diagnosis or for any other purpose.

****Who has reviewed this study?****

This project has been approved by the University of Hertfordshire Health, Science, Engineering and Technology Ethics Committee with Delegated Authority (ECDA) (UH protocol number: TO BE SUBMITTED.

****Who can I contact if I have any questions?****

If there is anything unclear or you wish to discuss about this project, please do not hesitate to contact us using the details below.

Your support is very much appreciated.

Mr Shaunak Deshpande, School of Life and Medical Sciences, University of Hertfordshire, Hatfield AL10 9AB Email: s.deshpande@herts.ac.uk

Professor Naomi Fineberg, School of Life and Medical Sciences, University of Hertfordshire, Hatfield AL10 9AB Email: naomi.fineberg@btinternet.com

Dr Keith Sullivan, School of Life and Medical Sciences, University of Hertfordshire, Hatfield AL10 9AB Email: k.sullivan3@herts.ac.uk

****Thank you very much for reading this information and considering taking part in this study.****

****If you are happy to participate, please continue to the consent form on the following page.****

1b. **NHS Participant information sheet**

Is inflexibility in thinking a determinant for adhering to mental health therapies?

Hello, my name is Shaunak Deshpande. I am a trainee clinical psychologist. As part of my doctoral training in clinical psychology at Hertfordshire University, I invite you to participate in my research exploring how flexibility in thinking can influence well-being and adherence to therapies.

It is essential for you to have the necessary information about this research before deciding whether or not to participate. Please read through this information, and if you have any questions, feel free to contact us (contact details are provided below).

****What is the purpose of this study?****

There is little research that explores this topic despite those receiving mental health therapies often face difficulties during treatment and poor treatment outcomes. This research aims to understand how flexibility in thinking influences participation in mental health treatments and its effects on well-being. We will ask you to complete some questions exploring personality traits, well-being, and treatment adherence, as well as a puzzle measuring flexibility in thinking.

****Do I have to take part?****

As a participant in this research, we ask that you answer these questions as truthfully as possible by giving the most relevant rating of your situation. Participation is voluntary, so you are not required to complete the survey. *You can withdraw anytime without a reason*; you only need to close the internet browser.

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

You can take part in this research if you are aged 18 or above and have received some form of mental health treatment in the last 12 months. This includes receiving some form of talking therapy or psychiatric medication.

You also should have been diagnosed by a mental health professional with one or more of the following mental health disorders: obsessive-compulsive disorder (OCD) or a related disorder such as body dysmorphic disorder, olfactory reference disorder, hypochondriasis (health anxiety), hoarding disorder, hair-pulling disorder, skin-picking disorder, or an eating disorder such as anorexia nervosa, bulimia nervosa, binge eating disorder, avoidant restrictive food intake disorder and PICA.

You will also need to have access to some form of digital device, such as a computer, laptop or smartphone.

****How long will my part in the study take?****

The survey can be completed via smartphones, tablets, and personal computers/laptops. The survey will usually take around 30minutes to complete.

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

Should you choose to participate, we recommend you find a quiet room where you will not be disturbed for the duration of the study (about 30 minutes). You will be asked questions online about your personal circumstances and mental health. You will also be asked to complete **some questionnaires measuring psychological well-being, personality traits, adherence to mental health treatments, and a puzzle measuring flexibility in thinking.**

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

We do not expect the survey to be distressing; you may withdraw from the survey at any point by simply closing the internet browser. In doing so, no information you have disclosed up to that point will be recorded. **In case you are struggling with your mental wellbeing you will also receive access to an information leaflet that will direct you to various self-help resources that could support you with your mental wellbeing. The information provided in this document is provided by the World Health Organisation (WHO), Centre For Disease (CDC) and NHS**.

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

Your contribution to this research will help us to raise our understanding of how flexibility in thinking influences well-being and adherence to treatments, with potential for guiding development of more effective approaches for treating these disorders.

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

All information that you provide will be anonymised. This means the responses to the questions asked to you cannot be traced back to you. All data from the study will be securely stored on the Hertfordshire University server. Your data and those of others who have participated could be presented in combined form in a thesis, research meetings, and peer-review journals. Steps will also be taken to maintain confidentiality in line with the General Data Protection Regulation (GDPR) when handling data, and data will be stored for five years and then deleted. If you wish to view the research findings, you can view them in Hertfordshire University's research archive in the final quarter of 2025 by searching my name.

****Should I expect to receive any feedback on my results? ****

We cannot give personalised feedback on your performance, and results cannot be used to make a clinical diagnosis or for any other purpose.

****Who has reviewed this study?****

This project has been approved by the NHS Research Ethic committee (NHS protocol number: TO BE SUBMITTED.

****Who can I contact if I have any questions?****

If there is anything unclear or you wish to discuss about this project, please do not hesitate to contact us using the details below.

Your support is very much appreciated.

Mr Shaunak Deshpande, School of Life and Medical Sciences, University of Hertfordshire, Hatfield AL10 9AB Email: s.deshpande@herts.ac.uk

Professor Naomi Fineberg, School of Life and Medical Sciences, University of Hertfordshire, Hatfield AL10 9AB Email: naomi.fineberg@btinternet.com

Dr Keith Sullivan, School of Life and Medical Sciences, University of Hertfordshire, Hatfield AL10 9AB Email: k.sullivan3@herts.ac.uk

****Thank you very much for reading this information and considering taking part in this study.****

****If you are happy to participate, please continue to the consent form on the following page.****

2.Consent Form

Fill in your consent question here

	I agree
I confirm that I have been given information detailing the reasons why this research is being conducted and that you have been asked to participate in this study voluntarily.	
I have been assured that I may withdraw from the study at any time without disadvantage or having to give a reason.	
I have been told how information relating to me will be handled, how it will be kept, who will have access to it, and how it will or may be used.	

3. Participant Demographic Questionnaire

Please provide the following demographic information. Your responses will be kept confidential and used solely for research purposes. Please answer each question to the best of your ability.

What was the month and date of when you were born?

Drop down box selector - MM YYYY

2. What was your sex at birth?

Female

Male

Intersex

Prefer not to respond

3. How would you describe your gender?

Female

Male

Transgender

Non-binary/non-conforming

Prefer not to respond

4. How would you describe your ethnicity?

White

Black or Black British

Asian or Asian British

Mixed Ethnicity

Other Ethnic group

Prefer not to respond

5. What was the highest level of education you have attained?

GCSEs/O-Level/IGCSE

CSE

A-Levels/International Baccalaureate/Highschool Diploma/Abitur/Baccalauréat/VWO Diploma

Trade Qualification/Vocal Certification/Technical Certification

Industry-Recognized Certifications

Bachelor's/Associate's Degree

Postgraduate degree (e.g. MSc, MA, M.B.A MPhil, Doctorate, Postgraduate Diploma/Certificate)

Prefer not to respond

6. How would you describe your employment status?

Out of Work

Part time (working less than 37.5 hours)

Full time (working on average 37.5 hours a week)

On average working more than 37.5 hours a week

Retired

Prefer not to respond

7. What diagnosis have you been given by a healthcare professional? (Please select all that apply to you)

Obsessive-Compulsive Disorder (OCD)

Body Dysmorphic Disorder

Olfactory Reference Disorder

Health Anxiety (Hypochondriasis)

Hoarding Disorder

Skin-Picking Disorder

Anorexia Nervosa

Bulimia Nervosa

Binge Eating Disorder

Avoidant Restrictive Food Intake Disorder (ARFID)

PICA

8. Have you recently received or are you currently receiving some form of talking therapy (for example, counselling, cognitive behavioural therapy, exposure response prevention, compassion focused therapy, schema focused therapy and family therapy)? (please tick one response that fits your situation best)

I am currently receiving some form of psychological therapy

I received some form of psychological therapy in the last 3 months

I received some form of psychological therapy in the last 6 months

I received some form of psychological therapy in the last 12 months

9. Where did you receive this form of talking therapy?

Non-NHS services (for example Mind)

IAPT/Talking therapies service/Wellbeing team

Community mental health service/Community Mental Health Team/Outpatient Clinic

Specialist Service/Inpatient Service

Obtained talking therapy privately

10. Have you recently received or are you currently receiving some form of psychiatric medication (for example, SSRI, citalopram) ? (please tick one response that fits your situation best)

I am currently receiving some form of psychiatric medication

I received some form of psychiatric medication in the last 3 months

I received some form of psychiatric medication in the last 6 months

I received some form of psychiatric medication in the last 12 months

11. Where did you receive this form of psychiatric medication?

From my GP at a local healthcare centre or GP surgery

Community mental health service/Community mental health team/Outpatient Clinic

Specialist Service/Inpatient Service

Obtained psychiatric medication privately

4a. Medication Adherence Rating Scale

Do you ever forget to take your medication?

Yes / No

Are you careless at times about taking your medication?

Yes / No

When you feel better, do you sometimes stop taking your medication?

Yes / No

Sometimes if you feel worse when you take the medication, do you stop taking it?

Yes / No

I take my medication only when I am sick.

Yes / No

It is unnatural for my mind and body to be controlled by medication.

Yes / No

My thoughts are clearer on medication.

Yes / No

By staying on medication, I can prevent getting sick.

Yes / No

I feel weird, like a ‘zombie’ on medication.

Yes / No

Medication makes me feel tired and sluggish

Yes / No

4b. **Treatment Adherence Rating Scale – CS Revised**

Please all answer the following questions and consider how you found your most recent experiences of accessing psychological therapy. Please use the sliding rating scale, which ranges from 0-100.

1. To what extent did you understand the content of your talking therapy sessions?
No understand 0 to Excellent Understanding 100

2. To what extent did you accept/agree with the content of your talking therapy sessions?
Did not accept/agree 0 to Full Acceptance/Agreement 100
3. To what extent did you complete the practice exercises outside of your talking therapy sessions?
Did not complete 0 to Fully Completed 100
4. Overall, through the course of therapy, to what extent did you follow the instructions/recommendations of the treatment?
Not at all 0 to Completely 100
5. Overall, through the course of therapy, to what extent did you master the skills learned in your therapy?
Not at all 0 to Completely 100
*6. Through the course of therapy and following it, how often did you use the skills you have been developing?
Never 0 to at every opportunity 100

5. **Compulsive Personality Assessment Scale (CPAS)**

*The questions ask you to consider stable patterns of long-standing traits that date back to adolescence or early adulthood**. Please select the most appropriate option that best describes.*

1. Preoccupation with details

Are you preoccupied with details, rules, lists, order, organisation or schedules to the extent that the major aim of the activity is lost

Absent (0), Mild (1), Moderate (2), Severe (3), Very Severe (4)

2. Perfectionism

Would you describe yourself as a perfectionist who struggles with completing the task at hand?

Absent (0), Mild (1), Moderate (2), Severe (3), Very Severe (4)

3. Workaholism

Are you excessively devoted to work to the exclusion of leisure activities and friendships?

Absent (0), Mild (1), Moderate (2), Severe (3), Very Severe (4)

4. Over-conscientiousness

Would you describe yourself as over-conscientious and inflexible about matters of morality, ethics or values?

Absent (0), Mild (1), Moderate (2), Severe (3), Very Severe (4)

5. Hoarding

Are you unable to discard worn-out or worthless objects even when they have no sentimental value?

Absent (0), Mild (1), Moderate (2), Severe (3), Very Severe (4)

6. Need for control

Are you reluctant to delegate tasks or to work with others unless they submit to exactly your way of doing things?

Absent (0), Mild (1), Moderate (2), Severe (3), Very Severe (4)

7. Miserliness

Do you see money as something to be hoarded for future catastrophes?

Absent (0), Mild (1), Moderate (2), Severe (3), Very Severe (4)

8. Rigidity

Do others think you are rigid or stubborn?

Absent (0), Mild (1), Moderate (2), Severe (3), Very Severe (4)

6. **WHO-5 Wellbeing Index Questionnaire**

Please respond to each item by marking one box per question, regarding how you felt in the **last two weeks**.

Q1. I have felt cheerful in good spirits

All of the time OR Most of the time OR More than half the time OR Less than half the time OR Some of the time OR At no time

Q2. I have felt calm and relaxed.

All of the time OR Most of the time OR More than half the time OR Less than half the time OR Some of the time OR At no time

Q3. I have felt active and vigorous.

All of the time OR Most of the time OR More than half the time OR Less than half the time OR Some of the time OR At no time

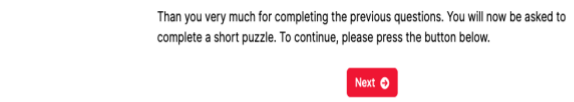
Q4. I woke up feeling fresh and rested.

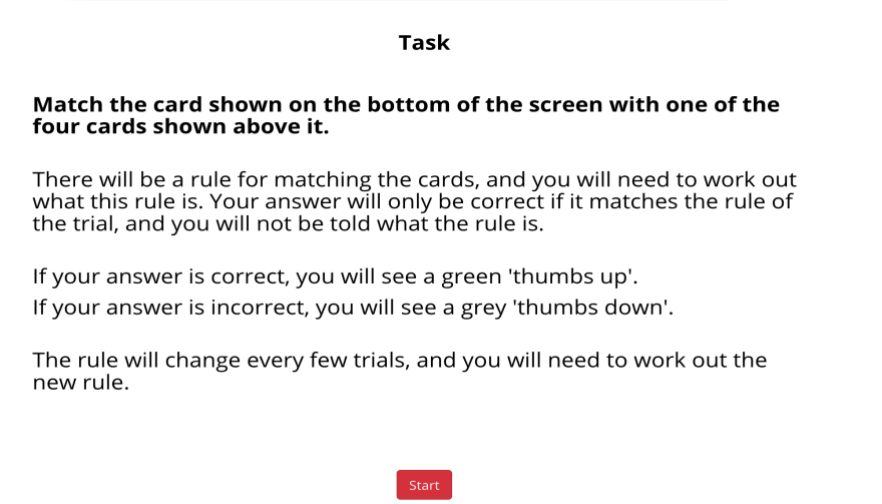
All of the time OR Most of the time OR More than half the time OR Less than half the time OR Some of the time OR At no time

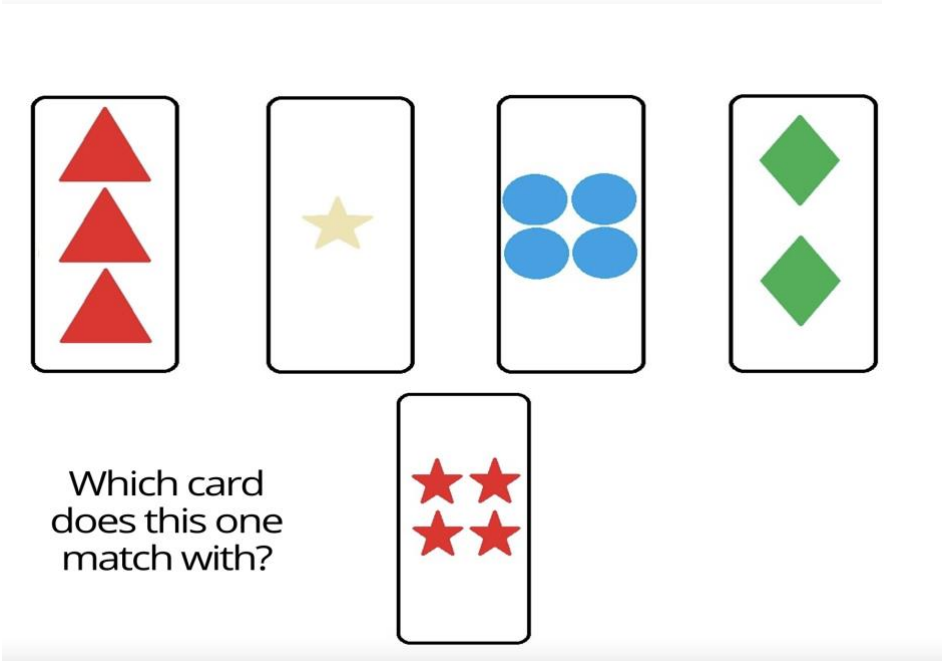
Q5. My daily life has been filled with things that interest me.

All of the time OR Most of the time OR More than half the time OR Less than half the time OR Some of the time OR At no time

7. Wisconsin Sorting Card Test







8. Debrief information sheet

** Does inflexible thinking determine adherence to mental health therapies? **

Thank you for taking part in this study.

Your participation will be kept confidential on the Hertfordshire University secure server. The information you have provided on the questionnaires will be safely disposed of after five years in line with data handling protocols and BPS ethical guidelines. Should this research be presented or published, all personal information will have been removed and anonymised beforehand. Should you wish to withdraw from this study, your data will be excluded from the analysis and destroyed; you will receive no penalty or disadvantage should you withdraw.

There is little research that explores this topic despite those receiving mental health therapies often face difficulties during treatment and poor treatment outcomes. This research aims to understand how flexibility in thinking influences participation in mental health treatments and its effects on well-being. As a participant, you were asked to complete some questions exploring personality traits, well-being, and treatment adherence, as well as a puzzle measuring flexibility in thinking.

If you have been adversely affected by any aspect of this survey, we advise that you seek support from your healthcare professional. They will be in the best position to support you.

If you feel the need to talk to someone who can listen to your concerns, the Samaritans helpline (telephone: 116 123) can provide a compassionate ear.

If you feel you are struggling with you mental wellbeing, we have provided you with self help information, which can be access through this link: LINK to 9.

Should you wish to contact the lead researcher or supervisor, the contact details can be found below:

Principal investigator: s.deshpande@herts.ac.uk

Supervisor: naomi.fineberg@btinternet.com

Supervisor: k.sullivan3@herts.ac.uk

Thank you again for your participation.

9. Mental Health Self-Help Resources

Here is a list of self-help mental well-being resources provided by the National Health Service (NHS), the Centre for Disease Control and Prevention (CDC), and the World Health Organization (WHO):

1. NHS:
- NHS Mood zone: Provides information and practical advice for managing stress, anxiety, and depression. Website: www.nhs.uk/conditions/stress-anxiety-depression
- Every Mind Matters: Offers a range of resources and practical tips for maintaining good mental health. Website: www.nhs.uk/oneyou/every-mind-matters

2. CDC:
- Mental Health: Provides information on various mental health topics, including stress management, coping strategies, and mental health conditions. Website: (www.cdc.gov/mentalhealth)
- Coping with Stress: Offers resources and strategies to cope with stress effectively. Website: https://www.cdc.gov/mentalhealth/cope-with-stress/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fmentalhealth%2Fstress-coping%2Findex.html

3. WHO:
- Mental well-being: resources for the public: https://www.who.int/news-room/feature-stories/mental-well-being-resources-for-the-public

- WHO's "Mental Health Atlas": The Mental Health Atlas is a publication that provides up-to-date information on mental health resources, policies, and service availability across different countries. It offers a global perspective on the status of mental health services and can be used for comparative analysis and planning. Website: https://www.who.int/publications/i/item/9789240036703

Appendix IX – Ethics documents and any other evidence to show that clearance was obtained to carry out research

University of Hertfordshire UH

HEALTH, SCIENCE, ENGINEERING AND TECHNOLOGY ECDA

ETHICS APPROVAL NOTIFICATION

TO	**Shaunak Sanjay Deshpande**
CC	**Prof Keith Sullivan** **Prof Naomi Fineberg**
FROM	**Dr Rebecca Knight**
DATE	**22/02/2024**

Protocol number: **cLMS/PGR/UH/05541**

Title of study: Does inflexible thinking determine adherence to mental health therapies?

Your application for ethics approval has been accepted and approved with the following conditions by the ECDA for your School and includes work undertaken for this study by the named additional workers below:

Prof Keith Sullivan

Prof Naomi Fineberg

Dr Luca Pellegrini

Prof Keith Laws

Aaron Clarke

Margherita Zenoni

Conditions of approval specific to your study:

Ethics approval has been granted subject to the following conditions being seen and approved by the supervisor as addressed prior to recruitment and data collection:

- All instances be changed to the “University of Hertfordshire”
- "Non-confirming" changed to “non-conforming”
- Contact details of the Secretary and Registrar added to PIS in case of a complaint
- A reminder that this ethics approval only covers data collection from non-clinical samples. The applicant will require further NHS REC approval for the data collection of clinical populations.

General conditions of approval:

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

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

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

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

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

Validity:

This approval is valid:

From: 22/02/2024

To: 31/12/2024

Please note:

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

Should you amend any aspect of your research or wish to apply for an extension to your study you will need your supervisor's approval (if you are a student) and must complete and submit form EC2.
Approval applies specifically to the research study/methodology and timings as detailed in your Form EC1A. In cases where the amendments to the original study are deemed to be substantial, a new Form EC1A may need to be completed prior to the study being undertaken.

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

Recruitment Material Agreement

I, Shaunak Deshpande, acknowledge that The Renfrew Center will help with participant recruitment of my external study by distributing the recruitment material provided by this external research team in the following ways listed:

Flyer sent to discharging patients, email to Renfrew alumni patients and alumni Site Representatives distribute the flyer to alumni as well.

between these dates listed:

05/06/2024
(Start Date)

31/12/2024
(End Date)

After this date range has ended, if my study requires additional participants/aid in recruitment, I must complete and submit an additional Recruitment Material Agreement Form to The Renfrew Center Research Department for approval to extend the distribution of my external study's recruitment material.

Shaunak Deshpande
Print Full Name


Signature

05/06/2024
Date


Approved by:

6/6/2024
Date

5/2024

NHS to NHS letter of access: proforma confirmation of pre-engagement checks
Version 1

For NHS researchers who have a substantive NHS contract of employment or clinical academics with an honorary clinical contract with an NHS organisation, and who need an NHS to NHS letter of access from an NHS organisation hosting their research

CONFIRMATION OF PRE-ENGAGEMENT CHECKS

To: R&D Office

Address of NHS site hosting the research

Re: **Researcher's name: Shaunak Deshpande**

Job title: Clinical Psychology Trainee

Contract end-date: 27/09/2025

Workplace and postal address:
Elizabeth House, Fulbourn Hospital, Cambridge CB21 5EF

Electronic Staff Record number: 30888355

As the representative of the NHS employer[1] of the above-named person, I can confirm that s/he is employed by this organisation. I understand that the responsibility for ensuring that the appropriate pre-engagement checks have been undertaken rests with us as the individual's substantive employer. I can confirm that the appropriate pre-engagement checks have been completed, commensurate with her/his job description and proposed research role in your NHS organisation, and in line with NHS employment checks standards

Name of employer's representative: **Dr Nick Oliver**

Job Title: **Director of Psychological Services**

Workplace address: **Elizabeth House, Fulbourn Hospital, Cambridge CB21 5EF**

Tel: **01386 575107**
Email: Nick.Oliver@cpft.nhs.uk

[1] For clinical academics, this would be a representative from their HEI employer

University of Hertfordshire
Higher Education Corporation
Hatfield, Hertfordshire
AL10 9AB

Telephone +44 (0) 1707 284000
Fax +44 (0) 1707 284115
Website www.herts.ac.uk

Professor Wendy Wills
PhD, MSc, BSc, SFHEA, Reg Nutr (Public Health)
Professor of Food and Public Health
Pro Vice-Chancellor (Research and Enterprise)
Director, NIHR Applied Research Collaboration (ARC) East of England

Dr Keith Sullivan (Shaunak Deshpande – student)

Centre for Health Services and Clinical Research

School of Life and Medical Sciences

30 April 2024

Dear Dr Sullivan,

Re: UNIVERSITY OF HERTFORDSHIRE SPONSORSHIP IN PRINCIPLE for the following: RESEARCH STUDY TITLE: To what extent does inflexible thinking determine adherence to mental health therapies
NAME OF CHIEF INVESTIGATOR (Supervisor): Dr Keith Sullivan
NAME OF INVESTIGATOR (Student): Shaunak Deshpande

This letter is to confirm your research study detailed above has been reviewed and accepted, and I agree to give University of Hertfordshire sponsorship in principle.

Before you commence your research you must be in full compliance with all Health Research Authority governance requirements. You must also secure full University of Hertfordshire sponsorship, for which you will need to have supplied the following documentation:

- Final version of the submitted IRAS form (pdf)
- Approval from the relevant Health Research Authority (HRA) Research Ethics Committee (REC) as well as confirmation of favourable opinion of any amendments arising during approval
- Evidence of relevant NHS Permissions (eg Research Passport) and Confirmations of capacity and capability as they are received
- Confirmation of University protocol number
- The final versions of the protocol, patient information leaflet and informed consent form
- For externally funded research, confirmation of adequate funding in the form of the award

letter

- Any other regulatory permissions required, eg from the National Information Governance Board (NIGB), under the Human Tissue Act or the Ionising Radiation (Medical Exposure) Regulations
- If applicable, copies of any contracts/agreements with external organisations (eg funders, collaborators, co-sponsors) involved in your research study.

As a condition of receiving full sponsorship, it is the responsibility of the Chief Investigator to inform the Sponsor of any changes to the duration or funding of the project, changes of investigators, changes to the protocol and any future amendments, or deviations from the protocol, which may require re-evaluation of the sponsorship arrangements. It is also the responsibility of the Chief Investigator to inform the funder, the HRA NHS Research Ethics Committee (REC) and any other relevant authority of any of these changes. Annual and end of study reports must be submitted to the HRA and copied to the Sponsor.

University of Hertfordshire UH

University of Hertfordshire
Higher Education Corporation
Hatfield, Hertfordshire
AL10 9AB

Telephone +44 (0) 1707 284000
Fax +44 (0) 1707 284115
Website www.herts.ac.uk

I look forward to receiving the above documents before you commence your research. Please email these to research-sponsorship@herts.ac.uk so the University can confirm sponsorship. In the meantime, we wish you well in pursuing this interesting research study.

Yours sincerely,

Professor Wendy Wills
Pro Vice-Chancellor (Research and Enterprise)

Encl: Insurance certificate(s)

Station Square
One Gloucester Street
Swindon
SN1 1GW
Tel: 020 7560 3000

www.ajg.com/uk

TO WHOM IT MAY CONCERN

01/08/2023

Dear Sirs

We are the Risk and Insurance Brokers for the client below and have pleasure in confirming details of their insurance arrangements as follows:-

Insured Details:

Name(s) **University of Hertfordshire and Subsidaries**

Postal Address **College Lane, Hatfield, Hertfordshire, AL10 9AB**

Our Ref **5068828**

Professional Indemnity		
Insurer	:	Royal & Sun Alliance Insurance Plc
Policy No.	:	RKK423027/37
Expiry Date	:	31st July 2024
Limit of Indemnity	:	£10,000,000

Cover is subject to the full terms, conditions and exclusions of the policy.

This document is issued to you as a matter of information only and the issuance of this document does not: -

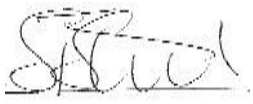
i) create any contractual relationship between Arthur J. Gallagher Insurance Brokers Limited and the recipient
ii) make the person or organisation to whom it has been issued an additional assured, nor does it modify in any manner the contract of Insurance between the Assured and the Underwriters.

Any amendments, change or extension of such contract can only be effected by specific endorsement attached thereto with the consent of the Assured and the Underwriters.

We accept no responsibility whatsoever for any inadvertent or negligent act, error or omission on our part in preparing this information or for any loss, damage, expense hereby occasioned to the recipient of this letter

Should the insurance cover be cancelled assigned or changed in any way during the period of insurance neither we nor insurers accept any obligation to notify any recipient.

Yours sincerely



Stephen Street]
Client Service Advisor

Direct Dial: 01793 468319

Email: LUPC@ajg.com

Ymchwil Iechyd a Gofal Cymru
Health and Care Research Wales

NHS
Health Research Authority

Dr Keith Sullivan

Senior Research Fellow

School of life and Medical Sciences, University of Hertfordshire

University of Hertfordshire

AL10 9AB

03 October 2024

Dear Dr Sullivan

Research Wales (HCRW) Approval Letter

Study title:	**Does inflexible thinking determine adherence to mental healththerapies?**
IRAS project ID:	**339671**
Protocol number:	**To be confirmed**
REC reference:	**24/WA/0189**
Sponsor	**University of Hertfordshire**

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

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

How should I work with participating NHS/HSC organisations in Northern Ireland and Scotland?

HRA and HCRW Approval does not apply to NHS/HSC organisations within Northern Ireland and Scotland.

If you indicated in your IRAS form that you do have participating organisations in either of these devolved administrations, the final document set and the study wide governance report (including this letter) have been sent to the coordinating centre of each participating nation. The relevant national coordinating function/s will contact you as appropriate.

Please see IRAS Help for information on working with NHS/HSC organisations in Northern Ireland and Scotland.

How should I work with participating non-NHS organisations?

HRA and HCRW Approval does not apply to non-NHS organisations. You should work with your non-NHS organisations to obtain local agreement in accordance with their procedures.

What are my notification responsibilities during the study?

The standard conditions document "*After Ethical Review – guidance for sponsors and investigators*", issued with your REC favourable opinion, gives detailed guidance on reporting expectations for studies, including:

- Registration of research
- Notifying amendments
- Notifying the end of the study

The HRA website also provides guidance on these topics, and is updated in the light of changes in reporting expectations or procedures.

Who should I contact for further information?

Please do not hesitate to contact me for assistance with this application. My contact details are below.

Your IRAS project ID is **339671**. Please quote this on all correspondence.

Yours sincerely,

Tracy Biggs

Approvals Specialist

Email: HCRW.approvals@wales.nhs.uk

Copy to: *Ms Leire Vallejo* **List of Documents**

The final document set assessed and approved by HRA and HCRW Approval is listed below.

Document	*Version*	*Date*
Copies of materials calling attention of potential participants to the research [Poster]	1	27 May 2024
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only) [sponsor letter]		01 August 2023
IRAS Application Form [IRAS_Form_06062024]		06 June 2024
Letters of invitation to participant [Invitation Letters]	2	04 July 2024
Non-validated questionnaire [Non-validated questionnaire]	Version 2:	28 June 2024
Organisation Information Document [OID]	4	22 August 2024
Other [Participant Debrief Sheet]	2	04 July 2024
Participant consent form [Consent Form]	2	04 July 2024
Participant information sheet (PIS) [Participant Information Sheet]	3	04 July 2024
Participant information sheet (PIS) [Participant Information Sheet TC]	3	04 July 2024
Referee's report or other scientific critique report [Critique of proposal]		08 May 2024
Research protocol or project proposal [Research Proposal]	1	27 May 2024
Schedule of Events or SoECAT [SoECAT]	6	20 September 2024
Summary CV for Chief Investigator (CI) [Keith Sullivan CV [CI and Supervisor]]		
Summary CV for student [Student CV [Mr. Shaunak Deshpande]]		
Summary CV for supervisor (student research) [Supervisor CV [Naomi Anne Fineberg]]		
Validated questionnaire [Wisconsin Sorting Card Test]		
Validated questionnaire [MARS Questionnaire]		
Validated questionnaire [TARS Questionnaire]		
Validated questionnaire [CPAS Questionnaire]		
Validated questionnaire [WHO 5 Questionnaire]		

IRAS project ID **339671**

Information to support study set up

The below provides all parties with information to support the arranging and confirming of capacity and capability with participating NHS organisations in England and Wales. This is intended to be an accurate reflection of the study at the time of issue of this letter.

Types of participating NHS organisation	**Expectations related to confirmation of capacity and capability**	**Agreement to be used**	**Funding arrangements**	**Oversight expectations**	**HR Good Practice Resource Pack expectations**
Research activities and procedures as per the protocol and other study documents will take place at participating NHS	Research activities should not commence at participating NHS organisations in England or Wales prior to their formal confirmation of capacity and capability to deliver the study in accordance with the	An Organisation Information Document has been submitted and the sponsor is not requesting and does not expect any other agreement to be used with participating NHS	Study funding arrangements are detailed in the Organisation Information Document	A Local Collaborator should be appointed at participating NHS organisations.	Where an external individual will be conducting any of the research activities that will be undertaken at this site type then they would be expected to hold a Letter of Access. This should be issued be on the basis of a Research Passport (if university employed) or an NHS to NHS confirmation of pre-engagement checks letter (if NHS employed). These should confirm Occupational Health

organisations.	contracting expectations detailed.	organisations of this type.			Clearance. These should confirm standard DBS checks and appropriate barred list checks.

Other information to aid study set-up and delivery

This details any other information that may be helpful to sponsors and participating NHS organisations in England and Wales in study set-up.
The applicant has indicated that they do not intend to apply for inclusion on the NIHR CRN Portfolio.

Appendix X – Funding for the Project

Please see invoices of how a modest budget was spent to facilitate the completion of the project.

IT Salnes

IT Salnes S.L.
B56374325
CALLE COSTA NUM 44 36960 Sanxenxo
Pontevedra
Spain
Tel: 611740641

Invoice

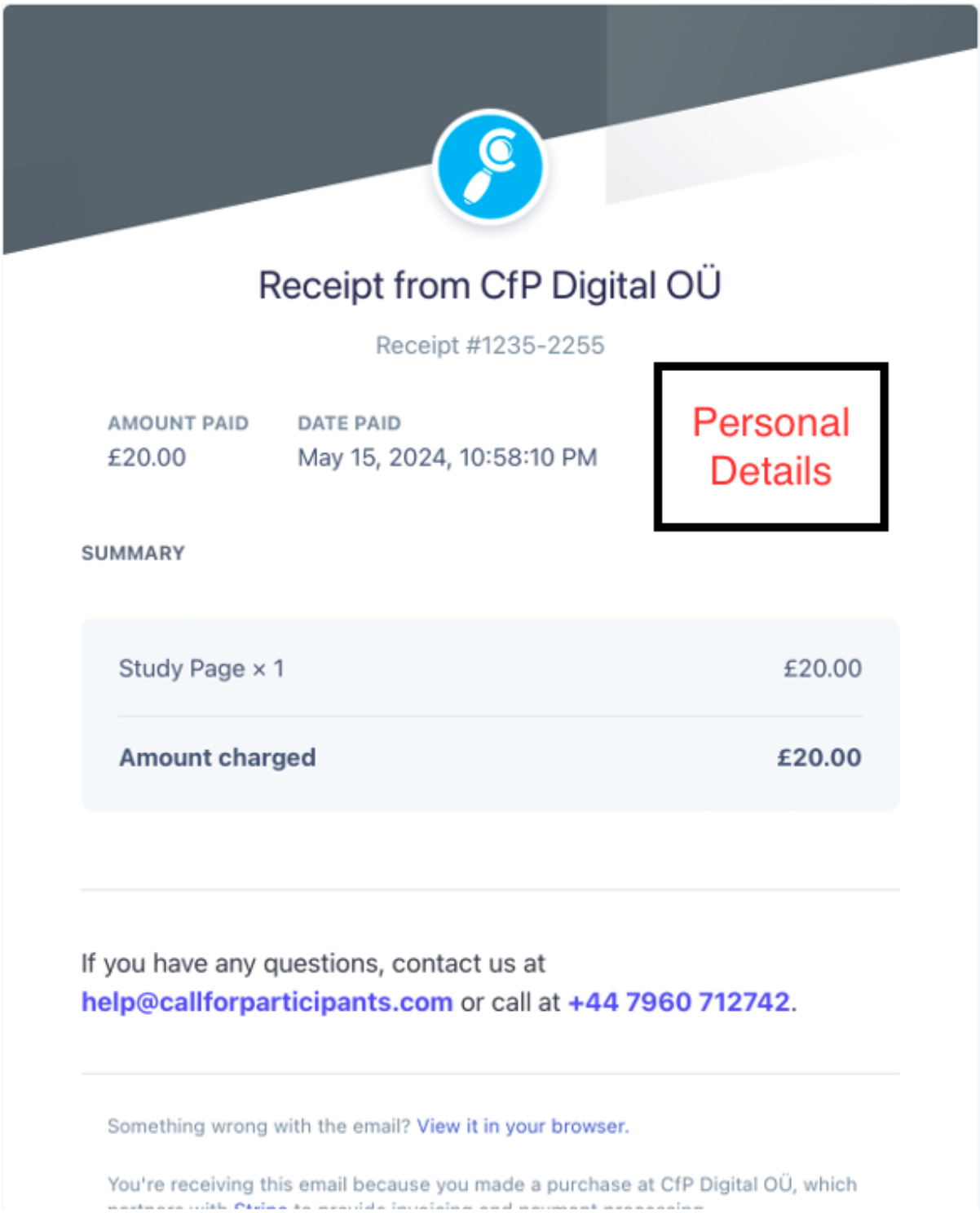
Date: 27/11/2024
Invoice: 2024/44

Personal Details removed

Product	Unit Price	Quantity	Total no VAT	VAT	Total
Data Analysis (Outside EU)	82.98£	1.79	148.54£	0.00£	148.54£

Total no VAT	148.54£
VAT	0.00£
Total	148.54£

PAYMENT: Cash payment



Receipt from CfP Digital OÜ

Receipt #1235-2255

AMOUNT PAID	DATE PAID
£20.00	May 15, 2024, 10:58:10 PM

Personal Details

SUMMARY

Study Page × 1	£20.00
Amount charged	**£20.00**

If you have any questions, contact us at **help@callforparticipants.com** or call at **+44 7960 712742**.

Something wrong with the email? View it in your browser.

You're receiving this email because you made a purchase at CfP Digital OÜ, which