Anxiety in Children with Intellectual Disability: the Role of Intolerance of Uncertainty

Doctorate in Clinical Psychology

Jessica Maxwell

July 2020

Words (excluding permitted sections and tables): 18,432

This thesis is submitted in partial fulfilment of the degree of Doctorate in Clinical Psychology.

BLANK PAGE

CONTENTS

OVERALL ABSTRACT

Approximately 2-3% of children worldwide are living with an Intellectual Disability (ID). Anxiety is prevalent in children with ID and can cause considerable distress for the child and wider family. Anxiety in children has been reported to have significant social and emotional impact and has a long-term effect, being predictive of mental health and economic status in adulthood. Despite this, the evidence base is limited with regard to psychological interventions for mental health difficulties in individuals with ID. More specifically, there is a clear gap in the literature pertaining to the evidence for the implementation of psychological interventions for alleviating anxiety in children with ID.

A systematic review was undertaken to evaluate the quality of literature on psychological interventions for anxiety in children with ID. 17 papers were eligible for inclusion and reported on a range of interventions, including a behavioural approach for specific phobias, and CBT-based interventions for generalised symptoms of anxiety. The evidence was highly variable in quality, and when aggregated, no intervention had sufficient empirical support to be considered current or promising evidence-based practice. Further research is therefore suggested in order to develop a strong evidence base from which clinicians can select effective interventions for this population. This research should additionally be clear and transparent in its conceptualisation, measurement and reporting of both anxiety and Intellectual Disability, in order to support the development of the field.

There is a robust body of evidence that the transdiagnostic construct of Intolerance of Uncertainty (IU) plays a key role in a range of anxiety disorders in the typically developing population. Recent research suggests that IU may be particularly elevated in children with Autism Spectrum Disorder (ASD), and that this may account for the increased difficulties with anxiety experienced by this population. IU has therefore been proposed as a potential target for intervention in managing anxiety in children with ASD, and interventions such as CUES

(Coping with Uncertainty in Everyday Situations) have begun to be successfully implemented to this end. However, a large proportion of children with ASD have a co-occurring ID, and the role of IU in the understanding and management of anxiety in this population had not been explored to date.

An investigation was undertaken to address this gap. The study aimed to explore the relationships between IU, anxiety and repetitive behaviours (RRBs) in children with ASD and ID, and consider whether CUES can be adapted so that it is suitable for this population. Within the study, parents/carers of children with ASD and/or ID completed measures of anxiety, IU and RRBs online. In this sample, IU was significantly higher in children with ASD and ID than children with ASD only, however there was no difference in anxiety levels between these groups. In children with ASD (both with and without ID), it was observed that IU significantly positively correlated with anxiety and RRBs, and that IU, but not ID-status, was a significant predictor of anxiety. The CUES parent group intervention was then adapted and implemented with parents of five children with ASD and co-occurring ID and was reported to be acceptable and helpful for parents in managing IU in their children. Therefore, findings suggest that IU plays a role in anxiety in children with ASD and ID and may be an appropriate target for intervention for this group.

ACKNOWLEDGEMENTS

I would like to wholeheartedly thank the following people and acknowledge their contributions to the study:

Jacqui Rodgers and Victoria Grahame for their invaluable support and guidance, providing both research and clinical supervision for the design, development and implementation of all phases of this study.

Ewan Lomax, research student, contributed to the reliability of the Systematic Review by second rating 100% of the abstracts during the screening process, as well as quality rating 25% of the resulting papers. Thank you to Ewan for his patience and for meeting with the applicant to reach rating consensus, and for operationalising the quality items in the rating scale. Priyanka Rob, research student, contributed towards the application for ethical approval for Phase 1 of this study. Leanne Rogan, Assistant Psychologist, co-facilitated the adapted intervention both in preparing for and delivering the sessions, and supported the applicant with contacting potential participants and collecting outcome measures. Theresa Ingram, Specialist Nurse, supported the study by providing fidelity ratings for two intervention sessions.

Recruitment for the study was supported by a number of professionals: Linda Dixon (Specialist Teacher, CNDS), Dr Melanie Teasdale (North Tyneside CLDT) and Emily Thompson (Newcastle CYPS) facilitated recruitment through clinical services; staff at Gibside School, Gateshead and Woodlawn School, North Tyneside supported recruitment by sending information packs to relevant parents; and the Tim Lamb centre, Contact-a-Family and SPARCs groups facilitated recruitment by allowing the applicant to advertise directly and electronically to their members. I would particularly like to thank Louise Holohan (SPARCs)

for her support of the project and sharing her insight and providing consultation with regards to recruitment issues.

Finally, I would like to offer my special thanks to all the families who participated in this study, without whom it would not have been possible; for your support, kindness and good humour throughout the process, and for giving me the great pleasure of getting to know you and your children.

PERSONAL ACKNOWLEDGEMENTS

First and foremost, I would like to thank my parents for modelling a love of learning and the delicate balance between career and family.

Thank you to Katy, for always being my cheerleader, and to Laura, for turning up at the doorstep at just the right time. Thanks to each of my amazing friends for supporting me in so many ways: for the extra-curriculars, the proof-readings, the debriefs, the wine and chats, and so much more.

To Lylah and Edie, who have taught me more than any Doctorate ever could, and for keeping it all in perspective. And last but not least, thank you to Maxy, for being beside me every step of the way.

The Quality of Evidence on the Implementation of Psychological Interventions for Anxiety in Children with Intellectual Disability:

A Systematic Review

Doctorate in Clinical Psychology

Jessica Maxwell

Word Count: 7,602

Excluding abstract, Figure 1 and Tables 2, 3, 6 & 7

ABSTRACT

Background Approximately 2-3% of children worldwide are living with an intellectual disability (ID). Anxiety is highly prevalent in children with ID and can cause considerable distress for the child and family. Thus far, no reviews have been undertaken to explore the evidence pertaining to interventions for anxiety for children with an intellectual disability.

Aims To conduct a systematic review to scope and evaluate the quality of literature reporting on the implementation of interventions for anxiety for children with an intellectual disability.

Method Systematic searches were undertaken in electronic databases Scopus, Medline, Embase, PsychInfo and Web of Science, and supplemented by hand searching and searching grey literature. Inclusion criteria were studies reporting on any non-pharmacological interventions for anxiety in children (<19) with ID.

Results 17 studies resulted, reporting on a range of interventions, including behavioural interventions for specific phobias (nine studies) and CBT-based interventions for general anxiety (four studies). Sample sizes of the resulting studies were small (11 single case series, five ranging n=3 to n=7, one n=21). Each study was rated for quality and a wide variability in quality was observed across studies, particularly in the methodological domain. Quality ratings also suggested that no intervention type currently meets criteria to be considered current or promising evidence-based practice.

Discussion The evidence base for psychological interventions for anxiety in children with ID appears limited. Further research is needed to begin to build an evidence base of sufficient quality to begin to determine which interventions may be deemed evidence-based practice in this field.

1.Introduction

It has been estimated that there are more than one million people living in England with an Intellectual Disability (ID) or 2% of the population. Approximately 180,000 of these are children, or 2.5% of the population (IHAL data, 2015). This is largely in line with the World

Health Organisation's estimate that approximately 3% of children worldwide have a diagnosable ID, which they define as:

> A significantly reduced ability to understand new or complex information and to learn and apply new skills (impaired intelligence). This results in a reduced ability to cope independently (impaired social functioning) and begins before adulthood, with a lasting effect on development (WHO, 2007).

It is a well-replicated finding that individuals with ID[1] are more vulnerable to experiencing mental health difficulties than their peers without ID (e.g. Reardon et al., 2015; Reid et al., 2011; Dekker et al., 2002). Although reported rates vary, it is frequently suggested that 30-40% of children and adolescents with ID experience significant comorbid mental health disorders (Totsika et al., 2011). Children with ID are reported to have higher reported levels of anxiety than their non-ID peers (Nelson & Harwood, 2011), and additionally it has been reported that ID predicts increasing symptoms of anxiety throughout childhood and adolescence (Rodas, 2020). A recent systematic review was undertaken to assess the prevalence and measurement of anxiety in children with an intellectual disability (Reardon et al., 2015). Reardon et al., 2015 found seven papers that reported on prevalence rates specifically of anxiety disorders in children with ID, which ranged from 3 – 22%. However, it is noted that there are unique challenges related to identifying mental health difficulties in individuals with ID, including long-standing problems associated with "diagnostic overshadowing", which is the misattribution of the anxiety symptoms to the ID itself (Jamieson & Matson, 2019; Reiss et al., 1982) and the atypical or idiosyncratic presentation of mental health disorders in this population (e.g. Helverschou & Martinsen, 2011; Cooper et al., 2003). Therefore, it is suggested that even this reported prevalence may be an under-representation.

[1] It is acknowledged that there has recently been some consultation with service users with regard to the academic use of the abbreviation ID – due to word count restrictions this shall be used for the purpose of this thesis, however, would be addressed if disseminated more widely.

Anxiety in children has been reported to have a significant social and emotional impact (Ialongo et al., 2006) and has a long-term effect, being predictive of anxiety symptoms and even economic status (lower earnings) in adulthood (e.g. Essau et al., 2018; Knapp et al., 2011). Additionally, the negative experience of anxiety may be further exacerbated in children with an ID, due to an often reduced ability to communicate their internal states effectively, or that they may report their emotions or thoughts in idiosyncratic ways (Hagopian and Jennett, 2008). Children with ID are also more likely to have externalising problems associated with anxiety than typically developing children (Green et al., 2015). In addition to the distress experienced by the individual, their anxiety symptoms can have a significant negative impact on the wellbeing of the wider family if left untreated (McPheeters et al., 2011), with child anxiety being related to parental stress and family dysfunction (Tehee et al., 2009). These difficulties can be further exacerbated when an intellectual disability is co-occurring with an additional developmental disorder, for example, children with ASD and a co-occurring intellectual disability are more vulnerable to experience anxiety-related distress, perhaps relating to the interplay between the conditions, and a resulting lack of coping skills and reduced cognitive and social resources (Deudney & Shah, 2004; Coorey & Bakala, 2005).

There exists a robust body of literature supporting the development and use of interventions for anxiety in typically developing children (e.g. Cresswell et al., 2014; Brendel & Maynard, 2013), with a recent review suggesting that the research evidence favours psychosocial intervention (particularly Cognitive Behaviour Therapy, CBT) for the prevention and treatment of childhood anxiety disorders (Schwartz et al., 2019). A recent review of psychological interventions for mental health difficulties in individuals with ID suggested that the current evidence base is limited (Vereenooghe et al., 2018) and there appears a concerning lack of evidence supporting the development or adaptation of interventions specifically targeting anxiety in children with ID.

Given that there are higher rates of anxiety disorders in children and adolescents with ID than their typically developing peers, and that there is a significant number of children living with ID, it is imperative that we make efforts to support these children and their families. There is a clear gap in the literature pertaining to the evidence for the implementation of psychological interventions for alleviating anxiety in children with an ID. This review aims to begin to address this gap.

1.1 Objectives

The aim of this review is to systematically scope and evaluate the quality of the empirical evidence for non-pharmacological interventions for anxiety in children with an ID. Due to a sparsity of intervention literature for this population, no limits were placed on the type of intervention implemented (other than pharmacological or surgical treatment) or the design of study included, i.e. no other intervention study type will be excluded.

2.Methods

An initial review question was formulated as discussed above, and a preliminary search was undertaken to ensure there were no existing systematic reviews with the same focus. This was done by searching PROSPERO, The Cochrane Database of Systematic reviews, and Google Scholar on 1st July, 2018 and repeated on 1st April, 2020; no existing or ongoing reviews addressing the question or similar were found. Eligibility criteria for the current review were set on the basis of this.

Once eligibility criteria and search strategy were established, this systematic review was registered with PROSPERO, Centre for Reviews and Dissemination under reference CRD42018103807 on 27th July, 2018.

2.1 Eligibility

2.1.1 Definition of terms for the purposes of this review:

Anxiety (fear)	Anxiety refers to anticipation of a future concern and is related to muscle tension and avoidance behaviour. Fear is an emotional response to an immediate threat. (APA, 2013).
Anxiety disorder	Anxiety disorders include disorders that share features of *excessive fear and anxiety*, and related *behavioural disturbances* (DSM-V). Types include Generalized Anxiety Disorder, Panic Disorder, Agoraphobia, Phobia, Social Anxiety Disorder, Separation Anxiety Disorder (APA, 2013).
Intellectual Disability	A developmental condition exhibiting significant deficits in both intellectual functioning and adaptive behaviour (including conceptual, social and practical skills) (APA, 2013). The severity of impairment has been previously categorised from borderline (IQ 70-84) to profound (IQ below 25), however the IQ score must be interpreted in the context of the person's difficulties in general mental abilities (APA, 2000).
Child	A person aged 19 years or younger (World Health Organisation).
Intervention	The act or fact or a means of interfering with the outcome or course especially of a condition or process (as to prevent harm or improve functioning (Merriam Webster Medical Dictionary).

As recommended by the NHS Guidance for undertaking reviews in health care (NHS CRD, 2001), eligibility criteria were set in order to fully define the boundaries of the review. These criteria were outlined as follows:

2.1.2 Populations Studied

The population to be included in this review were determined to be (all three criteria should be met):

i) individuals under 19 years of age (in line with WHO definition)

ii) individuals with ID (diagnosed, with an IQ reportedly below 70, or with significant functional impairments in intellectual and adaptive functioning). “Borderline” intellectual disability (IQ 70-85) or “learning difficulties” were not included.

iii) individuals with a diagnosed anxiety disorder or anxiety symptoms reported indicative of an anxiety disorder (no limit was placed on clinical or non-clinical samples).

No limits were placed on medical diagnoses or co-morbidities of individuals, other than those described above. Samples reported to have Autism Spectrum Disorder (ASD) with a concurrent intellectual disability were included, as well as genetic disorders associated with ID, as long as level of intellectual functioning was explicitly reported as in the ID range. Studies including children with ASD were included to be screened at full text level if the sample contained a heterogenous sample (both with and without co-occurring ID), however excluded later if reporting of results was not sufficient to appraise results only from those participants with ID. Search terms in relation to specific medical or genetic disorders associated with ID (e.g. Down Syndrome, Fragile X, Fetal Alcohol Syndrome) were not included however, to ensure efficiency of searching.

To be eligible, studies must have included participants described as having an anxiety disorder or symptoms of anxiety and include a measure or clear description of anxiety symptoms. Although it is acknowledged that there are many complex presentations or ways of communicating anxiety, such as selective mutism or self-injurious, “challenging-”, or “avoidance-” behaviours, for the purposes of this review, papers focusing on individuals with such presentations were only included if they were explicitly described as anxiety symptoms.

No limits were placed on gender or ethnicity of participants.

2.1.3 Type of Study

Empirical studies reporting on any psychological intervention were to be included in the review. This would include longitudinal studies, as long as empirical data in relation to an intervention was reported. Book chapters and expert reviews without original empirical data would not be included in the review.

Included studies must report on interventions that were specifically intended to target an anxiety disorder or symptoms or problems explicitly conceptualised as anxiety. Therefore, interventions described only as behaviour modification or targeting avoidant behaviour were not included. As discussed above, despite presentations such as behaviours that challenge or selective mutism being understood as clinically associated with anxiety, papers that do not explicitly define the intervention as a target for anxiety symptoms were not included. Similarly, interventions targeting medical conditions which may be conceptually linked with anxiety (e.g. tic disorder, encopresis) were excluded, unless specifically justified as targeting anxiety symptoms.

Non-direct interventions were to be included in the review (e.g. interventions mediated by parents or teachers), and we would expect a significant proportion of the studies to be of this kind, in line with the NICE guidance on interventions for mental health difficulties in young people with ID (NICE, 2016).

Pharmacological interventions were excluded from the review, as well as physical interventions such as psychosurgery.

2.1.4 Date range

No limits were placed on the date range for the studies to be included, due to the limited literature available in this area.

2.1.5 Language

No limits were placed on language for initial screening. Any Non-English language papers remaining at the full text screening stage would be considered for feasibility of translation.

2.1.6 Publication status

No limits were placed on the publication status of studies, due to the limited body of empirical research in this area, and to attempt to compensate for publication bias. However, full text must be available for unpublished articles (e.g. dissertations).

2.2 Search strategy

In order to develop a comprehensive search strategy, a number of pilot searches were undertaken to ascertain the sensitivity and specificity of the key terms. These, the definitions of terms above, and through examination of keywords associated with relevant literature gave rise to the search terms selected for this review. The searches were broadened using truncations by use of a wildcard suffix (asterisk (*) at the end) where a term may have a variety of endings, for example, by using the truncation **child*** the words child, children, childrens, childs and childhood should all be encompassed within the search. Terms in relation to anxiety were derived in such a way that papers including all categories of anxiety disorders (according to the DSM-V), should be elicited with the use of word truncation (Table 1). In databases utilising a LIMIT function, searches were limited by age, as well as child/adolescent term search (see Appendix A).

Final searches for this review were undertaken on 3rd January, 2020.

Table 1

Search Terms

Anxiety	anxi* OR *phobi* OR panic
Children	child* OR adolescen*
Intellectual disability	"intellectual disabilit*" OR "learning disabilit*" OR "developmental disabilit*" OR "mental* handicap*" OR "mental* retard*"
Intervention	interven* OR therap* OR treat*

2.2.1 Database searches

The electronic databases searched for this review were Scopus (1823-present) and OVID Medline (1946-present), PsychINFO (1967-present), Embase (1974-present) and Web of Science (1970-present). These databases were chosen as they provide a broad coverage of fields of research, including medical and psychological literature, as well as allied fields.

For search terms used and number of results for each database, see Appendix A.

2.2.2 Grey literature searches

In an attempt to include grey literature in the review, Open Grey and Google scholar were searched using the key terms identified. One title was found via Open Grey; however, it was only available through the British Library EThOS service, and so was not followed up within the scope of this review. One additional study, a Doctoral Thesis was found via Google Scholar and was retained in the final set of papers.

2.2.3 Journal searches

Nine journals were hand searched for additional papers via their online platforms, as they are specialist journals for one aspect of the review question. The journals searched were as follows: Journal of Intellectual Disabilities; Journal of Intellectual Disability Research;

Research in Developmental Disabilities; Journal of Applied Research in Intellectual Disabilities; Intellectual and Developmental Disabilities; American Journal of Mental Retardation; the Journal of Anxiety Disorders; Mental Health Research in Intellectual Disabilities; Learning Disabilities Quarterly. These searches did not elicit any further papers for review.

2.2.4 Author contacting

A number of leading researchers (both national and international) in the areas of anxiety intervention research, intellectual / developmental disabilities and associated fields were contacted to ask if there were any papers in development, preparation or press, and additionally to ask for further signposting to relevant research groups. This strategy did not highlight any further papers appropriate for review.

2.2.5 Citation searching

The reference lists of papers remaining after full screening were hand searched and the "cited by" function of the relevant databases was additionally utilised to check for relevant literature missed by database searching. No further relevant papers were found using this strategy.

3. Results

3.1 Study Selection

A total of 7498 citations were obtained through database searching, then 1515 duplicates and non-articles (e.g. books) were removed. The remaining 5983 citations were screened by title (5752 removed) and subsequently screened by abstract (154 excluded). One further paper for inclusion in the review was obtained via searching grey literature (and retained in the final resulting papers), and no further studies were found through journal hand-searching or citation searching. Five full texts obtained were in a language other than English (two German, one French, one Danish and one Italian) and it was not possible to translate these adequately for

review, so they were also excluded. Finally, the full text of one abstract was not available within Newcastle University Library resources (hard copy at the British library, with no right to copy) and so this was removed. A further reporting of results is outlined in the PRISMA diagram below (Fig 1).

At the "abstract screen" stage, 100% of the abstracts were screened by a second rater (Research Assistant), with 96% reliability. Disagreement was resolved by discussion and clarification of criteria between raters.

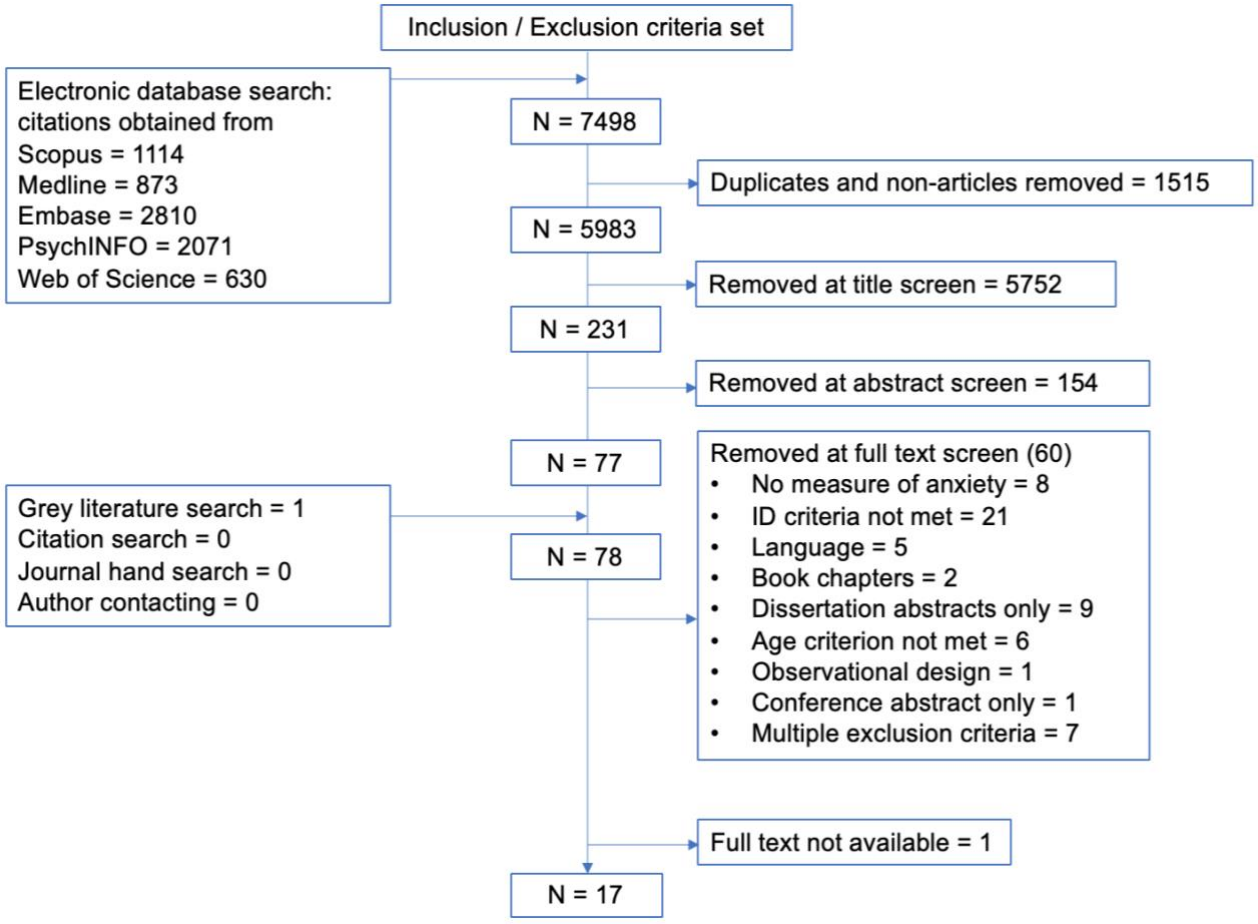


Figure 1: PRISMA diagram

3.2 Summary of Studies

The final 17 studies to be included in the review were appraised and information relevant to this review was extracted, as can be see below (Table 2).

Table 2
Summary Grid of Studies

Author and Year	Title	Journal	Sample	Main design and intervention features	Baseline measures/ characterisation	Main outcome measures	Main findings (in relation to current review)
Arntzen, E. & Almås, I.K. (1997)	Reduction of phobic behaviour for animals in a boy with mental retardation	Scandinavian Journal of Behaviour Therapy	N = 1 (male aged 11, IQ =45)	Single case design with measures pre- post-intervention and multiple probes Behavioural intervention (gradual exposure and reinforcement)	WISC (no indication of edition)	Physiological measures - Heart rate (pulse counter apparatus) Observational measure - "Shouting"	Reductions in number of "undesirable vocal responses" and heart rate to phobic stimuli (dogs) Generalisation of effects to non-trained stimuli (other animals).
Brown, F.J., & Hooper, S. (2009)	Acceptance and Commitment Therapy (ACT) with a learning-disabled young person experiencing anxious and obsessive thoughts	Journal of Intellectual Disabilities	N = 1 18 year old female with moderate/severe learning disabilities.	Single case design with pre and post measure 10 session ACT direct intervention protocol following a pre-intervention meeting.	WISC–IV (Wechsler, 2004) Vineland Adaptive Behaviour Scales–II (Sparrow et al., 2005)	Adapted Acceptance and Action Questionnaire-9 (AAQ9: Hayes et al., 2004) Parent report.	Reduction in scores on every question in the simplified AAQ9 (average 1.7, range 1-73, indicating less avoidance of cognitions and emotions. Parental report of "generally calmer".
Burton, P., Palicka, A., & Williams, T. (2017)	Treating specific phobias in young people with autism and severe	The Cognitive Behaviour Therapist	N= 5 aged 14-19 with ASD, severe ID (IQ 20-40) and minimal language	Case series Behavioural intervention – Systematic desensitisation to dogs, 30 minute	No measures in addition to outcome measures. Verbal	Behavioural observation ("fear reactions") – pre and post- reported for each individual	Participants able to "remain calm" when encountering a dog unexpectedly (idiosyncratic behavioural descriptions).

	learning difficulties			sessions, individualised hierarchy, reinforced practice and therapist modelling. 6-25 sessions.	ability described (measure not reported).		
Chok, J.T., Demanche, J., Kennedy, A., & Studer, L. (2010)	Utilizing physiological measures to facilitate phobia treatment with individuals with autism and intellectual disability: A case study	Behavioural Interventions	N= 1 15 year old male with autistic disorder, moderate LD and specific phobia.	Single case design Baseline measure and continuous measurement during direct intervention + 6 month follow up Graded Exposure / reinforced practice using social praise	No measures in addition to outcome measures	Physiological measure (heart rate monitor). Measurement of approach to feared stimulus (dogs) in metres.	Child met 100% of the of the criteria for treatment success, maintained at 6 months (i.e. behavioural approach of feared stimulus, dogs) .
Danial, J. (2013)	Cognitive Behavior Therapy for Anxiety: Adapting Interventions for Children with Autism and Intellectual Disability	Unpublished doctoral thesis (published online only, UCLA website)	N=1 11 year old male with autism and anxiety	Single case pre-post design. 8 week intervention direct (30 mins) and indirect (with parents 60 mins) adapted from manualised "Building confidence" programme.	ADI-R (Lord, Rutter, & Le Couteur, 1994) WISC–IV (Wechsler, 2004)	Youth Top Problem (Weisz et al, 2011) 3 anxiety symptoms rated by parents pre, session-by-session, and post intervention. Pre-post clinical interview of anxiety with parents – ADIS-IV-P (Silverman & Albano, 1996)	Significant reduction in 2 of 3 top anxiety symptoms. Moved out of caseness for separation anxiety and OCD, but no change in generalised anxiety or social phobia as assessed by ADIS.
Davis III, T.E., Kurtz, P.F.,	Cognitive-behavioural treatment for	Research in Developmen	N = 1 7 year old verbal male	Single case design – multiple baseline across phobias.	Functional assessmen t	Specific phobia module of the ADIS-IV-P – (Silverman &	Clinical recovery of both phobias- based on the reduction of Clinical

Gardner, A.W., & Carman, N.B. (2006)	specific phobias with a child demonstrating severe problem behavior and developmental delays	tal Disabilities	with pervasive developmental disorders, with persistent and intense fear of water and heights	Data collected at baseline, 2 months and 4 months post- first treatment. OST (Ost, 1989, 1997) intervention– massed exposure therapy – in vivo exposure, participant modelling, reinforcement and cognitive challenge (Cognitive behavioural and behavioural synthesis)	Treatment credibility measure.	Albano, 1996) – indirect measure with parents FSSC-R (Ollendick, 1983) – direct measure with participant. Direct observation measures: Behavioral avoidance tasks (BATS) Target Behaviors Interobserver agreement.	Severity Rating on the ADIS-IV-P, water = 5 (mod-severe) to 0 (no diagnosis) post intervention, heights 5 (mod-severe) to 3 (mild, sub-clinical) post intervention. Reduction in FSSC-R score by half a standard deviation. Positive outcomes indicated by observational measures, e.g. completing 100% of BATS and a reduction in neutral and negative vocalisations.
Dovgan, K., Clay, C.J., & Tate., S.A. (2020)	Dog phobia intervention: A case study in improvement of physiological and behavioural symptoms in a child with Intellectual Disability	Developmen tal Neuro-rehabilitation	N=1 13 year-old male with moderate ID, macrocephaly, developmental delays and specific phobia to animals	Single case design Behavioral intervention - Functional assessment, goal setting, BST and differential reinforcement (replication of procedures from Chan et al., 2016) – with ongoing	Functional assessmen t interview	Behavioral operationalised measures -Latency to elopement -Compliance with goals Physiological measures assessing latency to calm: -galvanic skin response	Substantial decrease in episodes of elopement and non-compliance with goals across the intervention. Overall, total latency improved substantially over the 15 sessions (GSR increased, HRV improvement and

				measurement across 15 sessions		-heart rate variability -peripheral skin temperature Inter-observer agreement	temperature decreased across sessions).
Freeman, B.J., Roy, R.R., & Hemmik, S. (1976)	Extinction of a phobia of physical examination in a seven year old mentally retarded boy	Behaviour Research & Therapy	N=1 7.5 year old male (IQ=53) with fear of physical examination, attentional and behavioural difficulties	Single case design Behavioural intervention – stepwise hierarchy including counter-conditioning, fading and generalisation.	Stanford-Binet IQ.	Behavioural observation only – avoidance behaviour and co-operation	Completion of physical examination- being cooperative with novel physician with no avoidance behaviour observed. (Extinction of phobia).
Gobrial, E., & Raghavan, R. (2017)	Calm child programme: Parental programme for anxiety in children and young people with autism spectrum disorder and intellectual disabilities	Journal of Intellectual Disabilities	N=7 Intervention phase: Parents (mothers) of 7 children (6m, 1f) aged 5-14 years (mean age 9.04) with a diagnosis of autism. Mild-moderate learning disability and living at home.	Two phase *-phase one: development of intervention* *-phase two: intervention implementation and evaluation with pre-post anxiety measure and qualitative feedback.* Parent-led intervention- grading anxiety and management strategies (proactive, communication	No measures reported in addition to outcome measures	*Phase one: semi-structured interview and Delphi process* Phase two: Glasgow Anxiety Scale for children with Intellectual Disabilities – GAS-ID (Mindham & Espie, 2003) Parent focus groups.	Significant reduction in anxiety scores from pre-intervention (M=27.29; SD=5.282) to post-intervention (M=16.43; SD=3.599), ($Z=-2.371$, $p<0.05$). Positive qualitative feedback reported including improving parenting practices and interactions with children.

				and reactive strategies).			
Hronis, A., Roberts, R., Roberts, L., & Kneebone, I. (2019)	Fearless me! A feasibility case series of cognitive behavioural therapy for adolescents with intellectual disability	Journal of Clinical Psychology	N=21 adolescents (age 12-18) with mild to moderate ID.	Case series Novel CBT intervention for anxiety, adapted for individuals with ID. 10x45-minute sessions plus online material. Measures taken pre-, throughout- and post-intervention.	Diagnostic / characterisation data reported for each case.	Direct measure: -Subjective Units of Distress (SUDS, Wolpe, 1969). Measure with teachers: -School Anxiety Scale-Teacher report SAS-TR (Lyneham et al., 2008) Measures with parents: -Spence Children's Anxiety Scale Parent Version (SCAS; Spence, 1998) -Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) -Children's Anxiety Life Interference Scale (CALIS; Lyneham et.al., 2013) -Emotions Development Questionnaire (EDQ; Wong et.al., 2009)	Overall trend to reduction in anxiety on direct child measure (SUDS). Clinically meaningful reductions in anxiety observed (Reliable Change Index statistics), reported at individual level. Parent measures not reported as a significant proportion not obtained at follow up.

Luiselli, J.K. (1977)	Case report: An attendant-administered contingency management programme for the treatment of a toileting phobia	Journal of Mental Deficiency Research	N=1 15 year old male with "severe mental deficiency" and minimal expressive language.	Single case design. Behavioural intervention – contingent reinforcement. Baseline (3 weeks), Treatment (28 weeks, Token reinforcement (4 weeks), Self-recording (1 week), Intermittent token reinforcement (10 weeks), Follow ups (4m, 6m, 1 year).	None reported	Observational measure of number of incidents of incontinence. (Inter-rater reliability calculated).	Reduction and subsequent elimination of incontinence incidents at follow up, as well as increase in appropriate toileting behaviours.
Matson, J.L. (1981)	Assessment and treatment of clinical fears in mentally retarded children	Journal of Applied Behaviour Analysis	N=3 Females aged 8, 8 and 10 within moderate range of mental retardation (Grossman, 1977) referred for "debilitating fears".	Multiple baseline across cases. Behavioural intervention-participant modelling.	Louisville Fear Survey Schedule (Miller et al., 1972) Unreported "Sociometric rating of popularity", as "not popular".	Social validity measure (for comparison to peers) Behavioural observation measure (Distance in feet, number of words spoken, fear rating)	Improvements on behavioural measures observed and in line with age matched norms at follow up achieving "normal levels" as determined by the social validity measure.

					Basic subjective measure (1-7) of "fear" in response to social situation.		
Moskowitz, L.J., Walsh, C.E., Mulder, E., McLaughlin, D.M., Hajcak, G., Carr, E.G., & Zarcone, J.R. (2017)	Intervention for anxiety and problem behaviour in children with Autism Spectrum Disorder and Intellectual Disability	Journal of Autism and Developmental Disorders	N=3 Males aged 6, 8 and 9 with ASD and a learning disability with symptoms of anxiety.	Non-concurrent multiple baseline design. Multi-component intervention package, incorporating strategies from Positive Behaviour Support and CBT.	Functional Assessment Interview (FAI; O'Neill et al. 1997) Vineland Adaptive Behaviour Scales–II (Sparrow et al., 2005) Stanford-Binet IQ level reported	Scoring of idiosyncratic behavioural indicators of anxiety Subjective rating of anxiety (0-3) Physiological measures (heart rate and RSA)	All three participants showed clear reductions in ratings once intervention was in place (pretest M=2.8, M=3, M=2.67 to M=0.21, M=0.46, M=0.17 posttest respectively). 76%, 88% and 91% mean baseline reductions in the frequency of anxious behaviours were also reported.
Newman, C. & Adams, K. (2004)	Dog gone good: Managing dog phobia in a teenage boy	British Journal of Learning Disabilities	N=1 17 year old male with moderate learning	Single case design. Behavioural intervention –	None reported	"Observed and verbally related level of anxiety" (details not reported).	Participant able to tolerate being in close proximity to unleashed dogs in the park.

	with a learning disability		disability and dog phobia	systematic desensitisation (gradual exposure), modelling and relaxation		Progression through hierarchy.	
O'Connor, E. (2009)	The use of Social Story DVDs to reduce anxiety levels: a case study of a child with autism and learning disabilities	Support for learning	N=1 Male – age not reported, only "primary school" age	Single case design. Social story DVD intervention and social reinforcement protocol.	None (descriptive only).	Subjective account of anxiety symptoms and display of challenging behaviour	Subjective reporting of anxiety reduction. Reduction in duration and intensity of incidents of challenging behaviours.
Rapp, J.T., Volmer, T.R., & Hovanetz, A.N. (2005)	Evaluation and treatment of swimming pool avoidance exhibited by an adolescent girl with autism	Behaviour Therapy	N=1 Female aged 14 years, with autism and severe mental retardation	Single case design – series of reversals Behavioural intervention-Baseline (A), Blocking plus reinforcement for pool approach and occupancy (B), Blocking plus reinforcement for pool occupancy only (C) over 12 sessions including follow up.	None reported	Observation scores of phobia-related "problem behaviours" (elopement, flopping, face hitting, choking and screaming – all operationalised). Videotaped sessions and Inter-Observer Agreements obtained.	Extinction of phobia – participant able to enter pool with no problem behaviours following intervention. Results maintained at 10 month follow up.

Thornton, V., Williamson, R., & Cooke, B. (2017)	A mindfulness-based group for young people with learning disabilities: a pilot study	British Journal of Learning Disabilities	N= 5 Two females and three males, aged 13-15 with mild-moderate learning disabilities and anxiety (and other difficulties including low mood, low self-esteem and aggression)	Pilot - pre-post design Mindfulness intervention – group format, facilitated by a Clinical Psychologist and assistant, and supported by parent or carer. Six 1-hour sessions. Details of intervention provided.		Self-report anxiety measure: Screen for Child Anxiety Related Disorders (SCARED; Birmaher et al., 1997) Parent questionnaire, designed for this study (questions detailed in paper). Weekly feedback of group “helpfulness”	Pre-intervention responses on the SCARED indicated high levels of anxiety. Insufficient data collected post-intervention to comment on the impact on anxiety. Changes in parent questionnaire data post-intervention suggested that the group did not impact on child anxiety, but there was a slight reduction reported in the impact of anxiety on daily life. Based on 3 out of 5 parents responding only. All participants responded that they found the intervention helpful.

3. 3 Quality grid and rating scale development

3.3.1 Quality grid

The importance of clear and accurate reporting of health research cannot be underscored more highly, as failure to do so means that study results cannot be interpreted or judged for reliability (Moher et al., 2011). As such, a quality grid was developed to highlight the aspects important to evaluating the quality of the studies answering the current review question. Multiple sources were utilised to support the development of this grid, including consulting guidance from the EQUATOR Network (Enhancing the Quality and Transparency of Health Research, Altman et al., 2008), CONSORT (Consolidated Standards of Reporting Trials), Statement for non-pharmacological interventions (Boutron et al., 2008), STROBE guidelines (Systematic Reporting of Observational von Elm et al., 2007) and CARE guidelines for single case research. In addition, a quality indicator system for appraising both single case and group intervention research in relation to determining evidence-based practice (EBP) (Reichow, Volkmar & Cicchetti, 2008) was consulted due to its close conceptual relevance to the research question.

A published review of systems to rate the strength of scientific evidence (West et al., 2002) highlights that a “one size fits all” quality rating scale may not evaluate quality as precisely as one may wish. In light of evaluating the sources listed, it was decided that a grid idiosyncratic to this review should be applied (Table 3), however largely based on a synthesis of the STROBE checklist for observational studies and methodological aspects from Quality Indicator rubrics (Reichow et al., 2008 – primary and secondary quality indicators from this method marked in the grid, superscript 1 and 2 respectively). Additional qualities such as emphasis on and careful evaluation of the sample characteristics of each paper (e.g. a well-defined reporting / diagnosis of ID) that were of direct importance to this review were also included. For clarity, the IMRAD (Introduction, Methods, Results and Discussion) structure (Sollaci and Pereira, 2005) was also utilised in the quality grid.

TABLE 3 *Quality Items*	
Introduction	
Introduction – background/rationale	Clear explanation of scientific background and rationale for the investigation being reported
Definition of terms:	Diagnostic criteria given or clear descriptive definition of key terms used in paper
Intellectual disability (ID)	(For this review) IQ score and functional ability described, or confirmed diagnosis ID, with reference to diagnostic strategy or manual
Anxiety	(For this review) Clearly described anxiety-related symptoms, conceptualised as difficulties with anxiety or fear, or reference to diagnosis of anxiety disorder, with reference to diagnostic strategy or manual.
Development of aims	Logical study aims based on existing literature or clinical need
Intervention type	Intervention grounded in or justified from existing evidence, or replication of existing intervention
Hypotheses	Hypothesis prespecified and clearly defined
Subscale score / Mean	
Method	
Design appropriate to address aims	Key elements of study design presented early in the paper and fit to test hypothesis
Setting and procedure	Setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection clearly described (so as to be replicable)
Consideration of ethics	Acknowledgement of ethical issues and how they were addressed
Experimental control procedure addressed[1]:	
Single Case	There were (a) at least three demonstrations of the experimental effect, (b) at three different points in time, and (c) changes in the DVs covaried with the manipulation of the IV in all instances of replication (note, if there was a delay in change at the manipulation of the IV, the delay was similar across different conditions or participants [±50% of delay]).
Group: Comparison condition	The conditions for the comparison group were defined with replicable precision, including, at a minimum, a description of any other interventions participants received. Participants were assigned to groups using a random assignment procedure
Intervention described (IV) [1]	Information about the treatment was provided with replicable precision (if a manual was used, this is always given a high quality rating)
Dependent (DV) measures	Dependent measures were described with operational and replicable precision, showed a clear link to the treatment outcome, and were collected at appropriate times
Psychometric properties	Reliability and validity of each measure reported and justified

Interobserver agreement (IOA)	IOA was collected across all conditions, raters, and participants with inter-rater agreement at or above .80, and a minimum of Good reliability (< .60). Psychometric properties of standardized tests were reported and were equal or greater than .70 agreement with a kappa<.40
Sample recruitment acceptable and representative	Sources and methods of selection of participants described.
Sample Inclusion/exclusion criteria	Eligibility criteria for inclusion explicitly given, as well as reasons for exclusion
Sample size	It was explained how sample size was arrived at (e.g. apriori power analysis or design-specific)
Participant characteristics reported[1]:	Age and gender were provided for all participants, specific diagnostic information was provided for all participants with ID, if applicable, and standardized test scores were provided, and information on the characteristics of the interventionist was provided
Age and gender	Age and gender of participants given
Diagnoses / Co-morbidities) identified	Including, ID, mental health, neurodevelopmental, behavioural or medical diagnoses, or genetic conditions of participants given
Interventionist characteristics	Personal and professional characteristics of the person/persons delivering the intervention reported
Inclusion criteria reported & adhered to:	
Intellectual Disability	(For this review) IQ score and functional ability described, or confirmed diagnosis ID, with reference to diagnostic strategy or manual
Anxiety disorder/symptomology – described or diagnosed	(For this review) Clearly described anxiety-related symptoms, conceptualised as difficulties with anxiety or fear, or reference to diagnosis of anxiety disorder, with reference to diagnostic strategy or manual.
Subscale score	
Longitudinal follow up reported[2]	Outcome measures were collected after the final data collection to assess generalization and/or maintenance
Validity of procedure	E.g. training for delivering intervention described, standardization of procedures (SOPs) developed
Participant engagement and retention[2] reported	Attrition less than 30% at final outcome measurement.
Fidelity addressed and reported[2]	Procedural fidelity or treatment fidelity was continuously assessed across participants, conditions, and implementers, and if applicable, had measurement statistics at or greater than .80
Subscale score / mean	
Analysis	
Analysis – appropriate to design and research question, and described clearly[1]	Data analyses were strongly linked to the research question(s) and the data analysis used correct units of measure on all variables

Single case: Baseline[1]	All baselines (a) encompassed at least three measurement points, (b) appeared through visual analysis to be stable, (c) had no trend or a counter therapeutic trend, and (d) were operationally defined with replicable precision
Single case: visual analysis[1]	All relevant data for each participant was graphed. Inspection of the graphs revealed (a) all data appeared to be stable (level and/or trend), (b) contained less than 25% overlap of data points between adjacent conditions, unless behaviour was at ceiling or floor levels in previous condition, and (c) showed a large shift in level or trend between adjacent conditions which coincided with the implementation or removal of the IV (note, if there was a delay in change at the manipulation of the IV, the delay was similar across different conditions and/or participants [±50% of delay])
Group: appropriate statistical tests[1]	Proper statistical analyses were conducted for each statistical measure with an adequate power and a sample size of n < 10.
Group: missing data	Explained how any missing data or loss to follow up was address
Analysis – bias potential addressed	Described any efforts to address potential sources of bias
Analysis – reporting	Reporting of results clear, transparent and sufficient detail to allow proper scrutiny
Subscale score / mean	
Discussion	
Summary of key results	Key results clearly described with reference to study objectives
Limitations	Discussed limitations of the study, taking into account sources of potential bias or imprecision - including both direction and magnitude of bias
Interpretation	A cautious overall interpretation of results given, considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability of findings[2]	External validity explicitly addressed
Social validity addressed[2]	The study contained at least four of the following; (a) DVs were socially important (i.e., would society value the changes in outcome of the study), the (b) intervention was time and cost effective (i.e., did the ends justify the means), (c) comparisons were made between individuals with and without disabilities, (d) the behavioural change was large enough for practical value (clinically significant), (e) the consumers were satisfied with the results, (f) people who typically come in contact with the participant manipulated the IVs, (g) the study occurred in natural contexts
Future Directions	Directions for future research identified and discussed, clinical implications discussed
Subscale score / mean	
Overall study quality based on Reichow et al. 2008 criteria	

3.3.2 Rating scale

A rating scale was developed to be applied to each item in the evaluation grid, assessing the quality of each item (higher score, greater quality), with each quality criteria operationalised for clarity (see Appendix B). An additional option of "not applicable" (n/a) was added, as some items may not be relevant for differing designs, but this should not have an impact on the quality score for such studies.

As an n/a option was included, a mean subscale score, omitting any non-applicable items, should be calculated for each subscale in the quality grid. This allows for the quality of the sections of papers to be easily compared but assessed separately and weighted differently at a later point, if desired.

Table 4
Quality Rating Scale

3	Excellent – Item addressed with excellent quality
2	Adequate – Item addressed with adequate quality, though some information may be missing
1	Poor – Item not addressed, or quality poor or inadequate
n/a	Item not applicable

A further overall descriptive rating of study quality, based on Reichow et al.'s (2008) guidelines for rating the strength of research was also included (Table 5), due to its relevance in appraising research for evidence-based practice for interventions.

Table 5
Reichow et al. (2008) Guidelines for Rating Research Report Strength

Strength	**Rating Guidelines**
Strong	Received high quality ratings on all primary quality indicators (superscript 1, Table 3) and showed evidence of three or more secondary quality indicators (superscript 2, Table 3)
Adequate	Received high quality ratings on four or more primary quality indicators with no unacceptable quality ratings on any primary quality indicators, and showed evidence of at least two secondary quality indicators
Weak	Received fewer than four high quality ratings on primary quality indicators or showed evidence of less than two secondary quality indicators

The developed grid and rating scales were then applied to the papers (Appendices C1&2). Four papers (24%) were second scored by a research assistant, and inter-rater reliability was calculated at 97%.

3.4 Results Synthesis

Table 6
Resulting Papers by Intervention Type I

	Arntzen & Almås (1997)	Burton et al. (2017)	Chok et al. (2010)	Dovgan et al. (2020)	Freeman et al. (1976)	Luiselli (1977)	Matson (1981)	Newman & Adams (2004)	Rapp et al. (2005)
Intervention Type	Behav	Behav	Behav	Behav	Behav	Behav	Behav	Behav	Behav
n	1	5	1	1	1	1	3	1	1
age	11	14-19	14	13	7	15	8-10	17	14
ID	IQ45	IQ20-40	Mod	Mod	IQ53	Severe	Mod	Mod	Severe
Intro Mean	1.5	2.3	2.8	2.5	1.5	1.3	2.3	2.2	2.3
Method Mean	2.4	1.9	2.6	2.5	1.9	2.2	2.6	2.1	2.4
Analysis Mean	2.5	1	3	3	1	1.8	2.5	1.3	3
Discussion Mean	1.3	2	2.7	3	1.3	2	2.3	1.5	2.5
Reichow Quality Rating	Adequate	Weak	High	High	Weak	Weak	Adequate	Weak	High

Table 7
Resulting Papers by Intervention Type II

	Davis III et al. (2006)	Moskowitz et al. (2017)	Danial (2013)	Hronis et al. (2019)	Brown & Hooper (2009)	Gobrial & Raghavan (2017)	O'Connor (2009)	Thornton et al. (2017)
Intervention Type	Behav + CBT	PBS +CBT	CBT	CBT	ACT	Parent	Social story	Mindful-ness
n	1	3	1	21	1	7	1	5
age	7	6-9	11		18	5-14	?	13-15
ID	Mod ID	Mild	IQ62	Mild-mod	IQ44	Mild-mod	?	Mild-mod
Intro Mean	2.8	2.5	2.8	2.3	1.8	2	1.3	2.3
Method Mean	2.4	2.6	2.5	2.3	1.8	2.3	1.6	2.1
Analysis Mean	1.8	3	3	2.6	1	1.8	1	1.8
Discussion Mean	2.3	3	2.7	2.8	1.5	2.7	1.3	2.2
Reichow Quality Rating	Weak	High	High	Adequate	Weak	Weak (pilot)	Weak	Weak (pilot)

Due to the varied designs, intervention types, and outcome measures (or lack thereof) it was not possible to pool data from the resulting studies. A narrative synthesis of the resulting 17 papers therefore follows. Resulting papers overall comprised a range of small-medium n designs: 11 of the 17 were single case design (n=1); five were small n (n=3, n=5, one n=7) case series or small group no-control design; and one was a medium sized feasibility case series (n=21).

3.4.1 Quality of studies within intervention type

3.4.1.1 Behavioural Approach

Nine papers (8 single case, and one case series of 5 participants) reported on a behavioural intervention targeting phobias: one of animals; four specifically of dogs; one of physical examinations; one of toileting; one swimming and one social phobia. Within these, participants were aged between 7 and 19, all with moderate-severe ID. All nine studies suggested that participants successfully overcame their phobias following intervention. The "behavioural approach" suggests that all behaviours are learnt through conditioning (classical and operant) and therefore interventions based on this approach, such as those described here, use principles and techniques such as reinforcement, modelling and graduated exposure in order to change "maladaptive" behaviours (Michie et al., 2013). By the nature of these behavioural interventions, successful outcome was primarily determined by observation of behavioural aspects (i.e. increased ability to approach or engage with the previously feared stimuli, and reduction of "problem" or avoidance behaviours, such as running away or shouting). Three papers (Arntzen et al., 1997; Chok et al., 2010 & Dovgan et al., 2020) additionally utilised physiological measures of heart rate (all) and galvanic skin response (Dovgan et al., 2020, only), which suggested a reduction in anxiety symptoms in line with the behavioural observations reported. Matson et al. (1981), also included a basic subjective measure of "fear" (1-7 scale) and a measure of social validity to better conclude recovery.

Across all behavioural studies, there was considerable variability in quality of evidence (Table 6). Ratings of four studies (Burton et al., 2017; Freeman et al., 1976; Luiselli, 1977 & Newman & Adams, 2004), although reporting positive outcome following intervention, highlighted methodological weaknesses across subscales which may make it difficult to draw sound conclusions as to the efficacy of their interventions. One study (Arntzen & Almås, 1997), despite obtaining poorer quality scores with regard to introduction and discussion, higher scores on the methods and analyses subscales may indicate that the positive outcomes reported following this behavioural intervention may provide some promise. Four studies appeared strongest across all subscales (Chok et al., 2010; Dovgan et al., 2020; Matson et al., 1985 & Rapp et al., 2005), providing robust justification for their intervention, sufficient detail regarding intervention and precision of methods and analyses to allow for replicability and methodological scrutiny, and strong discussions. It may therefore be suggested that, although small numbers, these studies provide strong support for the use of individualised behavioural intervention for specific anxiety in children (aged 13-17) with moderate-severe ID.

Aggregated evidence from the nine included papers pertaining to behavioural intervention may provide emerging evidence for the usefulness of this approach with this population, however it should be noted that all studies reporting on the behavioural approach were limited to targeting the Specific Phobia type of anxiety disorder.

3.4.1.2 CBT-based interventions (CBT and Behavioural focus with CBT elements)

Cognitive-behavioural therapy (CBT) -based interventions are based on the theory that thoughts and feelings, as well as physiological responses and behaviours, are interconnected and therefore aim to facilitate change identifying and adapting unhelpful cognitions in developmentally appropriate ways (alongside behavioural aspects described above) (e.g. Grave & Blissett, 2004).

Two papers reported evidence of the use of an adapted Cognitive Behavioural Therapy (CBT) intervention, with contrasting designs (one single case design, one case series of 21 participants). Danial (2013) reported upon an adaptation to a manualised CBT intervention (Building Confidence, involving increasing emotional literacy, identifying "icky thoughts" and developing an alternative repertoire of "calm thoughts" and practicing this thought challenging in vivo) implemented with an 11 year old boy with ASD and ID. Results showed a reduction in severity in problem behaviours, as well as reduction in scores on the ADIS measure of anxiety, which suggested that the participant no longer met diagnostic criteria for his primary diagnosis of separation anxiety or obsessive-compulsive disorder (however still meeting clinical criteria for social anxiety and generalised anxiety disorder). Hronis et al. (2019) reported upon case series of 21 participants aged 12-18 years with mild-moderate ID in a feasibility study of an online CBT intervention for anxiety (as well as face to face sessions). This intervention (Fearless Me!) included cognitive strategies such as identifying and "catching" unhelpful thoughts and fact checking, as well as physical and behavioural elements such as relaxation and exposure hierarchies. Self-report, teacher report and parent-report measures were employed, however only child and teacher measures were reported due to low return of parent measures. Results in this study (Table 3) suggested clinically meaningful reductions in anxiety post intervention. Both papers presented strong introductions, providing a good evidence base and justification of the use of CBT, and high-quality discussions suggesting that adapted CBT may be a useful intervention for anxiety for this population, with appropriate adaptation. It should be noted that one of these studies was reported in an unpublished thesis (Danial, 2013), and thus has not undergone the process of peer review.

Two studies reported on interventions which integrated CBT-based strategies into a behaviourally-focused approach. One study (Moskovitz et al., 2017) reported the use of a multicomponent intervention package, which utilised both CBT- and strategies from Positive Behaviour Support (PBS, a positive behavioural intervention approach**,** along with cognitive "coping statements") to target anxiety and problem behaviours in 3 children with ASD and co-

occurring ID (aged 6-9). This study had a small sample size, but utilised an appropriate design case series to answer the question of intervention piloting for this population, gave good-excellent justification and description of the intervention, providing a high level of detail of participant characteristics and idiosyncratic responses to treatment. It employed a strong methodology and was able to show substantial improvements in anxiety and problem behaviour using their intervention strategy. Both observational measures and physiological measures were employed to demonstrate favourable outcome and reduction in anxiety symptoms, and individualised intervention strategies were presented with sufficient detail to allow replication.

The other study combining CBT with a behavioural focus (Davis III et al., 2006) reported a multiple baseline design for a one-session treatment for water and height phobia in a 7 year old with pervasive developmental disorder and severe behaviour problems, combining cognitive "thought challenges" with behavioural techniques of in vivo exposure, participant modelling and reinforcement. This paper presented a strong introduction and justification for the use of the intervention in this population and employed both direct and indirect measures of anxiety symptoms (parental report and direct observational measures). Results indicated substantial improvements in anxiety following the intervention across measures, suggesting that the synthesis of behavioural and CBT strategies could be an appropriate intervention for phobia in this population. This paper additionally presented a good quality reflective discussion and importantly highlights and contextualises the clinical implications of the study, i.e. that this CBT-behavioural synthesis offers an alternative to traditional behavioural approaches (forced exposure) in young people with ID.

3.4.1.3 Other interventions (ACT, mindfulness, social stories, parent-lead)

One paper reported on a single case design study implementing an ACT intervention for an 18-year-old female with moderate-severe ID (Brown & Hooper, 2009). Results of this study suggested that the participant became less avoidant of her emotions and cognitions (as

measured by a simplified measure of acceptance), and this was supported by parental reports of her "being calmer". This is an improvement in line with the intentions of the ACT approach, that is acceptance, rather than symptom reduction as the targeted outcome, and therefore may show promise as an intervention for this population. However, methodological quality was weak across subscales, and therefore conclusions as to effectiveness of this intervention as a result of this study should be made with significant caution.

One paper reported on a social story intervention for a child with ASD and ID (O'Connor, 2009). Although this paper presented a reasonable rationale for the use of a social story intervention, methodological quality was poor and insufficient data was presented to allow conclusions to be drawn regarding the effectiveness of intervention. Subjective account reported an improvement in anxiety and associated reduction in challenging behaviour following the intervention in one out of two contexts described (swimming but not PE lessons).

One paper reported on a pilot study for mindfulness-based group intervention, implemented with five young people with mild-moderate ID aged 13-15 (Thornton et al., 2017). It presented good justification of the intervention and additionally described the intervention in accessible detail. It elicited both subjective and parental feedback, both pre-post and throughout the intervention, and results suggested that mindfulness was accessible and somewhat helpful for participants. The study design was appropriate to address its aims as a small pilot and elicited helpful feedback in relation to the feasibility and acceptability of mindfulness intervention in this population. However, because of the position of such a pilot in the research cycle, methodological quality, particularly in methods and analysis, was consequently somewhat weak. This study does, however, suggest that this approach may be a useful one to pursue with more methodological rigour in future studies.

An additional pilot study was reported in one paper which presented a parent-lead intervention for anxiety in their children with ASD and co-occurring ID (Gobriel & Raghavan, 2017). Both

the development and implementation of the novel intervention was reported upon, and thus a high level of detail was provided regarding the intervention content. Mothers of seven children (aged 5-14) took part in the implementation phase, and a reduction in child anxiety scores post intervention tentatively suggest that this parent-lead intervention strategy may be useful in managing anxiety in this population. Qualitative data provided also suggests that the intervention may be acceptable and helpful for parents. Due to the acceptability and feasibility pilot design, a poor quality score was given on the analysis subscale, however the discussion was notably strong in this paper, effectively drawing tentative suggestions for building upon the pilot, and placing the study in clinical context.

3.4.2 Quality of studies and evidence-based practice

When considering the strength of studies in relation the guidelines for establishing evidence-based practice, discussed by Reichow et al., (2008), the results of this review suggested that five studies were of high quality, three of adequate quality and nine were weak. Within those papers appraised as "high" quality (Chok et al., 2010; Dovgan et al., 2020; Rapp et al., 2005; Moskovitz et al., 2017; Danial, 2013) three reported on a single case behavioural intervention for specific phobias, one on an intervention combining elements the behavioural approach (PBS) and CBT with three participants, and one utilising adapted CBT with one participant, respectively.

Within the evidence appraised as "adequate" quality, two papers reported on behavioural interventions for social anxiety (n=3) and specific phobia (n=1) (Matson, 1981; Arntzen & Almås, 1997). It has been suggested that treatments may meet the standard to be considered Established Evidence Based Practice (EBP) or Promising EBP if, when multiple studies of sufficient quality are aggregated (Reichow et al., 2008). When taken together and appraised against Reichow's criteria for treatments to be considered EBP (Appendix D), results of this review suggest that there is not sufficient evidence strength for any intervention type to currently be considered either Established or Promising EBP for anxiety for children with ID.

It should be noted that two papers (Gobrial & Raghavan, 2017 and Thornton et al., 2017), although falling into the "weak" category when appraised using this scale, were of reasonable quality when taken overall and in the context of their position in the research process, and methodological aspects of the study (pilot study assessing acceptability and feasibility, meaning low analysis score) meant a high score would be more difficult. Aspects such as qualitative information in the development of and feedback regarding the intervention, and strong research methodology in development of the intervention was not accounted for in this rubric, but may have been reflected in the higher discussion subscale score.

3.4.3 Summary across interventions

As such, the quality rating grid suggested significant variability in the quality of evidence published in relation to the research question (scoping and appraising quality of evidence reporting on interventions for children with ID). Noticeably, all papers obtained poor score for reporting or addressing fidelity (a measure of fidelity of treatment to the described intervention / manual). Likewise, detailed description of interventionist characteristics was generally poor. Overall, resulting papers presented higher quality background leading to well justified rationales both for the importance of interventions for anxiety are in this population, and the specific interventions they implemented. However, as the quality of methods and results varied widely across the included sources, although most presented well-considered discussions, conclusions drawn from some studies in terms of the effectiveness of their particular intervention should be taken cautiously.

Overall the included studies suggest that positive outcomes are attainable for reducing anxiety in children with ID, utilising a range of psychological interventions. Studies reporting on the behavioural approach were the most numerous and contained some high-quality evidence suggesting the usefulness of this approach, however this was only in relation to specific phobias, and small numbers. For more general anxiety symptoms and disorders, there were

two papers reporting on CBT and two utilising CBT plus behavioural aspects that were of sufficient quality to suggest that these interventions show promise and should be explored further in order to establish a larger and more robust evidence base. Two pilot studies, reporting on a mindfulness and a parent lead intervention, were of sufficient quality to suggest that the further exploration of these approaches may be justified for this population.

4. Discussion

The aim of this review was to scope and evaluate the quality of current evidence pertaining to interventions for anxiety for children with Intellectual Disability. A systematic search elucidated 17 studies, nine of which reported on the use of the behavioural approach and two of which on an integration of behavioural and CBT approaches to target specific phobias. Two studies reported on adapted CBT intervention, one used mindfulness, one Acceptance and Commitment Therapy, one Social Stories and one developed a novel parent lead intervention to address more generalised anxiety presentations. Within the resulting papers quality was found to vary widely (Tables 6,7; Appendices C1,2), particularly within the methodological domains, however many presented robust justification for their use of intervention.

The predominance of single case and small n designs with no control should be noted when considering the validity and quality of this evidence as a whole. This is because such studies would conventionally be deemed to be of low ranking in a hierarchy of evidence for interventions (e.g. Oxford CEBM Levels of Evidence, 2009), being ranked respectively much lower than, for example, cohort studies or randomised controlled trials (RCT). Indeed, it must be noted that selection bias will substantially influence the study quality of the resulting evidence for interventions, however it has been argued that when evidence provided by a number of small n studies is aggregated, a richer evidence base may be developed in terms of the diversity of samples within a target population (West et al., 2002). In addition, it has been suggested that well designed observational studies need not necessarily be less valid, for example, that outcomes are not qualitatively different, nor do small studies overestimate

the magnitude of treatment effects when compared to RCTs on the same topic (Concato et al., 2000; Benson & Haartz., 2000). Relevantly, Kazdin (2011) argues that single-subject studies can have utility in detecting small, but meaningful, changes in behaviours, or behaviours which may change more gradually over time. As such, the studies evaluated in this review, particular those rated as higher quality, may make a useful contribution to the evidence base for therapeutic interventions for this population.

Despite this, in relation to the question addressed by the current review, due to the small sample sizes and, importantly, small numbers of studies pertaining to each intervention type, when aggregated, no intervention met criteria to be currently appraised as evidence-based practice (Appendix D, Reichow et al., 2008). This quality appraisal did however suggest that a number of interventions were reported with sufficient quality to justify further exploration, i.e. the behavioural approach for specific phobia, and adapted CBT, mindfulness or parent-led approaches for more generalised anxiety symptoms.

Several methodological aspects may have influenced the results of this review. A lack of an international consensus on diagnostic boundaries and terminologies around intellectual disability, as well as lack of transparency in reporting or measurement within studies was problematic when searching and reviewing papers, especially as such terminologies have evolved over time. For example, the term “learning disability” is still routinely used interchangeably with intellectual disability in the UK (and is still the “term of choice” clinically, e.g. in NICE guidance), however this term in the USA/Canada means an individual with average intellectual functioning but with specific learning difficulties such as Dyslexia. Without in depth knowledge of terminologies used across countries, if definitions of terms or clear reporting of participant characteristics are not included in papers, it is extremely difficult to conclude the appropriateness of inclusion for review. In addition, given the often complex and variable presentation of an intellectual disability (and how “significantly impaired adaptive functioning” may be operationalised), strict inclusion criteria around IQ level (below 70) may

result in studies being unfairly excluded. For example, one paper was excluded which reported on a “mixed” sample of borderline (IQ 70-80) and mild ID, and so was not included, however given that those in the borderline range may have been functioning significantly below average, this may have been an acceptable sample to include if sufficient detail had been provided.

Similarly, lack of clarity with regards to both the reporting and measurement, and indeed conceptualisation of anxiety in individuals with ID may have impacted upon this review. For example, as verbal ability or the ability to understand and express internal states decreases (which may be associated with increasing severity of ID), it may become more difficult for others to objectively identify or measure their anxiety, as diagnosis of anxiety disorders is traditionally reliant on verbal reports of cognitions and affect (Moskovitz et al., 2019). This issue impacts on this review on two levels. One is that a proportion of evidence may be overlooked in searches, as behaviours that may be clinically understood as possible expressions of anxiety states in those with ID and difficulties communicating their internal states (including, but not limited to self-injurious or challenging behaviours, selective mutism) would not be included unless explicitly conceptualising such behaviours as anxiety-related (see below for bias risk). Also in relation to this, a number of interventions based on alternative psychological approaches, such as the psychodynamic or systemic models, may have been overlooked during searches or excluded due to the inherent epistemological positions of such interventions (for example using a more holistic, rather than symptom-driven approach to assessment and intervention for individual distress).

Methodological and ethical issues around the conceptualisation of anxiety also need to be considered, for example interventions may be described as “behaviour modification” in participants with ID and may not only be overlooked in systematic searches (and therefore development of evidenced-based practice), but thoughtful consideration of the function and internal experience of such interventions may not be adequately addressed. Similarly, a

longstanding issue of “diagnostic overshadowing” (Jamieson & Matson, 2019; Reiss et al., 1982) whereby symptoms of anxiety are misattributed to the ID itself, or even that ID itself is not identified due to a more prominent condition or diagnosis (Manohar et al., 2016), may mean that a proportion of individuals may not be included in studies or properly represented by intervention literature. Effective, evidence-based interventions for this population may therefore be less accessible in the future.

Secondly, there is an important methodological issue that the definition and measurement of anxiety within the included papers may be substantively disparate, reducing the ability to compare or synthesise them systematically. Many of the resulting papers reported on behavioural interventions for specific phobia (Table 6), and observational measures were consistently used in relation to the participants’ experience of anxiety, and others supported this with alternative objective ones such as physiological measures. However, there was less clarity and consistency across other interventions addressing generalised anxiety, as to how the target outcomes were defined and measured, and this may be reflected in their overall quality. It may be questioned whether there is more evidence published in relation to behavioural interventions for this type of anxiety as it is easier to recognise, define and appraise behaviourally in those with ID than other types of anxiety.

4.1 Limitations and recommendations

Overall, the search strategy used in this review appeared fit for purpose and resulted in a sufficient number of papers to address the question. However, besides the methodological issues described latterly, there were several limitations identified within this study. One is the potential for publication bias, and despite searching the grey literature, the long-established tendency for positive results only to be published or disseminated will likely impact upon the literature reviewed (Rosenthal, 1979). Within the scope of this study, it was not possible to access translations of the non-English language publications obtained, and therefore there is potential bias within this review towards interventions reported upon by English-speaking

research groups or those with the capacity to access resources for translation. We may also therefore be unaware of any original interventions or potentially useful alternative approaches reported upon or developed within these countries. Similarly it was not possible to obtain a number of full texts in relation to published dissertation abstracts and therefore there may be a further small proportion of relevant existing literature than has not been included in this review. In addition, the decision not to include disorder-specific terminology within searches in relation to conditions or genetic disorders linked with Intellectual Disability (e.g. Downs Syndrome, William Syndrome) or disorders which may be clinically or conceptually related to anxiety (e.g. Selective Mutism, challenging behaviours) may bias the results of this review. It is possible that there are alternative intervention strategies utilised within these populations that would be of relevance to the review question, however the fact that there is such vast number of ID-related conditions, and many diverse presentations that may conceptualised as anxiety-related and that it is often difficult to ascertain this relationship objectively (particularly in a population who may struggle to articulate their internal experiences), it was considered unmanageable to objectively include all terms. This trade off was considered to be acceptable within the scope of this review, and the observation that populations including those with genetic syndromes were represented in the initial search results suggest that such groups were represented to some extent (although it is acknowledge that the extent of this inclusion is not quantifiable using this strategy). Although every attempt was made to develop a valid tool to appraise study quality, it is also acknowledged that the use of an idiosyncratic quality grid means that comparison with similar reviews or future metareviews may be less efficient.

There are several research recommendations arising from this review. Importantly, research efforts should be made to validate and agree operational definitions of constructs such as ID and anxiety across the field, or strive for clarity of definitions and descriptions of participant characteristics within studies. There is additionally a clear lack of methodological rigour within this small n research, as well as a lack study replication and studies with larger sample sizes in relation to existing interventions. Addressing this might allow such interventions to move

along the research trajectory that might justify research ranked higher in the hierarchy of evidence (RCTs and reviews of RCTs) or, perhaps more relevantly given the heterogeneity and complexity of the population studied, better controlled small n designs (single case or series) with robust methodological features such as appropriate experimental design, measurement and analysis, transparency of intervention, participant and interventionist characteristics, fidelity, long-term follow up may indeed be of similar importance and advance the field considerably. Until such research is prioritised, there may lack evidence of sufficient quality to identify evidence-based practice in this field.

It has been reported that historically, first line treatments for anxiety in individuals with ID is pharmacological or behavioural intervention (Vereenooghe & Langdon, 2013), and this review appears to support this in relation to children with ID also (it was observed that a large proportion of papers excluded at title screening were reporting upon pharmacological treatments). There has importantly been a recent healthcare initiative in the UK which underscores the importance of reducing the overmedication of children with ID (STAMP-STOMP, NHS England, 2018) and the results of this review highlights the crucial importance of prioritising future research into psychological interventions to redress this balance. Alongside this, social determinants of poor mental health in those with ID, for example discrimination and socio-economic factors (e.g. Hatton et al., 2019), should not be overlooked within intervention research.

Clinically, this study underscores the importance of careful formulation of anxiety in children with ID, with a view to selecting the most appropriate intervention based on idiosyncratic need and availability of clinical skill sets. Despite no one intervention type currently attaining the status of evidence-based practice, the reviewed studies do suggest that psychological interventions can positively impact on anxiety in this population, and it is therefore of value to pursue the use psychological intervention to alleviate distress.

4.2 Conclusions

In conclusion, it would appear that the evidence base for psychological interventions for anxiety in children with ID is extremely limited. The lack of a unified approach to intervention for anxiety other than in the specific phobia domain may reflect an evidence base that is lacking in this area, but also that ID is a term for a heterogenous population which may need a range of or idiosyncratic approach/es to intervention. Further research is needed to begin to build an evidence base robust enough to begin to determine which interventions may be deemed evidence-based practice in this field. For this population in particular, the importance of careful clinical formulation of anxiety is highlighted, in order to inform the most appropriate intervention strategy.

REFERENCES

Altman, D. G., Simera, I., Hoey, J., Moher, D., & Schulz, K. (2008). EQUATOR: reporting guidelines for health research. *Open Medicine*, *2*(2), e49.

American Psychiatric Association (2000). Diagnostic and statistical manual of mental disorders (4th ed., Text Revision). Washington, DC: Author

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

**Arntzen, E., & Almås, I. K. (1997). Reduction of phobic behaviour for animals in a boy with mental retardation. *Cognitive Behaviour Therapy*, *26*(3), 124-131.

Benson, K., & Hartz, A. J. (2000). A comparison of observational studies and randomized, controlled trials. *New England Journal of Medicine*, *342*(25), 1878-1886.

Boutron, I., Moher, D., Altman, D. G., Schulz, K. F., & Ravaud, P. (2008). Reporting of nonpharmacological treatment interventions: an extension of the CONSORT Statement. *Ann Intern Med*, *148*, w60-w66.

Brendel, K. & .Maynard, B.R. (2013) Child–Parent Interventions for Childhood Anxiety Disorders: A Systematic Review and Meta-Analysis. *Research on Social Work Practice, 24*, 3, pp. 287 – 295

**Brown, F.J., & Hooper, S. (2009) Acceptance and Commitment Therapy (ACT) with a learning disabled young person experiencing anxious and obsessive thoughts. *Journal of Intellectual Disabilities, 13*, 3, 195-201.

**Burton, P., Palicka, A., & Williams, T. I. (2017). Treating specific phobias in young people with autism and severe learning difficulties. *the Cognitive Behaviour Therapist*, *10*.

**Chok, J.T., Demanche, J., Kennedy, A., & Studer, L. (2010) Utilizing physiological measures to facilitate phobia treatment with individuals with autism and intellectual disability: A case study. *Behavioural interventions, 25*, 325-337.

Cooray, S.E. and Bakala, A. (2005) Anxiety disorders in people with learning disabilities. *Advances in Psychiatric Treatment 11*, 5, 355–361.

Cooper, S.A., Melville, C.A., & Einfeld, S.L. (2003) Psychiatric diagnosis, intellectual disabilities and diagnostic criteria for psychiatric disorders for use with adults with Learning Disabilities/Mental Retardation (DC–LD), *Journal of Intellectual Disability Research*, *47*,1, 3-15

Concato, J., Shah, N., & Horwitz, R. I. (2000). Randomized, controlled trials, observational studies, and the hierarchy of research designs. *New England journal of medicine*, *342*(25), 1887-1892.

Conners, C.K., 1990. *Manual for Conners' Rating Scales*. Multi- Health Systems, Toronto, Ontario.

Creswell C., Waite, P., Cooper, P.J. (2014) Assessment and management of anxiety disorders in children and adolescents. *Archives of Disease in Childhood,* 99, 674-678.

**Danial, J. (2013) Cognitive behaviour therapy for anxiety: adapting interventions for children with autism and intellectual disability. Unpublished thesis (UCLA). Available from https://escholarship.org/uc/item/34z1g0sc

**Davis III, T. E., Kurtz, P. F., Gardner, A. W., & Carman, N. B. (2007). Cognitive-behavioral treatment for specific phobias with a child demonstrating severe problem behavior and developmental delays. *Research in Developmental Disabilities*, *28*(6), 546-558.

Dekker, M. C., Koot, H. M., van der Ende, J., & Verhulst, F. C. (2002). Emotional and behavioral problems in children and adolescents with and without intellectual disability. *Journal of Child Psychology & Psychiatry & Allied Disciplines, 43*, 1087–1098

Deudney C and Shah A (2004) *Mental Health in People with Autism and Asperger's Syndrome: A Guide for Health Professionals*. London: National Autistic Society.

**Dovgan, K., Clay, C. J., & Tate, S. A. (2020). Dog Phobia Intervention: A Case Study in Improvement of Physiological and Behavioral Symptoms in A Child with Intellectual Disability. *Developmental Neurorehabilitation*, *23*(2), 121-132.

Essau, C. A., Lewinsohn, P. M., Lim, J. X., Moon-ho, R. H., & Rohde, P. (2018). Incidence, recurrence and comorbidity of anxiety disorders in four major developmental stages. *Journal of affective disorders*, *228*, 248-253.

**Freeman, B. J., Roy, R. R., & Hemmick, S. (1976). Extinction of a phobia of physical examination in a seven-year-old mentally retarded boy—a case study. *Behaviour Research and Therapy*, *14*(1), 63-64.

**Gobrial, E., & Raghavan, R. (2017) Calm child programme: parental programme for anxiety in children and young people with autism spectrum disorder and intellectual disabilities. *Journal of Intellectual Disabilities, 1-13*.

Grave, J., & Blissett, J. (2004). Is cognitive behavior therapy developmentally appropriate for young children? A critical review of the evidence. *Clinical Psychology Review*, *24*(4), 399-420.

Green, S. A., Berkovits, L. D., & Baker, B. L. (2015). Symptoms and development of anxiety in children with or without intellectual disability. *Journal of Clinical Child & Adolescent Psychology*, *44*(1), 137-144.

Gresham, F. M., & Elliott, S. N. (1990). *Social skills rating system manual*. Circle Pines, MN: American Guidance Service.

IHAL (The Improving the Health and Lives Learning Disabilities Observatory) (2015) People with learning disabilities in England 2015: Main report, Public Health England. Available through www.gov.uk.

Hagopian, L. P., & Jennet, H. K. (2008). Behavioral assessment and treatment of anxiety in individuals with intellectual disabilities. *Journal of Developmental and Physical Disabilities, 20*, 467–483.

Hatton, C., & Emerson, E. (2019). Mental Health and people with Intellectual Disabilities in England: What does secondary analysis of national cohort surveys tell us? *Journal of Intellectual Disability Research, 63*, 7, 681-681.

NHS Centre for Reviews and Dissemination (NHS CRD), (2001). *Undertaking systematic reviews of research on effectiveness: CRD's guidance for those carrying out or commissioning reviews. CRD report number 4.* York: University of York.

Helverschou, S. B., & Martinsen, H. (2011). Anxiety in people diagnosed with autism and intellectual disability: Recognition and phenomenology. *Research in Autism Spectrum Disorders, 5*, 377–387.

**Hronis, A., Roberts, R., Roberts, L., & Kneebone, I. (2019). Fearless Me!©: A feasibility case series of cognitive behavioral therapy for adolescents with intellectual disability. *Journal of clinical psychology*, *75*(6), 919-932.

Ialongo, N.S., Rogosch, F.A., Cicchetti, D., Toth, S.L., Buckley, J., Petras, H., & Neiderhiser, J. (2006). *A developmental psychopathology approach to the prevention of mental health disorders.* In: Cicchetti, D. (Ed.), Developmental Psychopathology, 2nd Edition, pp.968-1018.

Jamieson, D., & Mason, J. (2019). Investigating the Existence of the Diagnostic Overshadowing Bias in Australia. *Journal of Mental Health Research in Intellectual Disabilities*, *12*(1-2), 58-70. DOI: 10.1080/19315864.2019.1595231

Kazdin, A. E. (2011). Single-case research designs: Methods for clinical and applied settings (2nd ed.). Oxford University Press

Knapp, M., King, D., Healey, A., & Thomas, C. (2011). Economic outcomes in adulthood and their associations with antisocial conduct, attention deficit and anxiety problems in childhood. *Journal of mental health policy and economics*, *14*(3), 137-147.

**Luiselli, J. K. (1977). Case report: an attendant-administered contingency management programme for the treatment of a toileting phobia. *Journal of Mental Deficiency Research*, *21*(4), 283-288.

Lord, C., Rutter, M., & Le Couteur, A. (1994). Autism Diagnostic Interview-Revised: a revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. *Journal of autism and developmental disorders*, *24*(5), 659-685.

Manohar, H., Subramanian, K., Kandasamy, P., Penchilaiya, V., & Arun, A. (2016). Diagnostic masking and overshadowing in intellectual disability—how structured evaluation helps. *Journal of Child and Adolescent Psychiatric Nursing*, *29*(4), 171-176.

**Matson, J. L. (1981). Assessment and treatment of clinical fears in mentally retarded children. *Journal of Applied Behavior Analysis*, *14*(3), 287-294.

McPheeters, M.L., Warren, Z., Sathe, N., Bruzek, J.L., Krishnaswami, S., Jerome, R.N., & Veenstra-Vanderweele J. (2011) A systematic review of medical treatments for children with autism spectrum disorders. *Paediatrics, 127*(5), 1312-21.

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., ... & Wood, C. E. (2013). The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Annals of behavioral medicine*, *46*(1), 81-95.

**Moskovitz, L.J., Walsh, C.E., Mulder, E., McLaughlin, D.M., Hajcak, G., Carr, E.G., & Zarcone, J.R. (2017) Intervention for anxiety and problem behavior in children with autism spectrum disorder and intellectual disability. *Journal of Autism and Developmental Disorders*, *47*, 3930-3948.

Moskowitz, L. J., Braconnier, M., & Jeffay, M. (2019). Anxiety and Phobias in Individuals with Intellectual Disabilities. In *Handbook of Intellectual Disabilities* (pp. 813-842). Springer, Cham.

Nelson, J.M., & Harwood, H. (2011) Learning Disabilities and Anxiety: A Meta-Analysis. *Journal of Learning Disabilities, 44*, 1.

**Newman, C., & Adams, K. (2004). Dog Gone Good: Managing dog phobia in a teenage boy with a learning disability. *British Journal of Learning Disabilities*, *32*(1), 35-38.

National Institute for Health and Care Excellence. (2016). Mental health problems in people with learning disabilities: Prevention, assessment and management. *London, United Kingdom: NICE*.

"Oxford Centre for Evidence-based Medicine – Levels of Evidence (March 2009)" *Centre for Evidence-Based Medicine.* 2009-06-11.

**O'Connor, E. (2009) The use of social story DVDs to reduce anxiety levels: a case study of a child with autism and learning disabilities. *Support for learning, 24, 3,* 133-136.

Pine, D.S., Cohen, P., Gurley, D., Brook, J., Ma, Y. (1998) The risk for early-adulthood anxiety and depressive disorders in adolescents with anxiety and depressive disorders. *Archives of General Psychiatry, 55*, 56-64.

**Rapp, J. T., Vollmer, T. R., & Hovanetz, A. N. (2005). Evaluation and treatment of swimming pool avoidance exhibited by an adolescent girl with autism. *Behavior Therapy*, *36*(1), 101-105.

Reichow, B., Volkmar, F. R., & Cicchetti, D. V. (2008). Development of the evaluative method for evaluating and determining evidence-based practices in autism. *Journal of autism and developmental disorders*, *38*(7), 1311-1319.

Reid, K. A., Smiley, E., & Cooper, S. A. (2011). Prevalence and associations of anxiety disorders in adults with intellectual disabilities. *Journal of Intellectual Disability Research, 55*, 172–181.

Reardon, T. C., Gray, K. M. & Melvin, G. A. (2015). Anxiety disorders in children and adolescents with intellectual disability: Prevalence and assessment. *Research In Developmental Disabilities, 36*, 175–190.

Reiss, S., Levitan, G. W., & Szyszko, J. (1982). Emotional disturbance and mental retardation: Diagnostic overshadowing. *American Journal of Mental Deficiency*, 86, 567–574.

Rodas, N. V., Blacher, J., & Baker, B. L. (2020). Predictors of Anxiety Symptom Trajectory in Children with or without ID from Early Childhood to Adolescence. *Journal of Mental Health Research in Intellectual Disabilities*, 1-18.

Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological bulletin*, *86*(3), 638.

Schwartz, C., Barican, J. L., Yung, D., Zheng, Y., & Waddell, C. (2019). Six decades of preventing and treating childhood anxiety disorders: a systematic review and meta-analysis to inform policy and practice. *Evidence-based mental health*, *22*(3), 103-110.

Simera, I., Altman, D. G., Moher, D., Schulz, K. F., & Hoey, J. (2008). Guidelines for reporting health research: the EQUATOR network's survey of guideline authors. *PLoS Medicine*, *5*(6), e139.

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA. Consulting Psychologist Press.

Sollaci, L. B., & Pereira, M. G. (2004). The introduction, methods, results, and discussion (IMRAD) structure: a fifty-year survey. *Journal of the medical library association*, *92*,3, 364.

Tehee, E., Honan, R., & Hevey, D. (2009) Factors contributing to stress in parents of individuals with autistic spectrum disorders. *Journal of Applied Research in Developmental Disabilities* 22,1, 34–42.

Terwee, C.B., Mokkink, L.B., Knol, D.L., Ostelo, R.W.J.G., Bouter L.M., & de Vet, H.C.W. (2012) Rating the methodological quality in systematic reviews of studies on

measurement properties: a scoring system for the COSMIN checklist. *Quality of Life Research, 21*(4):651-7.

**Thornton, V., Williamson, R., & Cooke, B. (2017). A mindfulness-based group for young people with learning disabilities: A pilot study. *British Journal of Learning Disabilities*, *45*(4), 259-265.

Totsika, V., Hastings, R. P., Emerson, E., Lancaster, G. A., & Berridge, D. M. (2011). A population-based investigation of behavioural and emotional problems and maternal mental health: Associations with autism spectrum disorder and intellectual disability. *Journal of Child Psychology and Psychiatry, 52*(1), 91–99.

Sparrow, S. S., Cicchetti, D. V. & Balla, D. A. (2005) *Vineland Adaptive Behavior Scales–II.* Minneapolis: Pearson.

Vereenooghe, L., & Langdon, P. E. (2013). Psychological therapies for people with intellectual disabilities: A systematic review and meta-analysis. *Research in developmental disabilities*, *34*(11), 4085-4102.

Vereenooghe, L., Flynn, S., Hastings, R. P., Adams, D., Chauhan, U., Cooper, S. A., ... & Langdon, P. E. (2018). Interventions for mental health problems in children and adults with severe intellectual disabilities: a systematic review. *BMJ open*, *8*(6), e021911.

Vernooij, R.W.M., Alonso-Coello, P., Brouwers, M., Martínez García, L., & Checkup, P. (2017) Reporting Items for Updated Clinical Guidelines: Checklist for the Reporting of Updated Guidelines). *PLOS Medicine, 14,* 1.

von Elm, E., Altman, D.G., Egger, M., Pocock, S.J., Gøtzsche, P.C., Vandenbroucke, J.P. & the STROBE Initiative (2007) The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)statement: guidelines for reporting observational studies*, Lancet*, *370* (9596), 1453-1457

Wechsler, D. (1999). Wechsler Abbreviated Scale of Intelligence. San Antonio, TX: Psychological Corporation.

Wechsler, D. (2004) *Wechsler Intelligence Scale for Children–Fourth UK Edition*. Oxford: Pearson.

West, S., King, V., Carey, T. S., Lohr, K. N., McKoy, N., Sutton, S. F., & Lux, L. (2002). Systems to rate the strength of scientific evidence: summary. In *AHRQ Evidence Report Summaries*. Agency for Healthcare Research and Quality (US). Available from: https://www.ncbi.nlm.nih.gov/books/NBK11930/

World Health Organization. Atlas: global resources for persons with intellectual disabilities: 2007. Geneva: WHO, 2007

Woodcock, R. McGrew, K.S., & Mather, N. (2001). The Woodcock– Johnson Tests of Achievement—Third edition. Itasca, IL. Riverside.

Appendices

APPENDIX A – SEARCH TERMS AND RESULTS BY DATABASE			
Database	**Criteria**	**Search Terms**	**Results**
Medline	Anxiety	Exp Anxiety Disorders/ Exp Anxiety/ Anxi*.mp Exp Phobic Disorders/ Exp Agoraphobia/ Exp Fear/ *phobia/ Phobi*.mp Exp Panic Disorder/ Exp Panic/ Panic.mp	
	Intellectual Disability	Exp Intellectual Disability/ Exp Developmental Disabilities/ Learning disabilit*.mp Intellectual disabilit*.mp Mental retard*.mp Mental handicap*.mp	
	Intervention	Therap*.mp Exp Therapeutics/ Treat*.mp Exp Treatment Outcome/ Interven*.mp	
	Child	Exp Child Psychiatry/ Exp Child/ or Psychology Exp Child/ Exp Child, Preschool/ Exp Child Development/ Child*.mp Exp Psychology, adolescent/ Exp adolescent/ Exp adolescent psychiatry/	

		Adolescen*.mp OR LIMIT to “all child (0 to 18 years)”	
	TOTAL		873
Embase	Anxiety	Exp anxiety/ Exp anxiety disorder Exp generalized anxiety disorder Anxi*.mp Exp fear/ Exp phobia/ *phobia/ Exp panic/ Panic.mp	
	Intellectual Disability	Exp intellectual impairment/ Exp Intellectual Disability/ Exp Developmental Disabilities/ Intellectual disabilit*.mp Exp mental deficiency/ Mental retard*.mp Mental handicap*.mp	
	Intervention	Interven*.mp Exp early childhood intervention/ Exp intervention study/ Exp early intervention/ Treat*.mp Exp treatment outcome/ Exp treatment planning/ Exp treatment response/ Therap*.mp Exp therapy/	
	Child	Exp child psychology/ Exp child psychiatry/ Child*.mp Exp adolescence/ Adolescen*.mp	

		OR LIMIT to (child <unspecified age> or preschool child <1 to 6 years> or school child <7 to 12 years> or adolescent <13 to 17 years>	
	TOTAL		2810
PsychInfo	Anxiety	Anxi*.mp Exp Generalized Anxiety Disorder/ Exp Anxiety/ Exp Anxiety Management/ Phobi*.mp Exp Social Anxiety/ *phobia/ Exp Panic Attack/ Exp Panic/ Exp Panic Disorder Panic.mp	
	Intellectual Disability	Exp Disabilities/ Exp Developmental Disabilities/ Exp Learning Disabilities/ Intellectual disabilit*.mp Learning disabilit*.mp Exp Intellectual Development Disorder/ Mental retard*.mp Mental handicap*.mp	
	Intervention	Exp Treatment outcomes/ Exp Treatment/ Treat*.mp Exp Response to Intervention/ Exp Intervention/ Interven*.mp Exp psychotherapy/ Therap*.mo	
	Child	Exp Preschool students/ Exp Child Psychotherapy/ Exp Child Psychology/ Exp Child Psychopathology/ Exp Child Psychiatry	

		Child*.mp Adolescen*.mp OR LIMIT to (childhood or adolescence)	
	TOTAL		2071
Web of Science	All	**TOPIC:** (((anxi* OR phobi* OR *phobia OR panic) AND (child OR adolescen*) AND ("intellectual disabilit*" OR "learning disabilit*" OR "developmental disabilit*" OR "mental* retard*" OR "mental* handicap*") AND (interven* OR therap* OR treat*))) *OR* **TITLE:** (((anxi* OR phobi* OR *phobia OR panic) AND (child OR adolescen*) AND ("intellectual disabilit*" OR "learning disabilit*" OR "developmental disabilit*" OR "mental* retard*" OR "mental* handicap*") AND (interven* OR therap* OR treat*)))	
	TOTAL		630
Scopus	All	TITLE-ABS-KEY(anxi* OR phobi* OR *phobia OR panic AND child* OR adolescen* AND "intellectual disabilit*" OR "learning disabilit*" OR "*developmental disabilit*" OR "mental* retard*" OR “mental* handicap*” AND interven* OR therap* OR treat*)	
	TOTAL		1114
DATABASE SEARCHES TOTAL			7498

Appendix B – Operationalisation of Quality Ratings		
Introduction – background/rationale	3	Clear explanation of scientific background and rationale for the investigation being reported
	2	An attempt has been made to explain the scientific background but the rationale behind may lack focus.
	1	Scientific background and rational are missing/ have no connection with the present study.
	N/A	
Intellectual disability (ID)	3	(For this review) IQ score and functional ability described, or confirmed diagnosis ID, with reference to diagnostic strategy or manual
	2	(For this review) IQ score and functional ability mostly described, or confirmed diagnosis ID, with some reference to diagnostic strategy or manual
	1	(For this review) IQ score and functional ability, or confirmed diagnosis ID are not described
	N/A	

Anxiety	3	(For this review) Clearly described anxiety-related symptoms, conceptualised as difficulties with anxiety or fear, or reference to diagnosis of anxiety disorder, with reference to diagnostic strategy or manual.
	2	(For this review) anxiety-related symptoms or reference to diagnosis of anxiety disorder may be stated but with no reference to diagnostic strategy or manual.
	1	(For this review) Anxiety or diagnosis of anxiety disorder is not described
	N/A	
Development of aims	3	Logical study aims based on existing literature or clinical need
	2	Aims are presented but may not link to existing literature or clinical needs
	1	Aims are missing or not directed towards the present study
	N/A	
Intervention type	3	Intervention grounded in or justified from existing evidence, or replication of existing intervention
	2	Intervention only partially grounded in existing evidence, or fail to replicate existing intervention with high accuracy
	1	Intervention is not grounded within/unjustified from existing research
	N/A	
Hypthotheses	3	Hypothesis prespecified and clearly defined
	2	Hypothesis reported but vague or not included or justified within introduction.
	1	No hypothesis reported
	N/A	
Design appropriate to address aims	3	Key elements of study design presented early in the paper and fit to test hypothesis
	2	Key elements of study design presented early in the paper and fit to test hypothesis
	1	Study design not reported or unsuitable to test hypothesis
	N/A	
Setting and procedure	3	Setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection clearly described (so as to be replicable)
	2	Key features of the procedure described, but not sufficient to be replicated with fidelity, or detail missing.
	1	Procedure unclear or missing key elements, so that replication would be not be possible.
	N/A	
Consideration of ethics	3	Acknowledgement of ethical issues and how they were addressed
	2	Ethical issues may be presented, but not stated how they are addressed
	1	Ethical issues are not reported, or missing issues central to present study
	N/A	
Single Case	3	There were (a) at least three demonstrations of the experimental effect, (b) at three different points in time, and (c) changes in the DVs covaried with the manipulation of the IV in all instances of replication (note, if

		there was a delay in change at the manipulation of the IV, the delay was similar across different conditions or participants [±50% of delay]).
	2	There were (a) at least two demonstrations of the experimental effect, (b) at two different points in time, and (c) changes in the DVs covaried with the manipulation of the IV in most/some instances of replication (note, if there was a delay in change at the manipulation of the IV, the delay was similar across different conditions or participants [±50% of delay]).
	1	There was very limited/no demonstration of the experimental effect across (b) all points of time different points in time, and (c) changes in the DVs covaried with the manipulation of the IV in few/no instances of replication (note, if there was a delay in change at the manipulation of the IV, the delay was similar across different conditions or participants [±50% of delay]).
	N/A	
Group: Comparison condition	3	The conditions for the comparison group were defined with replicable precision, including, at a minimum, a description of any other interventions participants received. Participants were assigned to groups using a random assignment procedure
	2	The conditions for the comparison group may be defined but not to allow absolute replication. Other interventions participants received may be missing. Random assignment procedure may not have been used
	1	Missing or inadequate conditions for the comparison group making replication impossible. Missing or very poor description of any other interventions participants received. No randomisation used for participant group allocation.
	N/A	
Intervention described in detail (IV) [1]	3	Information about the treatment was provided with replicable precision (if a manual was used, this is always given a high quality rating)
	2	Some information is given about the treatment making replication difficult, (if a manual was used, this is sometimes given a high quality rating)
	1	Intervention is missing / not described in adequate detail making replication impossible
	N/A	
Dependent (DV) measures	3	Dependent measures were described with operational and replicable precision, showed a clear link to the treatment outcome, and were collected at appropriate times
	2	Dependent measures described but not operationalised, showing thin links to the treatment outcome with sporadic collection.
	1	Dependent measures may be missing and/or no mention to data collection making replication impossible
	N/A	
Psychometric properties	3	Reliability and validity of each measure reported and/or justified

	2	Reliability and validity of most measures reported and/or justified
	1	Reliability and validity of measures are not reported upon
	N/A	
Interobserver agreement	3	IOA was collected across all conditions, raters, and participants with inter-rater agreement at or above .80, and a minimum of Good reliability (< .60). Psychometric properties of standardized tests were reported and were equal or greater than .70 agreement with a kappa<.40
	2	IOA was collected across some conditions, raters, and participants with inter-rater agreement at or above .80, and a minimum of Good reliability (< .60). Psychometric properties of standardized tests were mostly reported and were equal or greater than .70 agreement with a kappa<.40
	1	Interobserver agreement is not reported
	N/A	
Sample recruitment	3	Sources and methods of selection of participants described.
	2	Sourcing of participants may be described, but detail and some methods may be missing
	1	Sources and methods of selection of participants are not reported
	N/A	
Sample Inclusion/exclusion criteria	3	Eligibility criteria for inclusion explicitly given, as well as reasons for exclusion
	2	Some eligibility criteria for inclusion given, exclusion criteria may be omitted
	1	No criteria for inclusion and/or exclusion described
	N/A	
Sample size	3	It was explained how sample size was arrived at (e.g. apriori power analysis or design-specific)
	2	Sample size is stated, but explanation of this size is missed (e.g. apriori power analysis or design-specific)
	1	Sample size is not stated
	N/A	
Age and gender	3	Age and gender of participants given
	2	Age and gender may be given, but missing supplementary data (e.g. Mean, SD)
	1	Age and/or gender of participants not reported
	N/A	
Diagnoses / Co-morbidities identified	3	Including, ID, mental health, neurodevelopmental, behavioural or medical diagnoses, or genetic conditions of participants given
	2	Study specific diagnoses are identified, but co-morbidities and/or frequencies may be missed.
	1	No diagnoses or co-morbidities explicitly stated
	N/A	
	3	Personal and professional characteristics of the person/persons delivering the intervention reported

Interventionist characteristics	2	The person/persons delivering the intervention are referenced, but their personal or professional characteristics may be missing adequate detail
	1	No reference to the personal or professional characteristics of the person/persons delivering the intervention is made
	N/A	
Intellectual Disability	3	(For this review) IQ score and functional ability described, or confirmed diagnosis ID, with reference to diagnostic strategy or manual
	2	(For this review) IQ score and/or functional ability described, or confirmed diagnosis ID, but no reference is made to diagnostic strategy or manual
	1	(For this review) No reference is made to a confirmed diagnosis ID or IQ score and functional ability
	N/A	
Anxiety disorder/symptomology	3	(For this review) Clearly described anxiety-related symptoms, conceptualised as difficulties with anxiety or fear, or reference to diagnosis of anxiety disorder, with reference to diagnostic strategy or manual.
	2	(For this review) Conceptualisations of anxiety-related symptoms as difficulties with anxiety or fear may be unclear, or miss reference to diagnosis of anxiety disorder or miss reference to diagnostic strategy or manual.
	1	Missing all/some elements of anxiety-related symptoms or diagnosis of anxiety disorder, with no reference to diagnostic strategy or manual.
	N/A	
Longitudinal follow up reported[2]	3	Outcome measures were collected after the final data collection to assess generalization and/or maintenance
	2	Collection of some of the outcome measures after the final data collection may be missing.
	1	All/most outcome measures were not collected after the final data collection making generalization and/or maintenance impossible.
	N/A	
Validity of procedure	3	E.g. training for delivering intervention described, standardization of procedures (SOPs) developed
	2	E.g. training for delivering intervention not described in full detail, incomplete development for standardisation of procedures (SOPs)
	1	No training was given for delivering intervention and no standardization of procedures (SOPs) is developed
	N/A	
Participant engagement and retention[2]	3	Attrition less than 30% at final outcome measurement.
	2	Attrition between 30%-50% at final outcome measurement
	1	Attrition over 50% at final outcome measurement, or attrition rates are not reported.
	N/A	

Fidelity addressed and reported[2]	3	Procedural fidelity or treatment fidelity was continuously assessed across participants, conditions, and implementers, and if applicable, had measurement statistics at or greater than .80
	2	Procedural fidelity or treatment fidelity was infrequently assessed across participants, conditions, and implementers, and if applicable, had measurement statistics at or greater than .80
	1	Fidelity was not addressed or reported
	N/A	
Analysis – appropriate to design and research question, and described clearly[1]	3	Data analyses were strongly linked to the research question(s) and the data analysis used correct units of measure on all variables
	2	Data analyses has adequate links to the research question(s) and the data analysis used correct units of measure on most variables
	1	Data analysis is missing or not appropriate to design and research question.
	N/A	
Single case: Baseline[1]	3	All baselines (a) encompassed at least three measurement points, (b) appeared through visual analysis to be stable, (c) had no trend or a counter therapeutic trend, and (d) were operationally defined with replicable precision
	2	Most baselines (a) encompassed at least 3 measurement points, (b) appeared through visual analysis to be stable, (c) had no trend or a counter therapeutic trend, and (d) were operationally defined with replicable precision
	1	No baselines (a) encompassed at least 3 measurement points, (b) appeared through visual analysis to be stable, (c) had no trend or a counter therapeutic trend, and (d) were operationally defined with replicable precision
	N/A	
Single case: visual analysis[1]	3	All relevant data for each participant was graphed. Inspection of the graphs revealed (a) all data appeared to be stable (level and/or trend), (b) contained less than 25% overlap of data points between adjacent conditions, unless behavior was at ceiling or floor levels in previous condition, and (c) showed a large shift in level or trend between adjacent conditions which coincided with the implementation or removal of the IV (note, if there was a delay in change at the manipulation of the IV, the delay was similar across different conditions and/or participants [±50% of delay])
	2	Most relevant data for each participant was graphed. Inspection of the graphs revealed (a) most data appeared to be stable (level and/or trend), (b) contained less than 25% overlap of data points between adjacent conditions, unless behavior was at ceiling or floor levels in previous condition, and (c) showed a large shift in level or trend between adjacent conditions which coincided with the implementation or removal of the IV (note, if there was a delay in change at the manipulation of the IV, the delay was similar across different conditions and/or participants [±50% of delay])

	1	No relevant data for each participant was graphed and/or inspected
	N/A	
Group: appropriate statistical tests[1]	3	Proper statistical analyses were conducted for each statistical measure with an adequate power and a sample size of n < 10.
	2	Proper statistical analyses were conducted in most cases for each statistical measurement with an adequate power and a sample size of n < 10.
	1	Missing/Inappropriate statistical analyses were conducted for each statistical measure, or with inadequate power, or with a sample size of n < 10.
	N/A	
Group: missing data	3	Explained how any missing data or loss to follow up was addressed
	2	An explanation of how any missing data or loss to follow up was given, but lacked clarity
	1	No explanation of how any missing data or loss to follow-up was addressed
	N/A	
Analysis – bias potential addressed	3	Described any efforts to address potential sources of bias
	2	Commented on potential sources of bias, but limited effort to address this.
	1	No effort made to address potential sources of bias
	N/A	
Analysis – reporting	3	Reporting of results clear, transparent and sufficient detail to allow proper scrutiny
	2	Reporting of results may lack clarity, but enough detail to allow some scrutiny
	1	Results are not reported, or unclear to the extent scrutiny cannot be conducted
	N/A	
Summary of key results	3	Key results clearly described with reference to study objectives
	2	Commented on key results but little reference made to study objectives
	1	No summary of key results reported
	N/A	
Limitations	3	Discussed limitations of the study, taking into account sources of potential bias or imprecision - including both direction and magnitude of bias
	2	Limitations of the study were discussed, however some sources of potential bias or imprecision were missed.
	1	No discussion of limitations of the study
	N/A	
Interpretation	3	A cautious overall interpretation of results given, considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence

	2	An interpretation of results given, however this may be unsupported as considerations including objective, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence may be misseing
	1	No interpretation of the results reported
	N/A	
Generalisability of findings[2]	3	External validity explicitly addressed
	2	External validity was mentioned, but not fully addressed
	1	External validity was not reported
	N/A	
Social validity addressed[2]	3	The study contained at least four of the following; (a) DVs were socially important (i.e., would society value the changes in outcome of the study), the (b) intervention was time and cost effective (i.e., did the ends justify the means), (c) comparisons were made between individuals with and without disabilities, (d) the behavioral change was large enough for practical value (clinically significant), (e) the consumers were satisfied with the results, (f) people who typically come in contact with the participant manipulated the IVs, (g) the study occurred in natural contexts
	2	The study contained at least two of the following; (a) DVs were socially important (i.e., would society value the changes in outcome of the study), the (b) intervention was time and cost effective (i.e., did the ends justify the means), (c) comparisons were made between individuals with and without disabilities, (d) the behavioral change was large enough for practical value (clinically significant), (e) the consumers were satisfied with the results, (f) people who typically come in contact with the participant manipulated the IVs, (g) the study occurred in natural contexts
	1	The study contained one or none of the following; (a) DVs were socially important (i.e., would society value the changes in outcome of the study), the (b) intervention was time and cost effective (i.e., did the ends justify the means), (c) comparisons were made between individuals with and without disabilities, (d) the behavioral change was large enough for practical value (clinically significant), (e) the consumers were satisfied with the results, (f) people who typically come in contact with the participant manipulated the IVs, (g) the study occurred in natural contexts
	N/A	
Future Directions	3	Directions for future research identified and discussed, clinical implications discussed
	2	Directions for future research and clinical implications may be presented but vague
	1	No consideration for future research and/or clinical implications
	N/A	

Appendix C1 Quality Grid of Papers: Part 1								
	Arntzen, & Almås (1997)	**Brown & Hooper (2009)**	**Burton et al. (2017)**	**Chok et al. (2010)**	**Danial (2013)**	**Davis III et al. (2006)**	**Dovgan et al. (2020)**	**Freeman et al. (1976)**
Introduction								
Introduction – background/rationale	2	3	3	3	3	3	3	2
Definition of terms:								
Intellectual disability (ID)	1	2	2	3	2	2	1	1
Anxiety	1	1	2	3	3	3	3	1
Development of aims	2	2	3	3	3	3	3	2
Intervention type	2	2	3	3	3	3	3	2
Hypotheses	1	1	1	2	3	3	2	1
Subscale score	**9**	**11**	**14**	**17**	**17**	**17**	**15**	**9**
Subscale mean	**1.5**	**1.8**	**2.3**	**2.8**	**2.8**	**2.8**	**2.5**	**1.5**
Method								
Design appropriate to address aims	2	1	2	3	3	3	3	2
Setting and procedure	3	2	2	3	3	3	3	1
Consideration of ethics	1	1	2	1	1	1	3	1
Experimental control procedure[1]:								
Single Case	**3**	**1**	**1**	**3**	**3**	**3**	**3**	**1**
Group: Comparison condition	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Intervention described in detail (IV) [1]	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
Dependent (DV) measures	2	2	1	3	3	3	3	1
Psychometric properties	n/a	n/a	n/a	n/a	2	2	2	n/a
Interobserver agreement	3	1	1	3	n/a	2	2	1
Sample recruitment	1	1	2	2	3	1	3	3
Sample size	n/a	n/a	1	n/a	n/a	n/a	3	n/a
Participant characteristics reported[1], Mean of:	***2.3***	***2.3***	***2.7***	***2.3***	***2.3***	***2.3***	***2.7***	***2.7***
Age and gender	3	3	3	3	3	3	3	3
Diagnoses / Co-morbidities identified	3	3	3	3	3	3	3	3
Interventionist characteristics	1	1	2	1	1	1	2	2
Inclusion criteria reported/adhered to:								

Intellectual Disability	3	3	3	3	3	2	2	3
Anxiety disorder/symptomology	3	1	2	3	3	3	3	3
Longitudinal follow up reported[2]	**3**	**2**	**1**	**3**	**1**	**3**	**1**	**1**
Validity of procedure	3	2	2	3	2	3	2	2
Participant engagement and retention[2]	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Fidelity addressed and reported[2]	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**
Subscale score	**41**	**31**	**35**	**44**	**42**	**44**	**48**	**33**
Subscale mean	**2.4**	**1.8**	**1.9**	**2.6**	**2.5**	**2.4**	**2.5**	**1.9**
Analysis								
Analysis – appropriate and clear[1]	**2**	**1**	**1**	**3**	**3**	**2**	**3**	**1**
Single case: Baseline[1]	**3**	**1**	**1**	**3**	**3**	**1**	**3**	**1**
Single case: visual analysis[1]	**3**	**1**	**1**	**3**	**3**	**2**	**3**	**1**
Group: appropriate statistical tests[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Group: missing data	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Analysis – reporting	2	1	1	3	3	2	3	1
Subscale score	**10**	**4**	**4**	**12**	**12**	**7**	**12**	**4**
Subscale mean	**2.5**	**1**	**1**	**3**	**3**	**1.8**	**3**	**1**
Discussion								
Summary of key results	2	2	2	3	3	3	3	2
Limitations	1	1	1	3	3	1	3	1
Interpretation	2	2	3	3	3	3	3	2
Generalisability of findings[2]	**1**	**1**	**1**	**2**	**2**	**3**	**3**	**1**
Social validity addressed[2]	**1**	**1**	**2**	**2**	**2**	**2**	**3**	**1**
Future Directions	1	2	3	3	3	2	3	1
Subscale score	**8**	**9**	**12**	**16**	**16**	**14**	**18**	**8**
Subscale mean	**1.3**	**1.5**	**2**	**2.7**	**2.7**	**2.3**	**3**	**1.3**
Overall study quality based on Reichow et al. 2008 criteria	**Adequate**	**Weak**	**Weak**	**High**	**High**	**Weak**	**High**	**Weak**

Appendix C2 Quality Grid of Papers: Part 2									
	Gobrial & Raghavan (2017)	**Hronis et al. (2019)**	**Luiselli (1977)**	**Matson, (1981)**	**Moskowitz et al. (2017)**	**Newman & Adams (2004)**	**O' Connor (2009)**	**Rapp et al. (2005)**	**Thornton et al. (2017)**
Introduction									
Introduction – background/rationale	3	3	2	3	3	2	2	3	3
Definition of terms:									
Intellectual disability (ID)	1	1	1	2	2	1	1	1	2
Anxiety	1	1	1	3	3	3	1	3	1
Development of aims	3	3	2	3	3	3	1	3	3
Intervention type	3	3	1	2	3	3	2	3	3
Hypotheses	1	3	1	1	1	1	1	1	2
Subscale score	**12**	**14**	**8**	**14**	**15**	**13**	**8**	**14**	**14**
Subscale mean	**2**	**2.3**	**1.3**	**2.3**	**2.5**	**2.2**	**1.3**	**2.3**	**2.3**
Method									
Design appropriate to address aims	3	3	2	3	3	2	1	3	2
Setting and procedure	2	2	2	3	3	2	1	3	2
Consideration of ethics	3	3	1	1	1	1	1	1	1
Experimental control[1]									
Single Case	**1**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**n/a**
Group: Comparison condition	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**1**
Intervention described (IV) [1]	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**
Dependent (DV) measures	2	3	1	2	3	1	1	2	2
Psychometric properties	2	1	1	n/a	n/a	n/a	1	n/a	2
Interobserver agreement	n/a	n/a	2	3	3	1	1	3	n/a
Sample recruitment	3	3	3	3	2	3	3	3	3
Sample size	2	3	n/a	2	3	3	3	3	2
Participant characteristics reported[1]:	***2.3***	***3***	***2.3***	***2.7***	***2.7***	***2.7***	***1.7***	***2.3***	***2.3***
Age and gender	3	3	3	3	3	3	1	3	3
Diagnoses / Co-morbidities identified	3	3	2	2	3	3	2	3	2
Interventionist characteristics	1	3	2	3	2	2	2	1	2
Inclusion criteria reported/adhered to									
Intellectual Disability	3	2	3	3	3	2	2	3	3

Anxiety disorder/symptomology	3	1	3	3	3	3	1	1	3
Longitudinal follow up reported[2]	**1**	**1**	**3**	**3**	**1**	**2**	**1**	**3**	**1**
Validity of procedure	2	2	1	2	3	1	1	2	2
Participant engagement and retention[2]	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
Fidelity addressed and reported[2]	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Subscale score	**41**	**42**	**39**	**46**	**46**	**37**	**30**	**44**	**37**
Subscale mean	**2.3**	**2.3**	**2.2**	**2.6**	**2.6**	**2.1**	**1.6**	**2.4**	**2.1**
Analysis									
Analysis – appropriate and clear[1]	**2**	**3**	**2**	**3**	**3**	**1**	**1**	**3**	**2**
Single case: Baseline[1]	**1**	**2**	**1**	**2**	**3**	**1**	**1**	**3**	**n/a**
Single case: visual analysis[1]	**2**	**2**	**2**	**3**	**3**	**1**	**1**	**3**	**n/a**
Group: appropriate statistical tests[1]	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**1**
Group: missing data	**n/a**	**3**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**2**
Analysis – reporting	2	3	2	2	3	2	1	3	2
Subscale score	**7**	**13**	**7**	**10**	**12**	**5**	**4**	**12**	**7**
Subscale mean	**1.8**	**2.6**	**1.8**	**2.5**	**3**	**1.3**	**1**	**3**	**1.8**
Discussion									
Summary of key results	2	3	3	3	3	2	2	2	3
Limitations	3	3	1	1	3	1	1	3	2
Interpretation	3	3	2	3	3	2	1	3	2
Generalisability of findings[2]	**2**	**2**	**2**	**2**	**3**	**1**	**1**	**2**	**1**
Social validity addressed[2]	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**3**	**2**
Future Directions	3	3	1	2	3	1	2	2	3
Subscale score	**16**	**17**	**12**	**14**	**18**	**9**	**8**	**15**	**13**
Subscale mean	**2.7**	**2.8**	**2**	**2.3**	**3**	**1.5**	**1.3**	**2.5**	**2.2**
Overall study quality based on Reichow et al. 2008 criteria	**Weak (pilot)**	**Adequate**	**Weak**	**Adequate**	**High**	**Weak**	**Weak**	**High**	**Weak**

Appendix D Criteria for treatments to be considered EBP (Reichow, 2008)	
Level of EBP	**Criteria** (treatment must meet at least one criterion, can meet multiple criteria)
Established EBP	At least five single subject studies of strong research report strength meeting the following criteria: - Conducted by at least three different research teams- - Conducted in at least three different locations- - Total sample size of at least 15 different participants across studies At least 10 single subject studies of at least adequate research report strength meeting the following criteria: - Conducted by at least three different research teams - Conducted in at least three different locations - Total sample size of at least 30 different participants across studies At least two group experimental design studies of strong research report strength conducted in separate laboratories by separate research teams At least four group experimental design studies of at least adequate research report strength conducted in at least two different laboratories by separate research teams One group experimental design study of strong research report strength and three single subject studies of strong research report strength Two group experimental design studies of at least adequate research report strength and three single subject studies of strong research report strength One group experimental design study of strong research report strength and six single subject studies of at least adequate research report strength Two group experimental design studies of at least adequate research report strength and six single subject studies of at least adequate research report strength

Promising EBP	At least three single subject studies of at least adequate research report strength meeting the following criteria: - Conducted by at least two different research teams - Conducted in at least two different locations - Total sample size of at least nine different participants across studies At least two group experimental design studies of at least adequate research report strength (can be conducted by the same research team in the same location)

Understanding and Managing Intolerance of Uncertainty (IU) in Children with Autism Spectrum Disorders and Co-occurring Intellectual Disability

Doctorate in Clinical Psychology
Empirical Project

Jessica Maxwell

Words: 10327 (not including abstract)

ABSTRACT

Background Anxiety is common in children with Autism Spectrum Disorder (ASD) and co-occurring Intellectual Disability (ID) and can cause distress for the child and family. There is a well-supported association between anxiety and the transdiagnostic construct of Intolerance of Uncertainty (IU) in individuals with ASD (without ID), and it may be useful for interventions to target IU as a means of managing anxiety in this group. However, a high proportion of children with ASD have a co-occurring ID, and these associations have not been explored in this population.

Aims To explore the relationships between IU, anxiety and repetitive behaviours (RRBs) in children with ASD and co-occurring ID (phase 1) and consider how an existing intervention for IU in children with ASD can be adapted and implemented so that it is suitable for this population (phase 2).

Methods 134 parents of children with ASD and/or ID (ASD+/-ID) completed measures of child anxiety, child IU, RRBs and parent IU online (Phase 1). An existing IU intervention was then adapted and implemented with parents of 5 children with ASD+ID. Satisfaction feedback from participants was gathered, as well the above measures utilised pre-and post-intervention, and followed up at three, six and 12 months (Phase 2).

Results In this sample, IU was significantly higher in children with ASD+ID than ASD-ID. Anxiety was not significantly different between groups. In both groups, IU significantly positively correlated with anxiety and RRBs. In a hierarchical regression of all children with ASD, age and anxiety (but not ID-status) significantly predicted anxiety (Phase 1). An adapted intervention for IU (CUES) was reported to be acceptable and helpful to parents, and preliminary analyses suggest a reduction in child IU following the intervention, an effect which was maintained at 12 months.

Discussion IU appears to play a role in anxiety in children with ASD and ID, and may be an appropriate target for anxiety interventions for this group. Parent-led interventions tackling IU may be accessible and helpful for parents of children with ASD and ID, with some early indications that a reduction in IU may result.

1. Background

1.1 ASD and Anxiety

Autism Spectrum Disorder (ASD[2]) is a lifelong neurodevelopmental disorder affecting approximately 1-2% of the population (Lyall et al., 2017). ASD is observed to be more prevalent in males than females, at a ratio of approximately 3:1 (Loomes et al., 2017), however it may be under recognised in females (Gould & Ashton-Smith, 2011). ASD is associated with a unique phenotypic profile, associated with deficits in social communication and social interaction, and the presence of sensory sensitivities and restricted and repetitive behaviours (RRBs) (APA, 2013). ASD is related to difficulties with emotion dysregulation (Samson et al., 2014) and a high prevalence of mental health disorders or difficulties, such as anxiety and depression (Strang et al., 2012). In children with ASD, it has been suggested that approximately 70% of those aged 10-14 years had at least one comorbid psychiatric disorder, and approximately 41% had two or more (Simonoff et al., 2008). This risk extends into adulthood, with a recent systematic review suggesting a lifetime prevalence of anxiety disorder (27-42%) and depressive disorder (23-37%) as disproportionately high in adults with ASD (Hollocks et al., 2019).

Anxiety in children has been reported to have significant social and emotional impact (Ialongo et al., 2006) as well as a negative impact on the wider family, if left untreated (McPheeters et.al., 2011), and has a long-term effect, being predictive of anxiety symptoms in adulthood (e.g. Pine et al., 1998). Anxiety is extremely common in those with a diagnosis of ASD, with approximately 50% of children with ASD having a diagnosable anxiety disorder (Simonoff et al., 2008; Van Steensel et al., 2011). Anxiety is related to significant distress in this population

[2] There are evolving diagnostic terminologies/labels in relation to ASD (including autism, ASD, ASC, Asperger's syndrome, high/ low functioning autism spectrum etc.). For this reason, and also in acknowledgement that there are differences in preferred self-identifying terminologies for individuals and families (Kenny et al., 2015), for purposes of this paper, I will use the term (child with) ASD to encapsulate all of the above.

(Wood & Gadow, 2010), can impact upon cognitive outcomes (Pellechia et al., 2016), and internalizing symptoms have been suggested to be associated with lower life satisfaction and greater social difficulties (Gotham et al., 2015). As such, anxiety has been named as a top priority in ASD research (Autistica; James Lind Alliance 2016).

1.2 Intolerance of Uncertainty (IU), ASD and anxiety

Recently research has focused on identifying cognitive constructs associated with the development and maintenance of anxiety; one such construct is "Intolerance of Uncertainty". Intolerance of uncertainty (IU) has been described as "the tendency to react negatively on an emotional, cognitive and behavioural level to uncertain situation and events" (Buhr & Dugas, 2009 pg216), and was originally conceptualised as a key feature in worry and GAD (Dugas et al., 1998). However, IU as a transdiagnostic construct has received recent research attention, evidencing its link with a number of mental health conditions, with a particularly strong association with a range of anxiety disorders (McEvoy & Mahoney, 2012). IU has been conceptualised as a 'broad dispositional risk factor for the development and maintenance of clinically significant anxiety' in typical populations (Carleton, 2012). A recent meta-analysis concluded that there was a strong positive correlation between IU and both anxiety and worry in young people, and that IU might therefore be an appropriate construct to be targeted in intervention (Osmanagaoglu et al., 2018). IU may also be associated with the intergenerational "transmission" of anxiety from parents to children (Aktar et al., 2017).

Given the significant evidence that IU is important in the development and maintenance of anxiety in neurotypical adults and children, alongside the high prevalence of anxiety in individuals with ASD, recent research has focused on exploring the role IU plays in the development and maintenance of anxiety in this population. Many of the core characteristics of ASD appear to be conceptually similar to operational elements of IU, for example insistence on sameness, preference for routine and difficulty coping with transitions or new situations

(Rodgers et al., 2012). However, Vasa et al. (2018) provided further evidence that IU is a construct distinct from those of ASD and anxiety. They reported IU to be related to, but separable from, ASD features including social communication deficits, RRBs, and particularly emotional dysregulation.

Current evidence therefore suggests that the consideration of IU may be important in further understanding the aetiology of the ASD phenotype, and that high levels of IU may, in part, account for the increased vulnerability to anxiety observed in this population (Boulter et al., 2014). In addition, core phenotypical characteristics of RRBs and sensory sensitivities have both been positively associated with anxiety and IU (Joyce et al., 2017; Neil et al., 2016), and more specifically it has been proposed that IU and anxiety mediate the relationship between atypical sensory processing and RRBs in children with ASD (Wigham et al., 2015). Therefore, IU may play a central role in the relationship between phenotypical characteristics of ASD (Rodgers et al., 2016). A recent theoretical framework based on this growing evidence includes IU as an important transdiagnostic mechanism to explain the increased vulnerability of children with ASD to anxiety, and to inform treatment in this group (Figure 1, South and Rodgers, 2017).

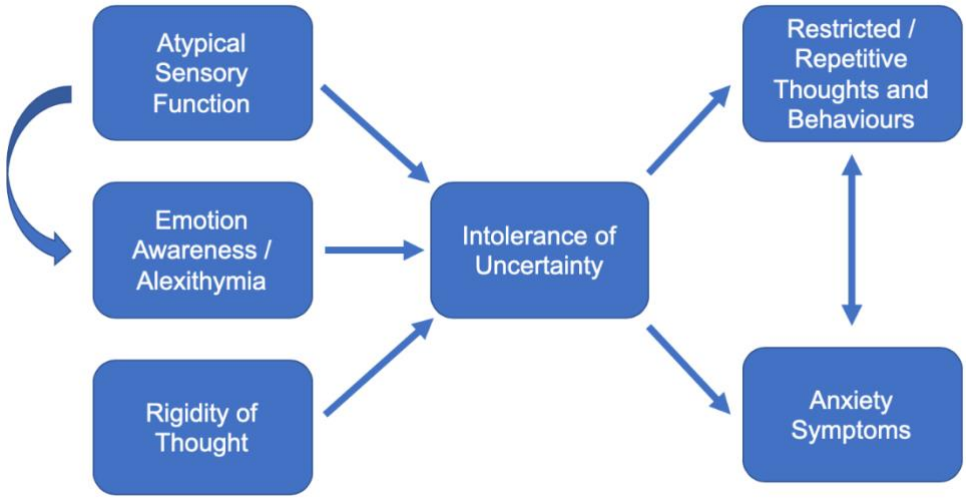


Fig. 1 South & Rodgers (2017) Cognitive model for IU as a mediator in anxiety in ASD.

It has also been observed that core autism symptoms predict increased alexithymia and IU, and also reduced "emotional acceptance" in adults with ASD. This suggests that individuals with ASD may experience increased anxiety because they are more likely to have an aversive reaction to their emotional experiences, whilst also being less able to identify and understand their emotions (Maisel et al., 2016). IU may additionally mediate the relationship between emotion regulation (ER) and symptoms of anxiety and depression in young people with ASD (Cai et al., 2018), and it thus may be important to additionally consider IU when implementing interventions targeting ER in this population.

Cognitive Behavioural Therapy (CBT) is a well-established first-line intervention for anxiety in children and has been successfully adapted to meet the needs of different age groups, presentations and delivery formats (e.g. face-to-face, parent mediated, online) (Banneyer et al., 2018). Although there is some evidence that CBT-based interventions are efficacious at reducing anxiety in children with ASD, a significant proportion of this population do not respond to such treatments (Ung et al., 2015). In relation to this, a recent multisite intervention for anxiety in children with ASD found that high levels of baseline IU predicted poorer treatment

response, and that high IU predicted higher levels of anxiety and worry both pre- and post-intervention, suggesting that targeting IU may improve outcomes in CBT-based interventions for anxiety in young people with ASD (Keefer et al., 2017). Intervention research undertaken by Rodgers et al. (2017) provides preliminary evidence that targeting IU led to a reduction in parent reported symptoms of anxiety and IU in young people with ASD. This programme (Coping with Uncertainty in Everyday Situations, CUES) comprised an 8-week parent-mediated group intervention to manage and reduce IU in children with ASD (Rodgers et al., 2017).

CUES aims to tackle IU, and despite having a manualised structure, it is highly individualised and materials are used flexibly in response to the needs and preferences of the participants. Parents select a target uncertain situation to work on throughout the programme, and are helped to tailor and individualise strategies in order to help them manage this IU scenario. The intervention includes psychoeducation around IU, vignettes and example situations where IU may play a role, and ways of thinking about helpful and unhelpful management strategies, in order to generalise learning beyond the target situation. Parents are encouraged to support each other throughout the intervention and offer experiences and suggestions to one another in a contained environment. Within the intervention understanding and managing uncertainty (over and above stress or anxiety itself) is explicitly targeted in a number of ways, both within the psychoeducation and intervention strategies. This includes tasks such as a “sorting” task, whereby parents illustrate their understanding of IU rather than fears of dislike of change, and parents were also supported to identify target situations, diaries and graded exposure tasks relating specifically to uncertainty. As part of this, a key component of the programme is supporting parents to use “Unsure” diaries, in which they explicitly identify the “uncertainties” within recorded situations.

When evaluated, the CUES intervention was found to be feasible, acceptable, and valuable to parents, as well as effect size analyses indicating promise as a potential treatment option for children with ASD and IU (Rodgers et al., 2017). Importantly, a positive effect was additionally observed on Parental IU and wellbeing.

1.3 Intellectual Disability (ID), Anxiety and IU

Children with an intellectual disability (ID[3]) have higher reported levels of anxiety than their non-ID peers (Nelson & Harwood, 2011). It has been suggested that children in the UK with an ID are 2.5 times more likely to have a diagnosis of an anxiety disorder than those without ID (8.7% and 3.6% respectively (Emerson, 2003)). The prevalence rates for anxiety disorder in children with an ID ranges from 3-21.9% (Reardon et al. 2015; Royston et al. 2017) which is considerably higher than the general population. ID is also predictive of increasing symptoms of anxiety throughout childhood and adolescence (Rodas et al., 2020). In addition to anxiety in this population being significantly elevated compared to age-matched peers, children with ID may also show more externalizing problems in relation to anxiety, however no differences in anxiety levels are observed between sexes in this group (Green et al., 2015). Anxiety is also a major risk factor for later mental health difficulties in adulthood (Essau et al. 2018). However, despite the prevalence of anxiety in children with ID, and the profound impact it can have on their quality of life, there is a marked lack of research of sufficient quality and consequently no robust evidence-base pertaining to interventions for anxiety in children with ID (see associated systematic review).

However, as general “intellectual disability” is such a broad term; differences in terminology lead to difficulties in determining prevalence and population (McConkey et al., 2019); and that

[3] It is acknowledged that there has recently been some consultation with service users with regard to the academic use of the abbreviation ID – due to word count restrictions this shall be used for the purpose of this thesis, however would be addressed if disseminated more widely.

approximately one third of individuals with ID also have ASD (Emerson & Barnes, 2010), literature considering mental health in those with ID often includes children with ASD. In order to focus more specifically on the contribution of ID to anxiety and IU, it would be helpful to consider how anxiety presents in children with ID (without ASD). Overarching research indicates that individuals with specific genetic disorders associated with ID, including Fragile X (FXS), William Syndrome (WS) and Cornelia de Lange syndrome are at greater risk of experiencing anxiety than the general population (Cordeiro et al., 2011; Dykens, 2003; Basile et al., 2007). The behavioural phenotypes of Prader-Willi and FXS have also been strongly associated with anxiety and RRBs (Bourgeois et al., 2011). Lifespan experience of anxiety may be particularly pronounced in WS (Dodd & Porter, 2009), with Specific Phobia and GAD being particularly prevalent (Leyfer et al., 2006). RRBs are also prevalent in disorders associated with ID, such as Prada-Willi, Down Syndrome and WS, and the profile of these behaviours appears to be similar across these syndromes (Royston et.al., 2018). Perhaps related to IU, Woodcock et.al., (2009), also highlighted that changes in routine or expectations resulted in negative emotional behaviours in these groups.

There is an emerging body of evidence that IU is related to both anxiety and RRBs in children with ID (e.g. Glod et al., 2019). Glod et al (2019) demonstrated that IU and anxiety fully mediated the relationship between sensory issues and repetitive behaviours in children with WS; suggesting that IU is an important factor in the way that anxiety presents in children with ID. Importantly, a recent study by Uljarevic et al (2018) reported a mediating effect of sensory sensitivity between IU and anxiety in children with WS, suggesting similarities between their findings and those observed in ASD, and concluding that a focus on tackling IU in WS is important in the development of anxiety interventions for this group also.

1.4 Overview (Intellectual Disability, ASD, anxiety and IU)

To date, research undertaken in relation to anxiety and IU in ASD has been focused on children functioning in the average range of ability, i.e. it has not been specifically inclusive of children with ASD and a co-occurring Intellectual Disability (ID). Intellectual disability is prevalent within autism spectrum disorders. Estimates of prevalence of ID with ASD vary, however a comprehensive review of the relationship between ID suggests that intellectual disability is present in around 50-70% of all cases of ASD (Matson & Shoemaker, 2009).

Not surprisingly, evidence suggests that a significant proportion (approximately 30%) of children with ASD and ID show symptoms of anxiety, and reported levels of anxiety are higher in these children than those with ASD alone (Gobrial & Raghavan, 2012). It has also been suggested that children with ASD and co-occurring ID are even more vulnerable to the deleterious effects of anxiety due to poor coping skills (Deudney & Shah, 2004) and more limited social or cognitive resource (Cooray & Bakala, 2005). Despite this, the evidence base for the conceptualisation and/or treatment of anxiety specifically for children with ASD and co-occurring ID is very limited. There is some evidence that a behavioural approach to anxiety intervention is efficacious for individuals with “lower functioning autism” (conceptually parallel to ASD and ID co-occurrence). This may be an alternative to the evidenced-based CBT approaches used for anxiety in neurotypical children, as individuals with ID may not have the verbal ability to access the cognitive elements of CBT (Rosen et al., 2016), however the quality of this evidence is lacking (see associated review).

This gap logically extends to a lack of literature exploring the role of IU in anxiety in children with ASD and ID. Given the previous evidence discussed: that IU is a construct centrally related to anxiety in both ASD and ID populations; it is logical that the construct may also be relevant in the presentation of anxiety in children with ASD and a co-occurring ID. If IU and anxiety are higher in ASD and ID groups than their typically developing counterparts, one may

tentatively hypothesise when ID and ASD co-occur, a cumulative effect of both IU and anxiety is observed. As discussed, it has been consistently reported that levels of anxiety are higher in children with ASD with co-occurring ID, than children with ASD only (Matson & Shoemaker, 2009; Gobriel and Raghavan, 2012). It has also been suggested that anxiety can be predicted by ID severity and co-morbid diagnoses in children (Whitney et al., 2019) and that ID is predictive of increasing anxiety symptoms in childhood (Rodas, 2020). This, when taken with the evidence base suggesting that IU predicts anxiety in children with ASD (without ID), it suggests that both presence of ID and IU may play a role in the anxiety experienced in a heterogenous sample of children with ASD.

In addition, if IU is an important construct and therefore potential agent for change in intervention for anxiety for children with ASD and co-occurring ID (in the same way as has been described in ASD and ID populations separately) how might we begin to develop an appropriate intervention which is effective for this population? One solution may be to adapt an existing intervention, such as CUES, for IU for children with ASD, so that it is accessible for children with co-occurring ID. Doing so may additionally provide information as to the quality of the role of IU (as a potential mediator) in the relationship between anxiety and the ASD phenotype in this population.

1.5 Project Aims

In summary, there is a well-supported association between IU, anxiety and RRBs in individuals with ASD. However, a high proportion of children with ASD also have a co-occurring Intellectual Disability, and these associations have not been explored in this population. Anxiety and RRBs are also common in individuals with ID (with and without ASD), and there is emerging evidence that IU is present and related to anxiety in individuals with ID. As such, this project aims to explore whether the relationships between IU, anxiety and RRBs are present in the same way in children with ASD and co-occurring ID (phase 1), and consider

how an existing intervention for IU in children with ASD can be adapted and implemented so that it is suitable for this population (phase 2).

2. Phase 1

2.1 Aims and Hypotheses

The aim of this phase was to quantitatively ascertain the presence of IU in children ASD both with and without ID and to explore the relationship between IU and anxiety, and RRBs in children with ASD and ID (whether the relationship is similar to that seen in children with ASD without ID). A small sample of parents of children with ID only (no ASD) would additionally be recruited in order to preliminarily observe data trends with respect to the relative different effects of diagnoses.

Based on previous literature it was hypothesised that:

i) IU, anxiety and RRBs will be higher in children with ASD and ID (ASD+ID) than in children with ASD without ID (ASD-ID).

ii) In both children with ASD with and without ID, anxiety will significantly and positively correlate with RRBs and IU.

iii) In both children with ASD with and without ID, RRBs will significantly and positively correlate with IU.

iv) IU and ID-status will predict anxiety in children with ASD.

2.2 Methods

2.2.1 Procedure

Ethical approval for this phase was granted by Ethics Committee, Faculty of Medical Sciences, Newcastle University in July 2018 (Appendix F).

A mixed design of within- and between-subjects methodology was used.

Participants were recruited via opportunity sampling by advertisement through local ASD networks, support groups, and SEN schools. Data was collected via the online questionnaire software EUQualtrics. Parents/carers were first given information outlining the nature of the study, ethical considerations (e.g. anonymity, potential distress) and the right to withdraw. They were then asked to consent by selecting an appropriate box, before completing a series of questionnaires (see section 2.2.3) Parents/carers were asked to provide basic, non-identifiable demographic information about their child (age, diagnoses, school type, relationship to child, first four postcode characters). Signposting to further information and sources of support was offered at completion of questionnaires. Electronic data was stored securely on Newcastle University IT systems and was anonymous at the point of collection.

2.2.2 Participants

Parents/carers of children (<18 years) with ID and/or ASD were invited to take part. 134 parents/carers of children aged 3-years, 3months to 17-years, 8 months (mean=118 months) took part (100 males, 34 females). 86 were parents of children with ASD without ID (ASD-ID), 32 with ASD and co-occurring ID (ASD+ID), and with ID without ASD (ID-ASD).

2.2.3 Measures

Parents/carers completed the following measures online:

Child IU:

i) Intolerance of Uncertainty Scale – Parent report (IUS-P; Boulter et al., 2014) - a 12-item questionnaire, asking parents to rate the extent to which statements about IU are relevant to their child, on a 5-point Likert scale. It is an adapted version of the IUS-C, with acceptable internal consistency and validity (Walker, 2009)), for use with parent informants.

ii) Responses to Uncertainty and Low Environmental Structure, RULES (Sanchez et.al., 2017) - a 17-item parent report measure of younger children's responses to uncertainty, with strong internal consistency and validity. It has been used with children with ASD with and without ID (e.g. Rodgers, Bamford et al *in prep*). This measure was selected as a secondary IU measure as it has previously been used for a developmentally younger population.

Child Anxiety:

ASC-ASD-P (Rodgers et al., 2016) - a 24-item parent report anxiety questionnaire for use with young people with ASD using a 4-point Likert scale, which has good reliability and validity. This measure has been used in children with and without ID (e.g. Glod, 2019).

Child RRBs:

RBQ-2 (Leekham et al., 2007) - 20 item questionnaire, in which parents rate their child's behaviours for frequency and severity on a three- or four-point Likert scale, which has been used with children and adolescents with ASD with good reliability and construct validity (e.g. Lidstone et al., 2014).

Parental IU:

Intolerance of Uncertainty Scale - A 12-item self-report questionnaire, asking parents to rate themselves on the extent to which statements related to IU are relevant to themselves, on a 5-point Likert scale (IUS-12, Carleton et.al., 2007). It has good reliability and construct validity with good empirical support for using total scores (Hale et al., 2016).

2.3 Results

2.3.1 Descriptive Statistics and Preliminary Analyses

Data for the small sample of children with ID without ASD (ID-ASD) was not the focus of the reported study and so was not included in the following data. However analyses including this data can be found in Appendix A.

Table 1

Descriptive Statistics (ASD Whole Sample)

					Skew		*Kurtosis*		
Measure	*n*	*Range*	*Mean*	*SD*	*Stat*	*Error*	*Stat*	*Error*	*Cronbach's α*
Child-IUS	118	18-60	46.32	9.27	-0.963	0.223	0.711	0.442	0.871
RULES	112	31-85	63.79	12.45	-0.570	0.228	-0.165	0.453	0.898
ASC-ASD	108	11-92	55.74	17.94	-0.055	0.233	-0.534	0.461	0.944
RBQ-2	100	25-60	42.96	6.97	0.001	0.241	-0.193	0.478	0.805
IUS-12	98	12-36	21.21	7.03	0.511	0.244	-0.767	0.483	0.923

Data from the remaining sample (Table 1) was found to be in the "acceptable" range (between -1 and 1) to assume normality of distribution of this data. A reduction in n (missing data) across measures is due to participant attrition during the data collection process. Good internal consistency was observed across all measures in this sample, as well as within subgroups (Appendix B). Data was then analysed by diagnostic grouping (see Table 2 for descriptive statistics).

2.3.2. Hypothesis 1

i) Intolerance of Uncertainty, anxiety and RRBs will be higher in children with ASD and ID (ASD+ID) than in children with ASD without ID (ASD-ID).

ASD+ID and ASD-ID groups were compared statistically on all measures. Levene's statistic suggested homogeneity of variance can be assumed for all measures other than that of Parental IU (in which variances were significantly different between the groups, $p<0.05$). Results are reported in light of this.

As can be seen in Table 2, parent-reported child IU was significantly higher for children with ASD+ID compared to children with ASD-ID ($p<0.05$). Parents of children with ASD+ID also reported significantly more child RRBs than parents of children with ASD-ID, partly supporting hypothesis 1. However, no significant difference was observed between groups on parent reported child anxiety (ASC-ASD).

Table 2

T-test Means Comparison between children with ASD+ID and ASD-ID

	ASD+ID		*ASD-ID*				
Measure	*N*	*Mean (sd)*	*N*	*Mean (sd)*	*t*	*df*	*sig*
IUS-P (Child IU)	32	49.38 (7.96)	86	45.19 (9.51)	-2.218	116	0.029
RULES (Child IU)	32	69.60 (11.44)	80	61.46 (12.14)	-3.253	110	0.002
ASC-ASD	31	55.48 (19.02)	77	55.84 (17.62)	0.094	106	0.925
RBQ2	29	46.48 (6.73)	71	41.52 (6.58)	-3.400	98	0.001
IUS-12 (Parent IU)	29	23.17 (8.30)	69	20.39 (6.32)	-1.618*	42.3*	0.113*

**Equal variances not assumed*

2.3.3 *Hypotheses 2 and 3*

ii) In both children with ASD with and without ID, anxiety will significantly and positively correlate with RRBs and IU.

iii) In both children with ASD with and without ID, RRB will significantly and positively correlate with IU.

In acknowledgement that there is content overlap between IUS-P and ASC-ASD, analyses were run both with the ASC-ASD in its complete form, as well as without the uncertainty subscale. As only very small differences were found between these analyses, data including the full ASD-ASD is presented here (see Appendix C for alternative analyses).

Correlation analyses – Children with ASD-ID

Correlation analyses within the ASD-ID group (Table 3) showed that child IU significantly positively correlated with child anxiety (with large effect) and RRBs (with med-large effect size), meaning that higher values of child IU were associated with higher levels of child anxiety and repetitive behaviors. The IUS-P only correlated significantly with parental IU (IUS-12), suggesting that a higher IUS-P score was associated with higher parental IU values, with a small effect size. As expected, since they are designed to measure the same construct of IU, the IUS-P and RULES measure were also significantly positively correlated, with a large effect size.

Table 3

Dependent Variable Pearson Correlations (Children with ASD-ID)

	1		*2*		*3*		*4*		*5*	
	IUS-P (Child)		*RULES*		*ASC-ASD*		*RBQ-2*		*IUS-12 (Parent)*	
	r	*N*	*r*	*N*	*r*	*N*	*r*	*N*	*r*	*N*
1	-	-	0.783**	80	0.643**	77	0.370*	71	0.278*	69
2			-	-	0.651**	77	0.469**	71	0.196	69
3					-	-	0.371*	71	0.064	69
4							-	-	0.097	69
5									-	-

*p<.01, **p<.001

Correlations Analyses - Children with ASD+ID

In the ASD+ID group (Table 4), both measures of Child IU were again significantly positively correlated with each other with large effect size. However, in this group only the RULES measure of IU was significantly positively correlated with the measure of anxiety and RRBs, with medium and large effect sizes respectively. Therefore in children with ASD+ID, higher levels of IU (as measured by the RULES) were associated with higher levels of anxiety and RRBs.

Other than the RULES, the IUS-P measure of child IU did not correlate with any other variables in this subgroup. This may suggest that the RULES measure is better able to capture IU in this population.

Parental IU did not correlate significantly with any other variables in this sample.

Table 4

Dependent Variables Pearson Correlations (Children with ASD+ID)

	1		*2*		*3*		*4*		*5*	
	IUS-P (Child)		*RULES*		*ASC-ASD*		*RBQ-2*		*IUS-12 (Parent)*	
	r	*N*	*r*	*N*	*r*	*N*	*r*	*N*	*r*	*N*
1	-	-	0.660***	32	0.348	31	0.272	29	0.263	29
2			-	-	0.403*	31	0.510**	29	0.319	29
3					-	-	0.274	29	0.255	29
4							-	-	0.218	29
5									-	-

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

Correlation analyses were additionally run with a combined sample of children with ASD, as well as with the sample of children with ID only. However, as this is not the focus of the current study and limited sample size of ID only group, results are included only in Appendix D.

2.3.4 *Hypothesis 4*

iv) IU and ID-status will significantly predict anxiety in children with ASD.

Statistical assumptions relating to regression analysis were analysed and considered acceptable: there was an adequate sample size; assumption of singularity was satisfied as IVs were not a combination of other variables; no multicollinearity was present with the largest VIF value of 1.18 and the assumption of independent errors was tenable (Durbin Watson statistic of 1.54 and 1.57). Analysis of residuals and scatterplots indicated that all assumptions of normality, heteroscedasticity and linearity were satisfied.

A hierarchical regression analysis was conducted with Anxiety as the dependent variable (ASC-ASD score). Age was entered at step one as this has been suggested to affect anxiety levels in children, and significantly correlated with anxiety in this sample. IU was entered at step two, as previous literature indicates that IU predicted anxiety in children with ASD. In this model, the RULES was implemented as the IU measure, due to its observed sensitivity in the ASD+ID sample (however for completeness a second analysis was undertaken using the IUS-P, Appendix E). Finally, ID-status was entered at step three to test whether the presence of ID is predictive of anxiety in children with ASD, over and above IU.

Table 5

Hierarchical Regression Analysis Summary for Variables Predicting Anxiety

Variable		β	*t*	*Std. Error*	*R*	R_2	ΔR_2
Step 1					0.378	0.143	0.143
	Age	0.378	4.184*	0.038			
Step 2					0.637	0.406	0.263
	Age	0.342	4.516*	0.032			
	RULES	0.514	6.790*	0.110			
Step 3					0.651	0.424	0. 018
	Age	0.318	4.164*	0.032			
	RULES	0.567	7.029*	0.117			
	ID Status	-0.144	-1.767	3.222			

*p<0.001

The hierarchical regression model showed that at step one, age contributed significantly to the regression model (F(1,105)=17.5., p<0.001) and accounted for 14.3% in the variance in anxiety. The addition of IU (as measured by the RULES) explained an additional 26.3% of variance in anxiety, and the resulting change in R_2 was significant (F(1,104)=46.1, p<0.001). Finally, the addition of ID status explained a further 1.8% of the variance in anxiety, with no

significant change in R_2 ($F(1,103=3.1$, $p=0.08$). Therefore, the overall model explained 42.4% of the variance in anxiety.

Regression models suggested that in children with ASD, both age and IU (as measured by both the IUS-P and RULES) were significant predictors of anxiety. ID status did not significantly predict anxiety. Casewise diagnostics suggested all cases had residuals less than three, with four and two cases (respectively) with residual statistics between 2 and 3, which suggests an accurate model. The amount of variance accounted for by the model (R-squared) was higher when using RULES as a measure of IU – this also may reflect the ability to capture IU when it is an ASD group with a mixed ID-status.

Overall, these results suggest that IU contributes to anxiety in children with ASD and co-occurring ID, in the same way that this is observed in children with ASD without ID; therefore, it is suggested that adaptation and evaluation of intervention targeting IU in this population is justified. In addition, since results suggest that the RULES may be a useful measure to include in studies of IU in ID-specific or heterogenous ASD groups, this measure of IU was included as a primary outcome measure in Phase 2.

3. Phase 2

3.1 Aims

In phase two, we aimed to undertake a development study to adapt the materials of the existing parent-mediated CUES intervention (Rodgers et al., 2017) and to assess preliminary acceptability and feasibility of this intervention for parents of children with ASD and co-occurring ID (ASD+ID). Results from this phase may be provide preliminary information in relation to whether IU plays a mediating role in the experience of anxiety in this population.

In two stages, this study aimed to:

i) Gather descriptions of how IU presents in children with ASD+ID and explore strategies that parents and professionals use to manage IU.

ii) Use the descriptions gathered to supplement or adapt the manualised content of the CUES intervention (the examples, tasks or activities regarding IU presentation and management), so it is as relevant as possible for this novel participant group.

iii) Undertake preliminary evaluation of the acceptability and feasibility of the CUES intervention for delivery to children with ASD+ID, via a parent mediated group.

3.2 Design

The phase 2 design is situated between the bi-directional "development" and "feasibility and piloting" stages as part of the development and evaluation cycle of complex intervention (see Figure 5) advocated by the Medical Research Council (MRC, Craig et al., 2008). It is appropriate at these stages to adapt and evaluate intervention materials, as well as consider preliminary individual outcome measures, despite not being a fully powered study. As such, results from this study may inform and support an application for a larger scale pilot acceptability and feasibility project in the future.

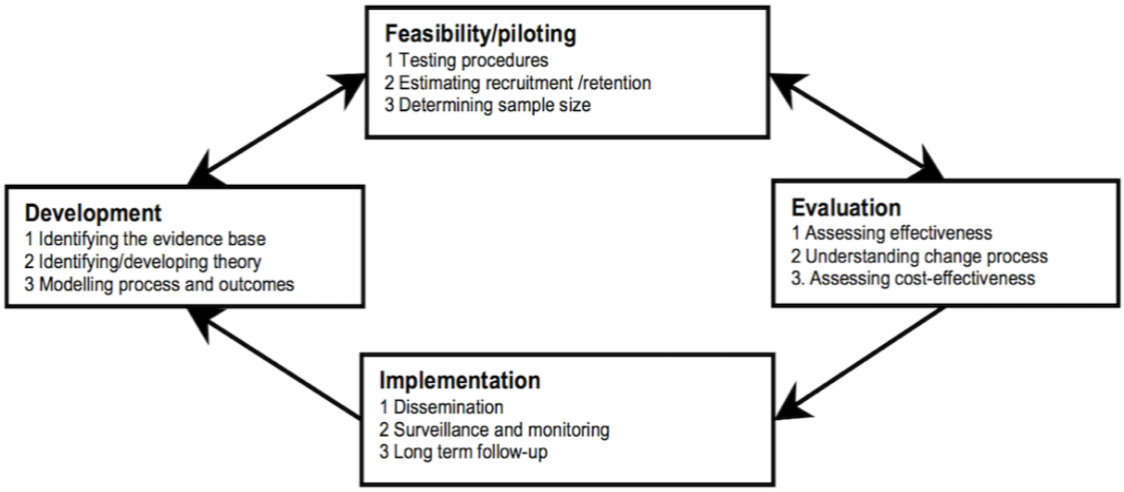


Fig. 5 Key elements of the development and evaluation process (Craig et al., 2008)

3.3 Stage 1 - Consultation and adaptation of the intervention.

Ethical Approval for this stage was obtained from Ethics Committee, Faculty of Medical Sciences, Newcastle University on 2nd October, 2017 (Appendix F).

Ten individual consultations were undertaken with parents of children with ASD+ID as well as one group consultation with professionals who have extensive experience of working with children with ASD+ID (a Clinical Psychologist, Specialist Nurses and Assistant Psychologists). Existing materials from CUES were presented to participants, and feedback sought regarding suitability. Participants were invited to make suggestions for adaptations to the content and format of the group (however all deemed the current group format to be acceptable). Individual examples of IU in their children (or children with whom they had worked) were gathered as were current IU management strategies. Participants were additionally consulted regarding the proposed outcome measures.

Information gathered at this stage was used to inform adaptations to the existing CUES intervention. Adaptations included (examples in Appendix H):

- Inclusion of more relevant vignettes into psychoeducation and activities
- Greater emphasis on behavioural and physical than social or cognitive strategies
- Relaxation, using up anxious energy through exercise, sensory activities, music, deep breathing, stress ball, 'relaxing' Cue Cards, mindfulness, play
- Simplifying / greater scaffolding of home activities

Ongoing feedback and suggestions to relevance and validity of materials were elicited throughout Stage 2.

3.4 Stage 2 – Evaluation of feasibility and acceptability

NHS ethical favourable approval was obtained for this stage via IRAS by the Health Research Authority South Central Hampshire B REC Sub-committee – IRAS number 236354 (Appendix G).

3.4.1 Methods

3.4.1.1 Procedure

This stage of the project utilised a within-subjects intervention design.

Inclusion criteria for recruitment were: parents of children aged 8-14 years; with a diagnosis of ASD+ID; who were willing and able to attend a group intervention and who had a sufficient level of spoken English to give informed consent and participate in the group.

Recruitment was undertaken via local clinical services (CAMHS, Community Learning Disability teams), specialist schools and local ASD or disability support groups. Clinicians were asked to hand out participant information packs (Appendices I,J,K), which included a letter of Invitation, a Participant Information Sheet and Expression of Interest Form, to those who fulfilled study criteria. The study was also advertised in person by the lead researcher and via posters at local support groups, letters to parents through specialist schools and local ASD/disability support networks. Parents were invited to return the Expression of Interest Form or contact the lead researcher directly via email, upon receipt of which the researcher would contact the parent. A home visit was then arranged to discuss the project further, take informed consent and undertake characterisation and baseline measures.

Characterisation data included: confirmation of ASD and ID diagnoses, assessment of adaptive functioning using the Vineland Adaptive Behaviour Scale- VABSII (Sparrow, Cicchetti & Balla, 2005; a 25-90 minute interview assessing adaptive functioning) and demographics including chronological age, gender, co-morbidities and schooling.

Outcome measures were gathered pre- and immediately post- intervention, and again at three-, six- and twelve-months post-intervention. Semi-structured satisfaction feedback interviews were additionally carried out 1-2 weeks following intervention by the lead researcher (Appendix L).

3.4.1.2 Outcome Measures

Measures of Child IU (IUS-P (Boulter et al., 2014), RULES (Sanchez et al., 2017); Child Anxiety (ASC-ASD-P (Rodgers et al., 2016)); RRBs (RBQ-2 (Leekham et al., 2007), and Parental IU (IUS-12 (Carleton et al., 2007) were utilised (see Phase 1 Methods). An additional measure of parent wellbeing was included (Depression Anxiety Stress Scales, Short version (Lovibond & Lovibond, 1995)), which is a 21-item scale, measuring symptoms of depression, anxiety and stress, with reportedly excellent reliability (Crawford and Henry, 2003).

3.4.1.3 Participants

Parents of five boys with confirmed diagnoses of ASD and ID took part in the intervention, with one parent of each child completing all measures. The boys were aged 8 years – 11 years, 9 months (mean months = 113.6, SD = 16.89) at baseline. All boys attended specialist education provisions. Results from the VABS-II indicated that all children were functioning in the “Low” range and within the 1st Centile for adaptive functioning when compared to their chronological peers. Four boys had additional comorbid diagnoses, including ADHD and attachment disorder, and one was adopted.

3.4.1.4 Fidelity

All intervention sessions were video-recorded and a random sample of 25% rated against a treatment fidelity checklist from the original CUES trial. This was to ensure that the intervention being delivered was in line with the treatment manual. The existing CUES fidelity checklist was appropriate for use in this study, with minor amendments for adapted content. Fidelity was rated by a clinical team member who had not been involved in the delivery of this intervention. The research team have extensive expertise in fidelity analysis from previous trials.

3.4.1.5 Analysis

Preliminary outcome of this phase (change pre- and post- intervention) was assessed on an individual level (using the Reliable Change Index, Jacobsen & Truax, 1991) and in a preliminary way using effect size estimates at the group level. This is a standard process within an intervention development study, in order to inform potential larger trials (examples in Rodgers et al., 2016 & Maskey et al., 2014). This is therefore not a fully powered study, but a descriptive quantitative study, commensurate with this stage of the research cycle of the development of intervention programmes, and the sample size is not sufficient for analyses of statistical significance.

3.4.2 Results

3.4.2.1 Fidelity

Video recordings of two intervention sessions were selected at random and reviewed for fidelity. Results suggested that the intervention was delivered as intended with 100% fidelity to the intervention manual. This high rating may be attributable to the fact that the author both adapted the intervention manual and led the delivery of the intervention.

3.4.2.2 Feasibility (Participant feedback)

Following the intervention, semi-structured interviews were undertaken with parents in order to gather feedback in relation to the feasibility and acceptability of the group format and content. Feedback was obtained within the following domains (example quotes are provided for illustrative purposes):

i) Suitability and content of the intervention

All parents reported the intervention to be suitable and appropriate for their children.

> *"It's been highly beneficial. The first week I was slightly apprehensive, I wondered if (Child) was advanced enough for any of the criteria to meet him… if he'd understand certain scenarios that were put to him? But over time, and together tweaking with what was presented, it's given me a tailormade way of coping."*

Despite reporting that generally the intervention content was appropriate, one parent felt that progress with their child was slower compared to others in the group.

> *"He's not good with some of the interventions (strategies), not like the other children – the other children seemed to adapt quicker than he would"*

The group format was reported to be acceptable, and several parents suggested that hearing other people's stories and experiences was particularly supportive.

> *"I think the group and the group size was spot on, there was enough people there to share experiences, and swap ideas, without there being too many voices."*

In terms of the content of the sessions, parents reported that all the tasks set were relevant and/or helped them understand and try out the new strategies. They also suggested that diaries were a useful tool.

> *"The diary, I found as the weeks passed, I found it was becoming less and less easy to find a scenario to put in it, because obviously we were coping better. The diaries were brilliant at the beginning, they just broke everything down, and gave it context seeing it written down, and thinking, right, how will I address this with what I've been told?".*

Parents offered suggestions for future adaptations or improvement to the course which included: a greater inclusion of sensory aspects (e.g. in diary), having a group for when the children are younger/newly diagnosed, the possibility of condensing the course into six sessions as eight sessions felt like a big commitment, and having separate groups for children of different functional abilities.

ii) Positive outcomes of intervention

All parents reported that they found the course helpful, and that they would recommend it to other parents.

> *"Before I would have just struggled on and like, now I have strategies I can put in place. I feel more focused, you know, like things probably will be alright. Like I can help him more. And like the motivation to try new things."*

Parents also reported an increase in confidence in supporting their child. They suggested that they had learnt new strategies and that they were putting them into practice and finding them helpful.

> *"We used the relaxation and picture stories a lot, and will continue with them. We intend to try and use other strategies when needed. We now use reassurance whilst pushing (Child) a bit more, which has made a huge difference."*

> *"Talking to (Child) about what he might find difficult is useful, to get him to consider what he might find difficult. And to talk about, what can you take, and what can you use to help you? And the social stories, just to help articulate it. So all three of those have been invaluable really."*

When asked if any strategies were less helpful, parents commented that when some activities may have been less relevant for their child at present, they recognised they were useful to consider for the future.

> *"There was nothing that I thought was unhelpful. You might think, that might be less useful for my child, but it's not unhelpful to know, you might find a time when it does become useful."*

Examples of what parents particularly liked included that they were also supported to adapt and individualise previously learned strategies as well as learning new ones;

> *"{Some strategies}, e.g. picture stories have been mentioned lots of times, and I've never quite understood how to write one myself. And think this is the first time I've thought, "God, I wish I'd known this!". Because they are actually quite simple and I think when I've tried to read about them in the past they've just seemed a lot more difficult. I think having the time to be shown and then you saying, "right, have a go" is brilliant, because it then gives you the confidence to use it at home."*

Overall, parents reported feeling better able to help their child with IU. When asked to rate out of ten, parents reported ratings of 7 and above.

> *"Now, I **can** do it. Like even just now it was (Child)s birthday, and he hates birthdays, and I used a picture story with him last night. And he was dead good this morning, honestly, he was amazing. I found it brilliant to be fair, really good. 10 out of 10."*

> *7-8 - There's always that little bit where you don't know what's going to happen. But that's with both of us, not just him! But things really are a lot better.*

Parents also reported that they felt things had improved and that they hoped would continue to get better.

iii) Research content

When asked about the research measures, parents suggested that, overall, the measures were suitable. However some noted that particular items with the ASC-ASD and IUS-P were more difficult to answer due to their child's developmental level, particularly as they may be unable to articulate their worries or experiences.

> *"I don't know what (Child) would be like with a test, because I don't know if he's done that at school or anything" (ASC-ASD)*

> *"I think some of the wording I had to apply differently, because they were sort of written in a way that (Child) wouldn't articulate. So, for example, he wouldn't say he gets worried about doing well in school" (ASC-ASD)*

3.4.2.3 Outcome Data

3.4.2.3.1 Group Level Data (Table 6)

Results showed that mean scores for both measures of child IU (IUS-P and RULES) were reduced immediately following the intervention. Effect sizes (Cohen's d) for these changes were medium and large, respectively. This indicates a reduction in parent-reported child IU following the adapted intervention. The improvement in IU was sustained and decreased further at each follow up, with large effect sizes observed on both measures at four-, six- and twelve- months following the intervention. Data from one participant was not available at 12 months post-intervention follow up, and so group data from the remaining four is reported.

An improvement in parent wellbeing was also observed immediately following the intervention, indicated by a reduction in mean scores on the DASS with a medium effect size. This reduction in DASS scores was also observed at four- and six- months post-intervention, with a small effect size. At 12 months post-intervention, a decrease in parent wellbeing was observed, reflected in an increase in group DASS scores, with a small effect size.

On the measure of self-reported parental IU, an increase was observed following the intervention with a medium effect size, meaning that parents are reporting greater levels of IU in themselves immediately after the intervention. This magnitude of increase in IU was observed to reduce across time, however at one year following the intervention, an increase in parental IU remained (with small effect size).

Table 6

Means, Standard Deviations and Effect Sizes (Cohen's d) for changes in Outcome Measures between Time 1 (Baseline) and Time 2 (Immediate Post-Intervention), Time 3 (4 months), Time 4 (6 months) and T5 (12 months)

Measure	T1 Mean (SD)	T2 Mean (SD)	T1-2 Effect Size (Cohen's d)	T3 Mean (SD)	T1-3 Effect Size (Cohen's d)	T4 Mean (SD)	T1-4 Effect Size (Cohen's d)	T1 Mean (SD) (*n=4)	T5 Mean (SD) (*n=4)	T1-5 Effect Size[4] (Cohen's d *n=4)
IUS-P	50.0 (7.48)	**45.2 (9.63)**	**0.56 (med)**	**43.0 (8.34)**	**0.88 (large)**	**41.2 (10.76)**	**0.95 (large)**	**47.5 (5.75)**	**38.0 (4.97)**	**1.77 (large)**
RULES	75.8 (8.04)	**67.4 (13.09)**	**0.77 (large)**	**63.8 (12.48)**	**1.15 (large)**	**60.2 (8.04)**	**1.94 (large)**	**74.0 (8.04)**	**57.0 (11.17)**	**1.75 (large)**
ASC-ASD	36.0 (9.27)	34.4 (12.93)	0.14 (small)	**28.0 (10.32)**	**0.81 (large)**	35.4 (12.18)	0.06 (small)	**34.3 (9.71)**	**29.0 (8.00)**	**0.60 (med)**
RBQ-2	47.2 (8.20)	45.8 (11.19)	0.14 (small)	46.4 (10.53)	0.08 (small)	46.6 (11.24)	0.06 (small)	**44.5 (6.40)**	**43.0 (11.17)**	0.16 (small)
IUS-12	20.6 (8.93)	**27.2 (17.70)**	**0.47 (med)**	20.6 (8.65)	0.00	23.0 (9.43)	0.26 (small)	17.8 (7.23)	18.75 (8.06)	0.12 (small)
DASS-21	13.8 (9.20)	**9.2 (5.36)**	**0.6 (med)**	11.8 (10.11)	0.03 (small)	10.8 (5.81)	0.39 (small)	16.0 (8.98)	17.50 (13.23)	0.13 (small)

Green indicates improvement; Red indicates Worsened

[4] Effect size (Cohen's d) at this follow up was calculated from baseline data from only the four participants who were followed up to Time 5, as the sample size was not sufficient for an "intention to treat" analysis.

3.4.2.3.2 Participant Level Data

Results were plotted for visual analysis of trends

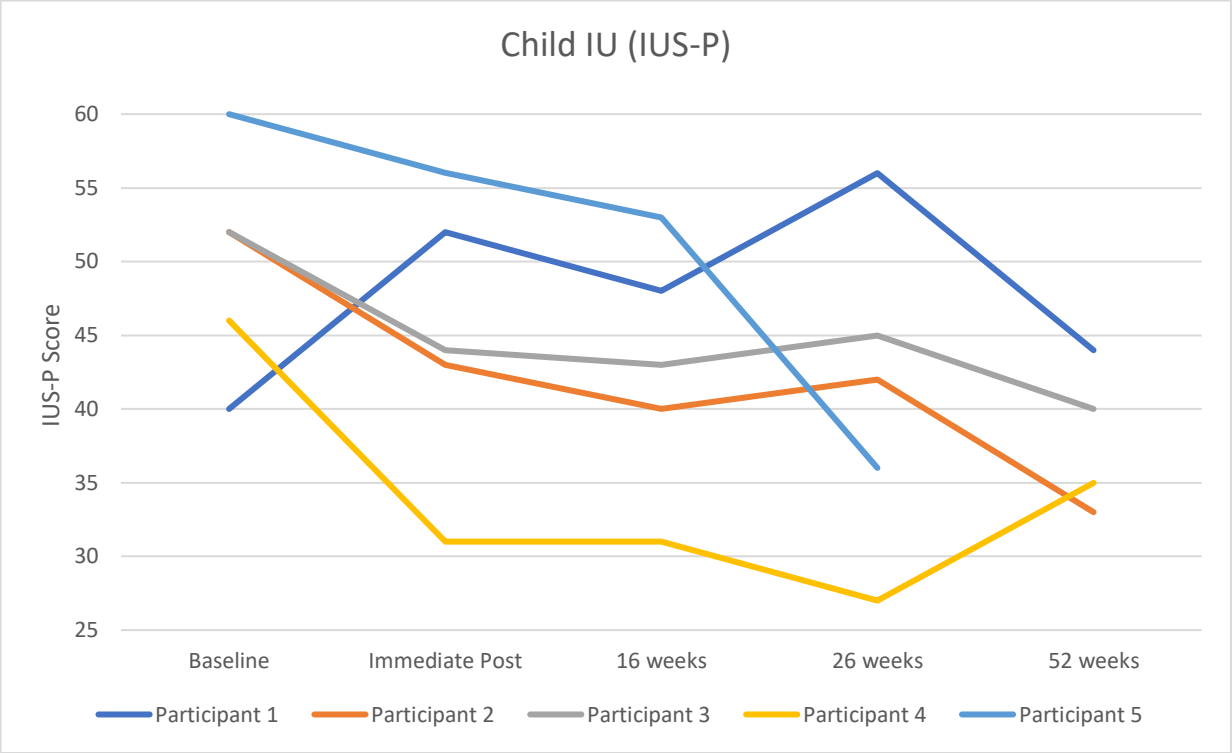


Fig. 6

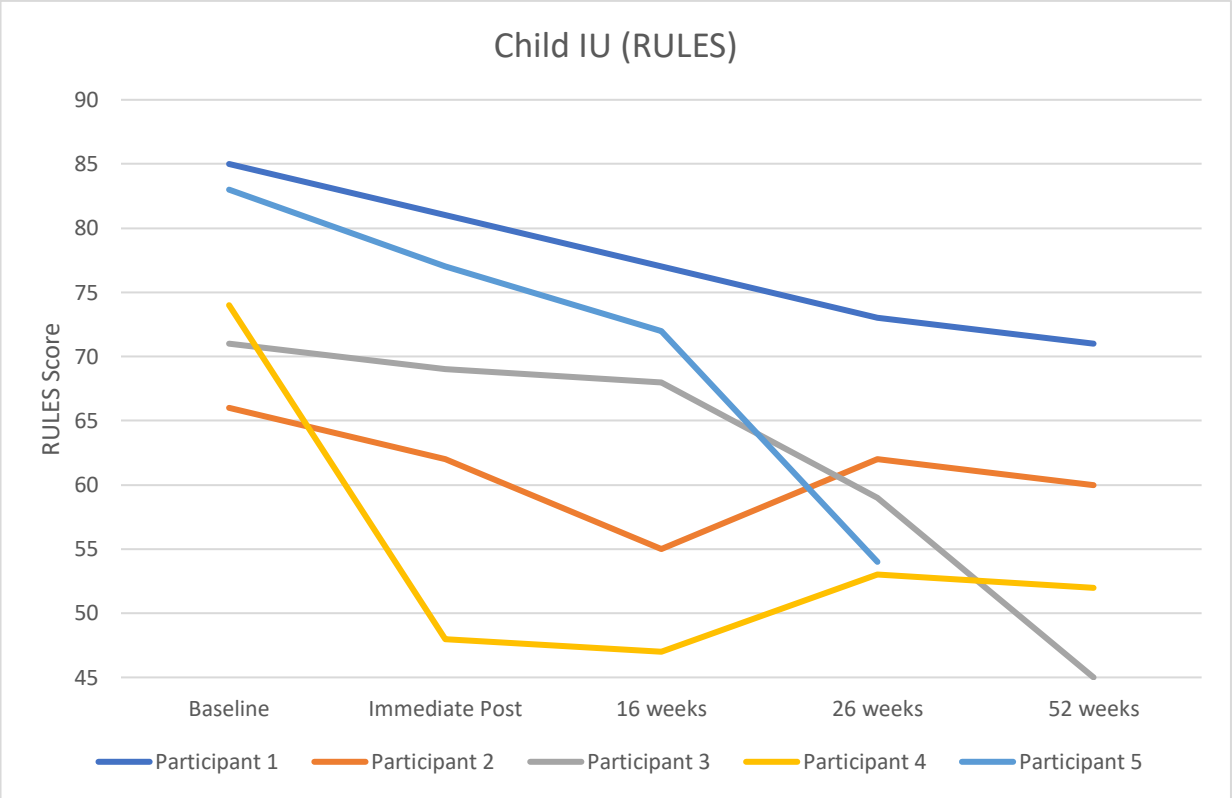


Fig. 7

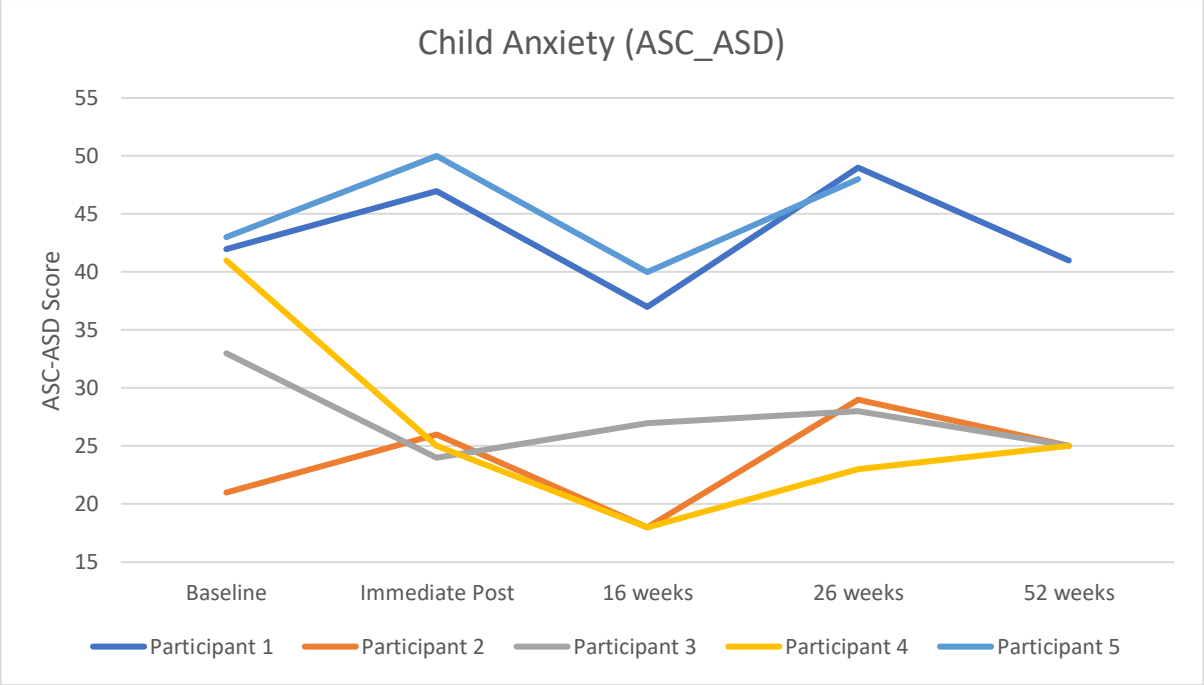


Fig. 8

Calculations using the Reliable Change Index (Jacobsen & Truax, 1991) indicated that Participant 1 showed reliable improvement on the RULES at six- months and this was maintained at 12-months follow up. This participant worsened on the IUS-P and ASC-ASD at six- months, however returned to baseline by 12 months. Participant 2 showed reliable improvement on the IUS-P at six- and 12 months, and on the RULES at 12-month follow up. They worsened on the ASC-ASD at six- months, however returned to baseline by 12 months post intervention. Participants 3 and 4 showed reliable improvements on the IUS-P, RULES and ASC-ASD at both six- and 12-month follow ups. Participant 5 showed reliable improvement on the IUS-P and RULES, and worsening on the ASC-ASD at six- months post intervention, however data is not available from this participant at 12 months follow up to observe whether these changes were maintained.

No reliable change was observed on the RBQ-2 or IUS-12 for any participant at six- or 12 months following the intervention. Participant 4 showed worsening on the DASS-21 at six- and

12- months post intervention, and participants 1, 2 and 3 did not show reliable change on this measure by 12 months following the intervention.

See Appendix M for full RCI data at all timepoints.

Table 7

Participant level Reliable Change Index (RCI) outcomes from Baseline to Time 4 (6 months) and T5 (12 months)

Measure	*Participant 1*			*Participant 2*			*Participant 3*			*Participant 4*			*Participant 5*		
	T1	*T4*	*T5*	*T1*	*T4*	*T5*	*T1*	*T4*	*T5*	*T1*	*T4*	*T5*	*T1*	*T4*	*T5*
IUS-P	40	56	44	52	**42**	**33**	52	45	40*	46	27*	35	60	36	NA
RULES	85	**73**	**71***	66	62	**60**	71	59	45*	74	53*	52*	83	54	NA
ASC-ASD	42	49	41	21	29	25	33	28	25*	41	23*	25*	43	48	NA
RBQ-2	51	52	53	49	51	52	39	37	31	39	33	36	58	60	NA
IUS-12	27	28	28	20	23	23	12	14	12	12	14	12	32	36	NA
DASS	26	14	32	21	8	14	7	4	1	10	19	23	5	9	NA

Green indicates reliable improvement, red indicates reliable worsening, yellow indicates no change

4.Discussion

This study set out to determine if IU plays a role in anxiety in children with ASD and co-occurring ID, and if so, consider whether an adapted parent-led intervention tackling anxiety via IU would be accessible and feasible for this population. This was achieved in two phases.

4.1 Phase 1 Findings

In line with hypotheses, findings from Phase 1 suggested that levels of IU are higher in children with ASD and co-occurring ID than children with ASD without ID. However, results did not support the prediction that anxiety will be higher in children with ASD+ID than children with ASD-ID. This is not in line with previous findings that children with ASD and co-occurring ID show higher levels of anxiety than those with ASD only (Matson & Shoemaker, 2009); and so may suggest that in this study we may not be capturing anxiety as accurately in children with co-occurring ID, or indeed may reflect real differences in this sample.

In children with ASD without ID, it was observed that both measures of Child IU positively correlated with anxiety and RRBs, replicating patterns reported in previous literature. In children with ASD and ID, IU also correlated with anxiety and RRBs, however only when measured using the RULES. These results may therefore suggest that the RULES measure is better able to capture IU in this population. In addition, in the ASD+ID group, anxiety positively correlated only with IU (RULES measure), and not RRBs, which was not in line with our hypothesis. This may be a true result, or again suggest that anxiety may not be being captured as sensitively in this population using the ASC-ASD measure. Results also suggested that Parental IU appears more related to ASD than ID, despite IU levels being higher in ID groups, which may raise the question of whether IU is a genetic or broader autism phenotype rather than an environmental one.

Regression analyses suggested that in children with ASD, both age and IU (as measured by both the IUS-P and RULES) were significant predictors of anxiety. However, ID status was not seen to be a significant predictor, which is not consistent with previous research. It could again be suggested that this unexpected result is reflecting that anxiety level has not been captured as precisely in the sample of children with ID. The fact that the amount of variance explained by the model was greater when using the RULES as the measure of IU, may further support

the above suggestion that this measure may be a more precise tool in this population which contains children with ID.

When taken together, results from Phase 1 suggest that IU is higher in children with ASD and ID than in children with ASD only, and that IU is related to anxiety and RRBs in this population. In children with ASD, both with and without ID, IU is also predictive of anxiety levels. Therefore, as with children with ASD without ID (Rodgers et al., 2017) it may be suggested that an intervention tackling IU could be a useful tool in reducing anxiety in children with ASD and co-occurring ID, and consequently provided good justification for the implementation of Phase 2.

4.2 Phase 2 Findings

In Phase 2, an intervention targeting IU in children with ASD was adapted so that it was accessible for parents of children with co-occurring ID. It should be noted that there were considerable difficulties with recruitment for both the adaptation and intervention stages of this phase. This was surprising given the anecdotal feedback obtained from both clinicians and parents whilst the study was developed, that there was a large population of parents of children with ASD+ID seeking support. Since we did not obtain feedback from parents who did not uptake the intervention, it is difficult to conclude why recruitment was so difficult. However consultation with local ASD champions and clinicians suggested that this could be related to reluctance of parents to commit to an eight session intervention due to existing family pressures or work, disillusionment with clinical services, or failure to recognise appropriateness of inclusion criteria, i.e. that many parents may not identify that their child has ID due to lack of formal diagnosis, or diagnostic overshadowing (e.g. Manohar et al., 2016).

Despite this, the adapted intervention (Coping with Uncertainty in Everyday Situation, CUES) was subsequently implemented with parents of five children, who reported it to be helpful and appropriate for their children, and that they had learned new strategies and gained confidence.

They further reported that the measures used were acceptable overall, however particular items in the ASC-ASD and IUS-P did not feel appropriate for their child, due to a reliance on their ability to communicate verbally.

At group level, preliminary (non-powered) analyses of outcome measures suggested that improvements were made in the primary focus of the intervention, Child IU (both measures) with a large effect size. This supports the interview feedback that the intervention supported parents in tackling Child IU. An improvement was also observed in anxiety symptoms (medium effect) and RRBs (small effect) following the intervention, and this group trend was maintained when followed up at one-year post-intervention. This may provide support for a mediating effect of IU on anxiety and RRBs in this population, similarly to that observed in children with ASD without ID (South and Rodgers, 2017), showing a downstream effect on these symptoms, and may additionally validate results from Phase 1. At the group level, an increase in Parental IU was observed following the intervention, with medium effect in the short term and small effect at longer follow up. This may in part be accounted for by their participation in the intervention leading to increased awareness of their own IU, or that they were engaging in graded exposure to uncertainty alongside their children. Parent wellbeing appeared to increase immediately following the intervention, however decreased over time, which may be a true effect, or perhaps due to anecdotal contextual factors reported by participants, e.g. additional family stressors.

At an individual level, reliable improvement was observed at follow up for all participants on the RULES measure of IU, and all but one on the IUS-P. It may be suggested that, as the RULES measure appeared more sensitive in this sample (ASD+ID) at Phase 1, it may be appropriate to consider this to be the primary measure of IU, and therefore tentatively concluded that all participants reliably improved on the targeted symptoms.

At 6- and 12- months post-intervention, two participants reliably improved on the measure of anxiety, and two reliably worsened at 6- but returned to baseline levels by 12 months. These trends may be a true effect, however if the ASC-ASD measure does not detect anxiety as precisely in this population (suggested by Phase 1), this may account for the observed trends. It may also be considered that increased anxiety at earlier follow ups may additionally reflect increased exposure to uncertainty as a result of the intervention (which includes graded exposure techniques), however that this results in a reduction in anxiety longer term.

No reliable change was detected on either the measure of RRBs or Parental IU at either of these follow ups. At 12 months, no reliable change was observed in parental wellbeing for three participants and one had reliably worsened (1 missing data at 12 months, but had not reliably changed at 6 months). It is therefore notable that data from one participant can have a marked influence of the mean in small samples such as this. Individual influencing factors at different time points must not be overlooked, as well as contextual factors which may have an impact on individual results, for example Christmas or periods of transition, which are known to be particularly difficult for children with ASD.

4.3 Strengths and Limitations

Key strengths of this study were that it successfully began to address an important gap in the literature pertaining to the transdiagnostic construct of IU in relation to anxiety in this specific population. It supports the validity of previous literature that has explored IU in heterogenous samples, and may justify the inclusion of the high proportion of children with ID in future studies of IU in ASD. It generated both quantitative and qualitative feedback, and the two phases of the study were complementary to each other in relation to how IU can be understood, its relationship to anxiety, and the possible mechanism for intervention in this population. Findings add to the existing evidence for the role of IU in anxiety, and also lends support to the use of parent-led interventions as a means of tackling the transdiagnostic construct of IU.

A key limitation of the current study was that the primary outcome measures used in both phases had not been specifically validated for use in the target population. The RULES measure was selected to be used alongside the IUS-P due to its potential to capture IU in a younger developmental population, and this appeared to be appropriate for this sample. However, despite the IUS-P and ASC-ASD having been validated in children with ASD, this has not to date been applied to children with ASD and co-occurring ID, and feedback from participants suggests that some items are less relevant to their children. It may be suggested a measure capturing more behavioural expressions of IU and anxiety may be more sensitive in this group (rather than the expression of internalised experiences).

Conceptually, it should be noted that the correlational nature of this study (Phase 1) is a limitation as it does not provide evidence as to the direction or quality of the relationship between IU and anxiety or ASD characteristics. In addition, Given that this study did not have a control comparison, it is important to highlight it the study is limited in that the changes observed in Phase 2 cannot be conclusively attributed to intervention-specific components (in this case tackling IU). As such, a future study with an active control arm would be beneficial to ascertain whether any changes observed are associated with the IU element of the intervention.

A further important limitation of the study, particularly in Phase 2, was the potential influence of bias. Recruitment, outcome measures and post intervention interviews were all undertaken by the same researcher, who also implemented the intervention. Participants may therefore have responded more favourably, as they were aware of the nature of the study (as part of a doctoral thesis). This may be compounded by the additional limitation that the sample size for Phase 2 was very small, due to recruitment difficulties, as discussed

Finally, a considerable limitation of the current study was that no direct measure of ID was implemented at either phase of the study, instead relying upon accurate parental report of

diagnosis. This may be unreliable due to the differing diagnostic and rhetorical terminologies used in relation to impaired intellectual functioning (e.g. learning difficulties as opposed to disabilities), as well as diagnostic overshadowing meaning that an explicit diagnosis of ID may not be given. This may have been more relevant in the context of the online recruitment utilised at Phase 1, as it was reliant upon participants selecting diagnoses from a list, rather than discussing fully the clinical context of diagnoses as in Phase 2.

4.4 Implications and Future Directions

There are a number of implications arising from this study, both in the clinical and research domains. In terms of outcomes, results suggested that the RULES may be a useful measure of IU in this population for future studies, and should be validated in this context. Furthermore, results indicated that adaptation or further validation of the IUS-P and ASC-ASD measures should be undertaken for those with co-occurring ID, or alternative measures of anxiety should be considered (perhaps one validated for ID rather than ASD, e.g. the MASC, see Thaler et al., 2010). This study focused on only one part of the IU model (South and Rogers, 2017) and therefore further exploration of how IU fits into the model in this population should be undertaken (i.e. the role of sensory processing and alexithymia). Pragmatically, barriers to recruitment should be systematically explored in order to scaffold further research in this area. Anxiety is also problematic for children with ID without ASD and interventions for this population are also lacking (see accompanying review). Therefore, this study supports the justification for future research exploring the role of IU in anxiety for this population also.

Clinically, results from this study suggest that the presence and role of IU should be taken into consideration when formulating anxiety difficulties in children with ASD and ID. In addition, interventions targeting IU as a transdiagnostic construct may be one treatment option for such children, and it may be feasible and appropriate to utilise a parent-led format in planning clinical service provision.

4.5 Conclusions

Anxiety is prevalent and problematic for children with ASD and ID, however, effective interventions targeting this are lacking. Previous literature suggests that IU mediates anxiety in children with ASD and may be a helpful mechanism to target during intervention. However, the role of IU in anxiety in children with co-occurring ID had not been explored to date.

Results from this study suggest that IU plays a role in anxiety in this population and therefore this construct may be an appropriate target for interventions in ID-specific or heterogenous samples of children with ASD. Parent-led interventions such as CUES can be adapted for this population, and may be accessible and helpful for parents, with some early indications that a reduction in IU may result. Further research should therefore focus on implementing larger, fully powered studies to explore the utility of such IU interventions further, as well as validating outcome measures for this group. Clinically, it may be important to consider if and how IU is mediating anxiety in patients with ASD and ID and utilise this within formulation.

Ethical Considerations

This study was undertaken with consideration to the Code of Human Research Ethics (British Psychological Society (BPS) 2014). As such, potential ethical issues were identified early in the design process and informed the applications for NHS and University Ethical Approval. Key examples of how these issues were addressed are as follows:

Participation in the intervention phase of the study involved parents/carers being asked to consider and discuss their child's anxiety and related behaviours, which may be distressing for them. As a discussion of these types (in regard to child anxiety and behaviours) is likely to have occurred in diagnosis and routine clinical appointments, participants were unlikely to be

surprised about the types of questions being asked. If participants became distressed, researchers could use their clinical skills to support them, and signpost them to further relevant sources of support, for example ASD support groups or local ASD coordinator. This potential risk was outlined in the participant information sheet, distributed prior to consenting to take part in the study. The right to withdraw from participation without giving reason, and issues around anonymity and confidentiality, were additionally included in this sheet, and reiterated during the home visit before consent was taken. Participants were also asked to consider their own wellbeing and intolerance of uncertainty, and researchers again used their clinical skills to support participants, and could signpost to relevant services for further support if this raised any distressing issues. In terms of burden, there were a number of interviews and questionnaires for participants to complete, as well as eight two-hourly group sessions to be attended. The expected time taken and procedure for these were discussed with participants before they consented. Measures were selected so that the minimum number and least burdensome were used to allow for high-quality data to be obtained, for example short forms where appropriate.

Parent/carer participation in the intervention group additionally involved them discussing their parenting experiences, and their child's anxiety-related difficulties, with other parents/carers. The group nature of the intervention was highlighted by the researcher at the initial home visit prior to taking consent, and that participants would be invited to share their parenting experiences with other participants. It was additionally highlighted that parents could choose not to share their own examples or answer questions put to the group if they did not wish to, and parents were made aware of their right to withdraw from the study, or discontinue with the group, before consenting. "Ground rules" for potential ethical issues were highlighted by the researcher and agreed by the group in the first intervention session, which included: confidentiality within the group, respectful communication and sensitivity towards each other. Although the group intervention was videotaped (and securely stored), the video-camera was placed so that the faces of participants could not be seen (focused on group leaders), and

was only to be viewed by members of the research team for the purposes of clinical supervision or ratings of fidelity. Parents/carers were made aware of this and were in agreement with it.

REFERENCES

Aktar, E., Nikolić, M., & Bögels, S. M. (2017). Environmental transmission of generalized anxiety disorder from parents to children: worries, experiential avoidance, and intolerance of uncertainty. *Dialogues in clinical neuroscience*, *19*(2), 137.

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Autistica Research Priorities (2016), retrieved from https://www.autistica.org.uk/our-research/our-research/your-research-priorities

Banneyer, K. N., Bonin, L., Price, K., Goodman, W. K., & Storch, E. A. (2018). Cognitive behavioral therapy for childhood anxiety disorders: a review of recent advances. *Current psychiatry reports*, *20*(8), 65.

Basile, E., Villa, L., Selicorni, A., & Molteni, M. (2007). The behavioural phenotype of Cornelia de Lange syndrome: a study of 56 individuals. *Journal of Intellectual Disability Research*, *51*(9), 671-681.

Boulter, C., Freeston, M., South, M., & Rodgers, J. (2014) Intolerance of uncertainly as a framework for understanding anxiety in children and adolescents with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 44*(6), 1391-1402.

Bourgeois, J. A., Seritan, A. L., Casillas, E. M., Hessl, D., Schneider, A., Yang, Y., ... & Hagerman, R. J. (2011). Lifetime prevalence of mood and anxiety disorders in fragile X premutation carriers. *The Journal of clinical psychiatry*, *72*(2), 175.

Buhr, K., & Dugas, M.J. (2009). The role of fear of anxiety and intolerance of uncertainty in worry: An experimental manipulation. *Behaviour Research & Therapy, 47*(3), pg 216.

Cai, R. Y., Richdale, A. L., Dissanayake, C., & Uljarević, M. (2018). Brief report: Inter-relationship between emotion regulation, intolerance of uncertainty, anxiety, and depression in youth with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *48*(1), 316-325.

Carleton, R.N., Norton, M., & Asmundsun, G. J. G. (2007) Fearing the unknown: A short version of the Intolerance of Uncertainty Scale. *Journal of Anxiety Disorders 21* (1), 105-117.

Carleton, R.N. (2012) The intolerance of uncertainty construct in the context of anxiety disorders: theoretical and practical perspectives. *Expert review of Neurotherapeutics, 12*(8), 937-947.

Craig, P., et. al. on behalf of the Medical Research Council (2008). Developing and evaluating complex interventions: new guidance. MRC publication.

Crawford, J. R., & Henry, J. D. (2003). The Depression Anxiety Stress Scales (DASS): Normative data and latent structure in a large non-clinical sample. British Journal of Clinical Psychology, 42, 111–131.

Deudney, C., & Shah, A. (2004). *Mental health in people with autism and Asperger syndrome: a guide for health professionals*. National Autistic Society.

Dodd, H.F. & Porter, M.A. (2009) Psychopathology in William's Syndrome: The effect of individual differences across the lifespan. *Journal of Mental Health Research in Intellectual Disabilities, 2*(2), 89-109.

Dugas, M.J., Gagnon, F., Ladouceur, R., & Freeston, M. H. (1998) Generalised anxiety disorder: a preliminary test of a conceptual model. *Behaviour research and therapy, 36*(2), 215-226.

Dykens, E. M. (2003). Anxiety, fears, and phobias in persons with Williams syndrome. *Developmental neuropsychology*, *23*(1-2), 291-316.Emerson & Barnes 2010

Emerson, E. (2003) Prevalence of psychiatric disorders in children and adolescents with and without intellectual disability. *Journal of Intellectual Disability Research, 47 (*1), 51-58

Essau, C. A., Lewinsohn, P. M., Lim, J. X., Moon-ho, R. H., & Rohde, P. (2018). Incidence, recurrence and comorbidity of anxiety disorders in four major developmental stages. *Journal of affective disorders*, *228*, 248-253.

Glod, M., Riby, D. M., & Rodgers, J. (2019). Relationships between sensory processing, repetitive behaviors, anxiety, and intolerance of uncertainty in autism spectrum disorder and Williams syndrome. *Autism Research*, *12*(5), 759-765.

Green, S. A., Berkovits, L. D., & Baker, B. L. (2015). Symptoms and development of anxiety in children with or without intellectual disability. *Journal of Clinical Child & Adolescent Psychology*, *44*(1), 137-144.

Gobrial, E., and Raghavan, R. (2012) Prevalence of anxiety disorder in children and young people with intellectual disabilities and autism. Advances in Mental Health and Intellectual Disabilities, 6 (3), pp. 130-141

Gotham, K., Brunwasser, S.M., & Lord, C. (2015) Depressive and anxiety symptom trajectories from school age through young adulthood in samples with Autism Spectrum Disorder and Developmental Delay. *Journal of the American Academy of Child & Adolescent Psychiatry, 54, 5*, 369-376.

Gould, J., & Ashton-Smith, J. (2011). Missed diagnosis or misdiagnosis? Girls and women on the autism spectrum. *Good Autism Practice (GAP)*, *12*(1), 34-41.

Elsabbagh, M. et al (2012) Global prevalence of autism and other pervasive developmental disorders, *Autism Research*, 5 (3), pp.160-179.

Hale, W., Richmond, M., Bennett, J., Berzins, T., Fields, A., Weber, D., Beck, M., & Osman, A. (2016). Resolving Uncertainty About the Intolerance of Uncertainty Scale-12: Application of Modern Psychometric Strategies. *Journal of personality assessment*, *98*(2), 200–208. https://doi.org/10.1080/00223891.2015.1070355

Hollocks, M., Lerh, J., Magiati, I., Meiser-Stedman, R., & Brugha, T. (2019) Anxiety and depression in adults with austism spectrum disorder: A systematic review ad meta-analysis. *Psychological Medicine, 49*(4), 559-572.

Ialongo, N.S., Rogosch, F.A., Cicchetti, D., Toth, S.L., Buckley, J., Petras, H., & Neiderhiser, J. (2006). *A developmental psychopathology approach to the prevention of mental health disorders.* In: Cicchetti, D. (Ed.), Developmental Psychopathology, 2nd Edition, pp.968-1018.

Jacobson, N.S. & Truax, P. (1991). Clinical significance: A statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology*, 59, 12–19.

James Lind Alliance Priority Setting Partnership (2016) retrieved from http://www.jla.nihr.ac.uk/top-10-priorities/

Joyce C., Honey E., Leekam S. R., Barrett S. L., & Rodgers J. (2017). Anxiety, Intolerance of Uncertainty and Restricted and Repetitive Behaviour: Insights Directly from Young People with ASD. *Journal of Autism and Developmental Disorders* [e-pub ahead of print].

Keefer, A., Kreiser, N.L., Singh, V., Blakeley-Smith, A., Duncan, A., Johnson, C., Vasa, R.A. (2016) Intolerance of uncertainty predicts anxiety outcomes following CBT in youth with ASD. *Journal of Developmental Disorders*, 1-10.

Kerns, C.M., Roux A.M., Connell, J.E., & Shattuck, P. T. (2016) Adapting cognitive behavioural changes to address anxiety and depression in cognitively able emerging adults on the autism spectrum. *Cognitive and Behavioural Practice, 23*, 329-340.

Kenny, L., Hattersley, C., Molins, B., Buckley, C., Povey, C., & Pellicano, E. (2016). Which terms should be used to describe autism? Perspectives from the UK autism community. *Autism*, *20*(4), 442-462.

Leekham, S., Tandos, J., McConachie, H., Meins, E., Parkinson, K., Wright, C., LeCouteur, A. (2007) Repetitive behaviours in typically developing 2-year-olds. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 48*(11), 1131-1138.

Leyfer, O. T., Woodruff-Borden, J., Klein-Tasman, B. P., Fricke, J. S., & Mervis, C. B. (2006). Prevalence of psychiatric disorders in 4- to 16-year-olds with Williams syndrome.

American Journal of Medical Genetics, Part B: (Neuropsychiatric Genetics), 141B, 615–622.

Lidstone, J., Uljarevic´, M., Sullivan, J., Rodgers, J., McConachie, H., Freeston, M., et al. (2014). Relations among restricted and repetitive behaviors, anxiety and sensory features in children with autism spectrum disorders. Research in Autism Spectrum Disorders, 8(2), 82–92. doi:10.1016/j.rasd.2013.10.001.

Loomes, R., Hull, L., & Mandy, W. P. L. (2017). What is the male-to-female ratio in autism spectrum disorder? A systematic review and meta-analysis. *Journal of the American Academy of Child & Adolescent Psychiatry*, *56*(6), 466-474.

Lovibond, S.H., & Lovibond, P.F. (1995) *Manual for the depression anxiety stress scales* (2nd Ed.) Sydney: Psychology Foundation.

Lyall, K., et al. (2017). The changing epidemiology of autism spectrum disorders. Annual Review of Public Health, 38(1), 81–102.

McEvoy, P. M., & Mahoney, A. E. (2012). To be sure, to be sure: Intolerance of uncertainty mediates symptoms of various anxiety disorders and depression. *Behavior therapy*, *43*(3), 533-545.

Maisel, M. E., Stephenson, K. G., South, M., Rodgers, J., Freeston, M. H., & Gaigg, S. B. (2016). Modeling the cognitive mechanisms linking autism symptoms and anxiety in adults. *Journal of Abnormal Psychology*, *125*(5), 692.

Manohar, H., Subramanian, K., Kandasamy, P., Penchilaiya, V., & Arun, A. (2016). Diagnostic masking and overshadowing in intellectual disability—how structured evaluation helps. *Journal of Child and Adolescent Psychiatric Nursing*, *29*(4), 171-176.

Maskey, M., Lowry, J., Rodgers, R., McConachie, H, & Parr, J. (2014) Reducing specific phobia/ fear in young people with Autism Spectrum Disorders through a Virtual Reality Environment intervention. *Plos One, 9,* 7.

Matson, J. L., & Shoemaker, M. (2009). Intellectual disability and its relationship to autism spectrum disorders. *Research in developmental disabilities*, *30*(6), 1107-1114.

McConkey, R., Craig, S., & Kelly, C. (2019) The prevalence of intellectual disability: A comparison of national census and register records. *Research in Developmental Disabilities, 89*, 69-75.

McPheeters, M.L., Warren, Z., Sathe, N., Bruzek, J.L., Krishnaswami, S., Jerome, R.N., & Veenstra-Vanderweele J. (2011) A systematic review of medical treatments for children with autism spectrum disorders. *Paediatrics, 127*(5), 1312-21.

Neil, L., Olsson, N. C., & Pellicano, E. (2016). The relationship between intolerance of uncertainty, sensory sensitivities, and anxiety in autistic and typically developing children. *Journal of Autism and Developmental Disorders*, *46*(6), 1962-1973.

Nelson, J.M., & Harwood, H. (2011) Learning Disabilities and Anxiety: A Meta-Analysis. *Journal of Learning Disabilities, 44*, 1.

Osmanağaoğlu, N., Creswell, C., & Dodd, H. F. (2018). Intolerance of Uncertainty, anxiety, and worry in children and adolescents: A meta-analysis. *Journal of affective disorders*, *225*, 80-90.

Pellecchia, M., Connell, J. E., Kerns, C. M., Xie, M., Marcus, S. C., & Mandell, D. S. (2015). Child characteristics associated with outcome for children with autism in a school-based behavioral intervention. Autism, 1362361315577518

Pine, D.S., Cohen, P., Gurley, D., Brook, J., Ma, Y. (1998) The risk for early-adulthood anxiety and depressive disorders in adolescents with anxiety and depressive disorders. *Archives of General Psychiatry, 55*, 56-64.

Reardon, T. C., Gray, K. M., & Melvin, G. A. (2015). Anxiety disorders in children and adolescents with intellectual disability: Prevalence and assessment. *Research in developmental disabilities*, *36*, 175-190.

Rodas, N. V., Blacher, J., & Baker, B. L. (2020). Predictors of Anxiety Symptom Trajectory in Children with or without ID from Early Childhood to Adolescence. *Journal of Mental Health Research in Intellectual Disabilities*, 1-18.

Rodgers, J., Glod, M., Connolly, B., & McConachie, H. (2012) The relationship between anxiety and repetitive behaviours in autism spectrum disorder. *Journal of Autism and Developmental Disorders, 42*(11), 2404-2409.

Rodgers, J., Hodgson, A., Shields, K., Wright, C., Honey, E., & Freeston, M. (2016). Towards a treatment for intolerance of uncertainty in young people with autism spectrum disorder: development of the coping with uncertainty in everyday situations (CUES) programme. *Journal of Developmental Disorders* [e-pub]

Rodgers, J., Wigham, S., McConachie, H., Freeston, M., Honey, E., & Parr, J.R. (2016). Development of the anxiety scale for children with autism spectrum disorder (ASC-ASD) *Autism Research.*

Rosen, T. E., Connell, J. E., & Kerns, C. M. (2016). A review of behavioral interventions for anxiety-related behaviors in lower-functioning individuals with autism. *Behavioral Interventions*, *31*(2), 120-143.

Royston, R., Howlin, P., Waite, J., & Oliver, C. (2017). Anxiety disorders in Williams syndrome contrasted with intellectual disability and the general population: A systematic review and meta-analysis. *Journal of Autism and Developmental Disorders*, *47*(12), 3765-3777.

Royston, R., Oliver, C., Moss, J., Adams, D., Berg, K., Burbidge, C., ... & Waite, J. (2018). Brief report: repetitive behaviour profiles in Williams syndrome: cross syndrome comparisons with Prader–Willi and Down syndromes. *Journal of autism and developmental disorders*, *48*(1), 326-331.

Samson, A. C., Phillips, J. M., Parker, K. J., Shah, S., Gross, J. J., & Hardan, A. Y. (2014). Emotion dysregulation and the core features of autism spectrum disorder. *Journal of Autism and developmental Disorders*, *44*(7), 1766-1772.

Sanchez, A.L., Cornacchio, D., Chou, T., Leyfer, O., Coxe, S., Pincus, D., & Comer, J.S. (2017) Development of a scale to evaluate young children's responses to uncertainty and low environmental structure. *Journal of Anxiety Disorders, 45*, 17-23.

Simonoff, E., Pickles, A., Charman, T., Chandler, S., Loucas, T., Baird, G. (2008) Psychiatric disorders in children with autism spectrum disorders: Prevalence, comorbidity, and associated factors in a population-derived sample. *Journal of the American Academy of Child and Adolescent Psychiatry, 47*(8):921–929)

South, M., & Rodgers, J. (2017). Sensory, emotional and cognitive contributions to anxiety in autism spectrum disorders. *Frontiers in Human Neuroscience*, *11*, 20.

Sparrow, S. S., Balla, D. A., & Cicchetti, D. V. (2005). *Vineland II: Vineland adaptive behavior scales*. American Guidance Service.

Strang, J. F., Kenworthy, L., Daniolos, P., Case, L., Wills, M. C., Martin, A., & Wallace, G. L. (2012). Depression and anxiety symptoms in children and adolescents with autism spectrum disorders without intellectual disability. *Research in autism spectrum disorders*, *6*(1), 406-412.

Thaler, N. S., Kazemi, E., & Wood, J. J. (2010). Measuring anxiety in youth with learning disabilities: Reliability and validity of the Multidimensional Anxiety Scale for Children (MASC). *Child Psychiatry & Human Development*, *41*(5), 501-514.

Uljarević, M., Labuschagne, I., Bobin, R., Atkinson, A., & Hocking, D. R. (2018). Brief report: the impact of sensory hypersensitivity and intolerance of uncertainty on anxiety in Williams syndrome. *Journal of autism and developmental disorders*, *48*(11), 3958-3964.

Ung, D., Selles, R., Small, B.J., & Storch, E.A. (2015) A Systematic Review and Meta-Analysis of Cognitive-Behavioral Therapy for Anxiety in Youth with High-Functioning Autism Spectrum Disorders. *Child Psychiatry and Human Development, 46*(4), 533-547.

Van Steensel, F.A., Bogels, S., & Perrin, S. (2011) Anxiety disorders in children and adolescents with autistic spectrum disorders: a meta-analysis. *Clinical Child and Family Psychology Review*, *14, 302-317.*

Vasa, R. A., Kreiser, N. L., Keefer, A., Singh, V., & Mostofsky, S. H. (2018). Relationships between autism spectrum disorder and intolerance of uncertainty. *Autism Research*, *11*(4), 636-644

Walker, S. (2009). *What do we know about the relationship between intolerance of uncertainty and worry in young children*? Unpublished Thesis, Newastle University, Newcastle Upon Tyne.

Whitney, D. G., Shapiro, D. N., Peterson, M. D., & Warschausky, S. A. (2019). Factors associated with depression and anxiety in children with intellectual disabilities. *Journal of intellectual disability research*, *63*(5), 408-417.

Wigham, S., Rodgers, J., South, M., McConachie, H.R., & Freeston, M.H. (2015) The interplay between sensory processing abnormalities, intolerance of uncertainty, anxiety and restricted and repetitive behaviours in autism spectrum disorder. *Journal of Autism and Developmental Disorders, 45*, 943-952.

Wood, J.J., & Gadow, K.D. (2010). Exploring the nature and function of anxiety in youth with autism spectrum disorders. *Clinical Psychology- Science and Practice, 17*(4), 281-292.

Woodcock, K., Oliver, C. & Humphreys, G. (2009) Associations between repetitive questioning, resistance to change, temper outbursts and anxiety in Prader–Willi and Fragile-X syndromes. *Journal of Intellectual Disability Research, 50* (3), 265-278.

APPENDICES

Appendix A - Analyses including the smaller ID-only subgroup

Table 9

Descriptive Statistics (whole sample, including ID-only)

Measure	*n*	*Range*	*Mean*	*SD*	*Skew*		*Kurtosis*		
					Stat	*Error*	*Stat*	*Error*	*Cronbach's* α
Child-IUS	134	18- 60	46.40	9.69	-0.939	0.206	0.559	0.408	0.884
RULES	131	23-85	64.02	13.51	-0.752	0.212	0.244	0.42	0.912
ASC-ASD	126	11-93	56.57	17.76	-0.037	0.216	-0.429	0.428	0.944
RBQ-2	116	22-60	42.95	7.31	-0.056	0.225	-0.019	0.446	0.827
IUS-12	114	12-36	20.87	6.98	0.625	0.226	-0.63	0.449	0.925

Table 10

Descriptive Statistics for ID only group

Measure	*n*	*Range*	*Mean*	*SD*
Child-IUS	16	19-60	47.50	13.47
RULES	15	23-83	65.93	19.77
ASC-ASD	14	30-89	61.57	15.03
RBQ-2	12	22-57	42.58	9.99
IUS-12	12	12-30	17.67	5.12

Despite the smaller subgroup of children with an intellectual disability without ASD (ID-ASD) not being included in the statistical analysis due to small group size, an interesting visual trend was observed across groups (Figs 2,3,4), perhaps suggesting a cumulative effect of both ASD and ID on IU and RRBs.

Although there was no significant difference between ASD-ID and ASD+ID groups in terms of Parental IU, again an interesting trend in IU was observed across groups.

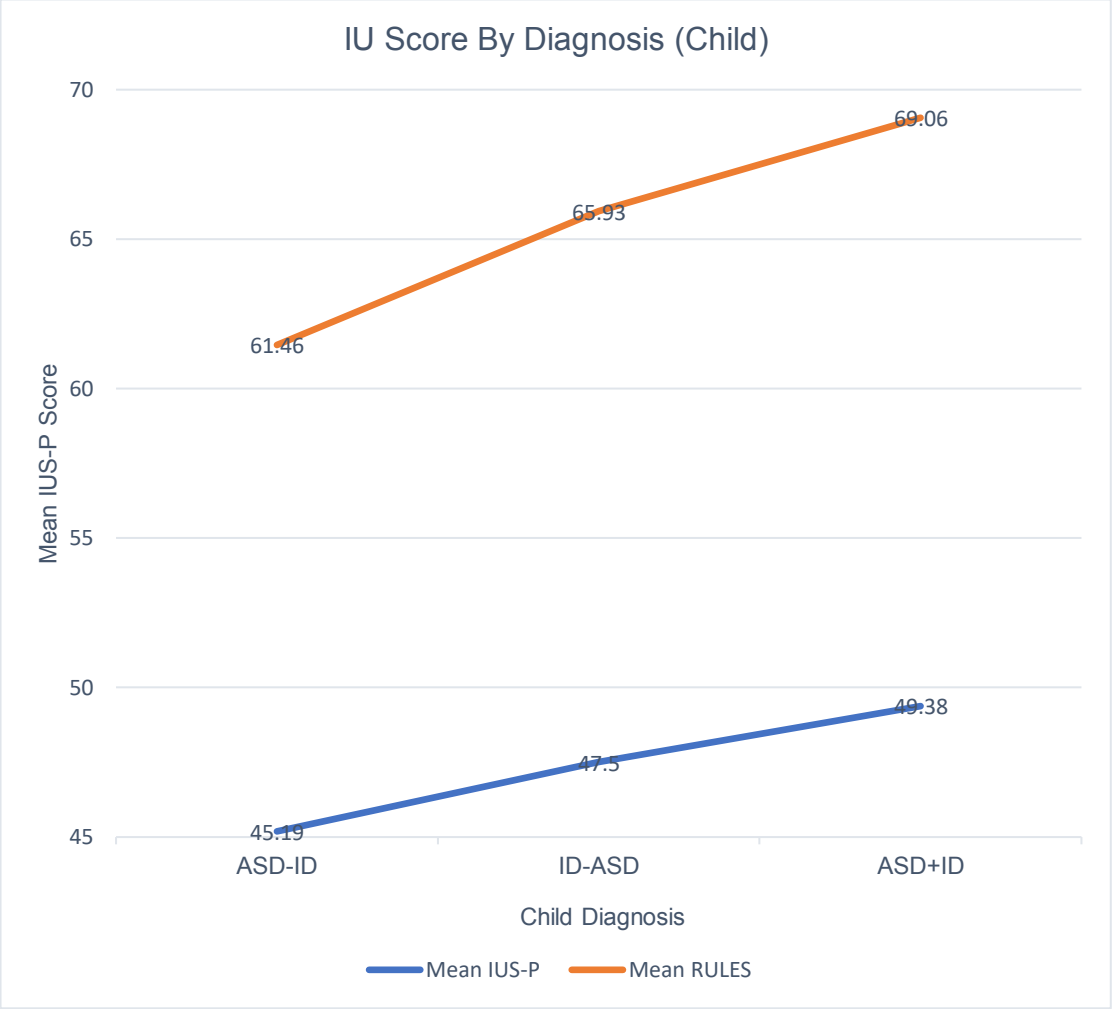


Fig 2

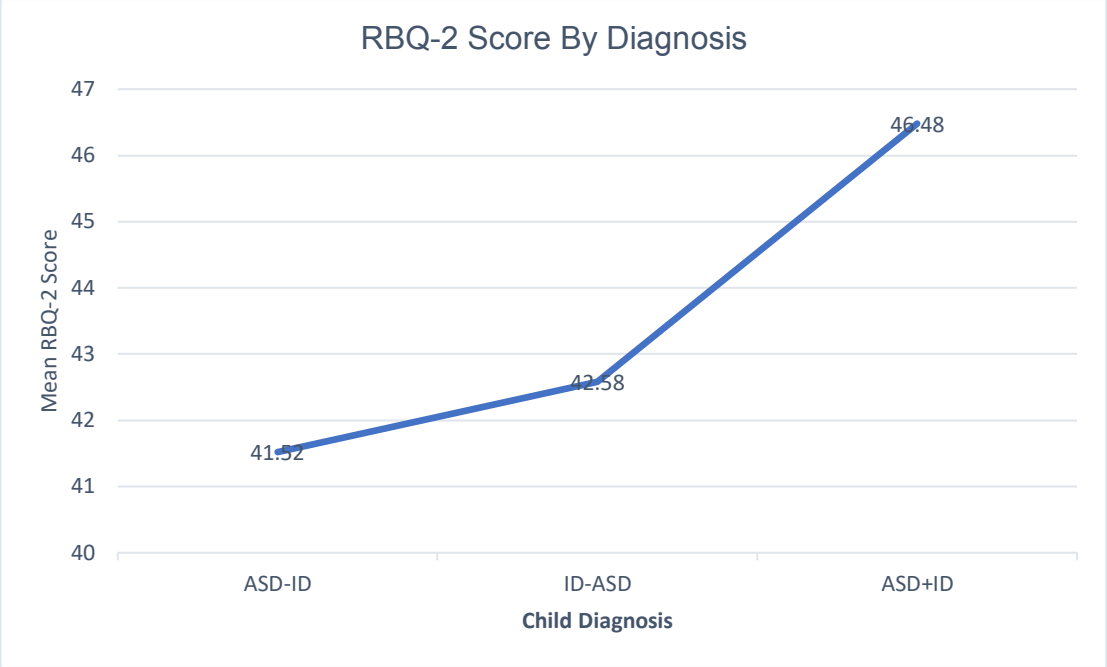


Fig 3

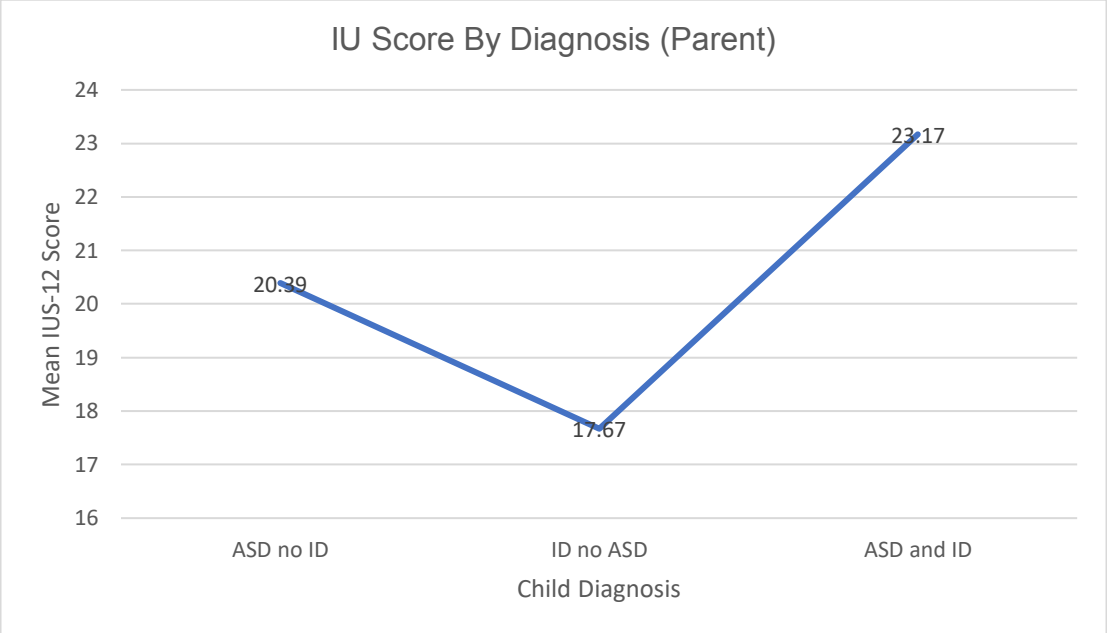


Fig 4

Appendix B

Table 11

Reliability of measures by diagnostic subgroup

	ASD-ID			*ASD+ID*		
Measure	*n*	*Mean (sd)*	*Cronbach's α*	*n*	*Mean (sd)*	*Cronbach's α*
Child-IUS	86	45.19 (9.51)	0.872	32	49.38 (7.96)	0.850
RULES	80	61.46 (12.12)	0.889	32	69.59 (11.44)	0.891
ASC-ASD	77	55.84 (17.62)	0.942	31	55.48 (19.02)	0.949
RBQ-2	71	41.52 (6.58)	0.774	29	46.48 (6.73)	0.808
IUS-12	69	20.39 (6.32)	0.924	29	23.17 (8.30)	0.921

Appendix C – Alternative Analyses using ASC-ASD without uncertainty subscale

Table 12

Dependent Variable Pearson Correlations (Children with ASD-ID)

	1		*2*		*3*		*4*		*5*	
	IUS-P (Child)		*RULES*		*ASC-ASD – no uncertainty scale*		*RBQ-2*		*IUS-12 (Parent)*	
	r	*N*	*r*	*N*	*r*	*N*	*r*	*N*	*r*	*N*
1	-	-	0.783**	80	0.676**	70	0.370*	71	0.278	69
2			-	-	0.697**	70	0.469**	71	0.196	69
3					-	-	0.307*	69	0.049	69
4							-	-	0.097	69
5									-	-

*p<.01, **p<.001

Table 13

Dependent Variables Pearson Correlations (Children with ASD+ID)

	1		*2*		*3*		*4*		*5*	
	IUS-P (Child)		*RULES*		*ASC-ASD – no uncertainty scale*		*RBQ-2*		*IUS-12 (Parent)*	
	r	*N*	*r*	*N*	*r*	*N*	*r*	*N*	*r*	*N*
1	-	-	0.660***	32	0.402	28	0.272	29	0.263	29
2			-	-	0.404*	28	0.510**	29	0.319	29
3					-	-	0.237	28	0.281	
4							-	-	0.218	29
5									-	-

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

Appendix D

Table 14

Dependent Variable Pearson Correlations (All children with ASD)

	1		*2*		*3*		*4*		*5*	
	IUS-P (Child)		*RULES*		*ASC-ASD*		*RBQ-2*		*IUS-12 (Parent)*	
	r	*N*	*r*	*N*	*r*	*N*	*r*	*N*	*r*	*N*
1	-	-	0.765**	112	0.547**	108	0.384**	100	0.295*	98
2			-	-	0.547**	108	0.531**	100	0.273*	98
3					-	-	0.315*	100	0.133	98
4							-	-	0.187	98
5									-	-

*p<.01, **p<.001

Table 15

Dependent Variable Pearson Correlations (Children with ID-ASD)

	1		*2*		*3*		*4*		*5*	
	IUS-P (Child)		*RULES*		*ASC-ASD*		*RBQ-2*		*IUS-12 (Parent)*	
	r	*N*	*r*	*N*	*r*	*N*	*r*	*N*	*r*	*N*
1	-	-	0.932**	15	0.666*	14	0.790*	12	0.381	12
2			-	-	0.613	14	0.817*	12	0.150	12
3					-	-	0.717*	12	-0.040	12
4							-	-	0.018	12
5									-	-

*p<.01, **p<.001

Appendix E

Table 16

Hierarchical Regression Analysis Summary for Variables Predicting Anxiety (IUS-P as IU measure)

Variable		β	*t*	*Std. Error*	*R*	R_2	ΔR_2
Step 1					0.378	0.143	0.143
	Age	0.378	4.184*	0.038			
Step 2					0.627	0.393	0.250
	Age	0.324	4.227*	0.033			
	IUS-P	0.503	6.544*	0.152			
Step 3					0.631	0.398	0.005
	Age	0.311	3.987*	0.033			
	IUS-P	0.524	6.556*	0.158			
	ID Status	-0.077	-0.957	3.182			

*p<0.001

When using the IUS-P as a measure of IU, the hierarchical regression model showed that at Step one, age contributed significantly to the regression model ($F(1,105)=17.5.$, $p<0.001$) and accounted for 14.3% in the variation in anxiety. The addition of IU explained an additional 25.0% in variance in anxiety, and the resulting change in R_2 was significant ($F(1,104)=42.8$, $p<0.001$). Finally, the addition of ID status explained a further 0.5% of variability in anxiety, however this was not a significant change in R_2 ($F(1,103)=0.9$, $p=0.341$) Therefore the overall model with all variables included explained 40% of the variability of anxiety in this group.

Appendix F – Ethics Approvals (University)

Ethics Form Completed for Project: Understanding and addressing Intolerance of Uncertainty in children with ASD and intellectual disability: Adaptation and evaluation of Coping with Uncertainty in Everyday Situations (CUES).

Policy & Information Team, Newcastle University <noreply@limesurvey.org>
Mon 02/10/2017 15:23
To: Jessica Maxwell (PGR) <J.Maxwell2@newcastle.ac.uk>

Ref: 308/2017

Thank you for submitting the ethical approval form for the project 'Understanding and addressing Intolerance of Uncertainty in children with ASD and intellectual disability: Adaptation and evaluation of Coping with Uncertainty in Everyday Situations (CUES).' (Lead Investigator:Jessica Maxwell). Expected to run from 16/10/2017 to 01/08/2019.

Based on your answers the University Ethics Committee grants its approval for your project to progress. Please be aware that if you make any significant changes to your project then you should complete this form again as further review may be required. If you have any queries please contact res.policy@ncl.ac.uk

Best wishes

Policy & Information Team, Newcastle University Research Office

res.policy@ncl.ac.uk

Ethics Form Completed for Project: Understanding and managing Intolerance of Uncertainty in children with ASD and ID: Quantitative Phase

Policy & Information Team, Newcastle University <noreply@limesurvey.org>
Fri 20/07/2018 09:12
To: Jessica Maxwell (PGR) <J.Maxwell2@newcastle.ac.uk>

Ref: 6783/2018

Thank you for submitting the ethical approval form for the project 'Understanding and managing Intolerance of Uncertainty in children with ASD and ID: Quantitative Phase' (Lead Investigator:Jessica Maxwell). Expected to run from 30/07/2018 to 20/12/2018.

Based on your answers the University Ethics Committee grants its approval for your project to progress. Please be aware that if you make any significant changes to your project then you should complete this form again as further review may be required. If you have any queries please contact res.policy@ncl.ac.uk

Best wishes

Policy & Information Team, Newcastle University Research Office

res.policy@ncl.ac.uk

APPENDIX H – Examples of adapted CUES intervention materials

Examples of Intolerance of Uncertainty
Time to play

Frankie is 14 and loves trains. He has a large collection of model trains, which he enjoys arranging by size, model number or the day's train timetable.

He also has a strict evening routine of dinner, bath, reading then bed.

Frankie is supposed to go out with his mum for the day, as they have some jobs to do. Frankie's mum says she doesn't know what time they'll get home after doing their jobs. Frankie becomes **tearful** and **shouts** at his mum, because **he doesn't know** whether or not he will have time to arrange his trains before dinner. He refuses to go out with his mum, and so she has to call a friend to stay at home with Frankie.

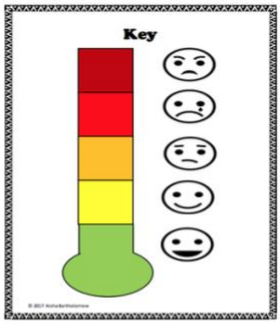
CUES2 - Adapted JM -
j.maxwell2@newcastle.ac.uk

Examples of Intolerance of Uncertainty
Danielle and the taxi escort

Danielle is 10 years old and has had the same escort take her to and from school every day for the last year. One afternoon on the way back from school in the taxi, Danielle's escort says that she doesn't feel very well and **might not be in the taxi tomorrow**, but it might be Danielle's usual holiday escort instead (Danielle likes this escort). When Danielle gets home, she finds it **difficult to settle** all night. Danielle's Mum knows she is **upset** about something because Danielle is **pacing** back and forth in the living room and **biting her hand**. Danielle has a **restless** night and doesn't sleep very well. The next morning, her Mum struggles to get Danielle ready for school and to eat her breakfast.

CUES2 - Adapted JM -
j.maxwell2@newcastle.ac.uk

Visual Rating Scales



Planning an experiment

Callum's Target uncertain situation

- Callum wants to go to more social groups but finds the uncertainty about who will be there and what to expect difficult
- Callum's Mum arranges for him to try a new meet-up group:
  - Callum and his Mum do **some preparation** to find out about the venue and who the adult leader is
  - They prepare his **tools** for coping with the uncertainty – relaxation techniques, a comic strip story on a key ring and a stress ball
  - Callum agrees to go to the meet-up for one hour and try one activity there
  - Callum does his **relaxation** in the car on the way there, and uses his **keyring** and **stress ball** to control his anxiety
  - Callum and his Mum **review** how this went when he gets home using pictures Mum has taken there and a smiley face rating scale

Adapted CUES
i.maxwell2@newcastle.ac.uk

Intolerance of Uncertainty: Molly and the hand-dryers

Molly is 12 years-old and loves being outdoors. She can spend hours at her local park, but there is only one toilet there and the hand-dryer is loud. Molly finds the sound of the hand-dryer distressing, especially if there is no warning. If she needs the loo while she's out playing she becomes very upset and doesn't want to use go in to the toilet. This is because she doesn't know if somebody will come in and put the hand-dryer on while she is in there.

She finds this so hard that she has to go home to use the toilet, cutting her playtime short.

CUES2 - Adapted JM –
j.maxwell2@newcastle.ac.uk

I take a taxi to school. 	Sometimes I have a different driver 	Not knowing who my driver will be tomorrow makes me feel **worried** 
When I feel worried, I can try:  I am amazing!	This makes me feel calm 	I can go in the taxi to school and feel calm and happy 

Table 17

Appendix M: Participant level Reliable Change Index (RCI) outcomes at Time 2 (Immediate post-intervention), Time 3 (4 months post intervention), Time 4 (6 months post intervention), Time 5 (12 months post intervention).

Measure	*Participant 1*				*Participant 2*				*Participant 3*				*Participant 4*				*Participant 5*		
	T1 - T2 RCI	*T1- T3 RCI*	*T1 - T4 RCI*	*T1- T5 RCI*	*T1 - T2 RCI*	*T1-T3 RCI*	*T1 - T4 RCI*	*T1- T5 RCI*	*T1 - T2 RCI*	*T1- T3 RCI*	*T1 - T4 RCI*	*T1- T5 RCI*	*T1 - T2 RCI*	*T1- T3 RCI*	*T1 - T4 RCI*	*T1- T5 RCI*	*T1 - T2 RCI*	*T1- T3 RCI*	*T1 - T4 RCI*
IUS-P	3.59*	2.39*	4.78*	1.20	-2.69*	-3.59*	-2.99*	-5.68*	-2.39*	-2.69*	-2.09*	-3.59*	-4.48*	-4.48*	-5.68*	-3.29*	-1.20	-2.09*	-7.17*
RULES	-1.33	-2.66*	-3.99*	-4.65*	-1.33	-3.66*	-1.33	-1.99*	-0.67	-1.00	-3.99*	-8.64*	-8.64*	-8.98*	-6.98*	-7.31*	-1.99*	-3.66*	-9.64*
ASC-ASD	1.56	-1.56	2.18*	-0.31	1.56	-0.93	2.49*	1.25	-2.80*	-1.87	-1.56	-2.49*	-4.98*	-7.16*	-5.60*	-4.98*	2.18*	-0.93	1.56*
RBQ-2	0.00	0.67	0.22	0.45	0.67	0.89	0.45	0.67	-0.67	-0.45	-0.45	-1.78	-1.56	-1.34	-1.34	-0.67	0.00	-0.67	0.45
IUS-12	-0.79	1.85	0.26	0.26	2.64*	0.26	0.79	0.79	0.53	0.53	0.53	0.00	0.00	0.00	0.53	0.00	6.34*	-2.64*	1.06
DASS	-2.44*	0.44	-2.66*	1.33	-1.33	-1.55	-2.88*	-1.55	-0.22	-0.67	-0.67	-1.33	-0.89	0.00	2.00*	2.88	-0.22	-0.44	0.89

*RCI>1.96 , p<0.05 = Reliable Change (Negative value = Clinical Improvement)

On following pages:

Appendix G – Ethical Approval (NHS)

Appendix I – Parent Invite Letter

Appendix J – Participant Information Sheet

Appendix K – Parent EOI

Appendix L – Interview Template

END OF THESIS

Health Research Authority

South Central - Hampshire B Research Ethics Committee
Level 3 Block B
Whitefriars
Lewins Mead
Bristol
BS1 2NT

Telephone: 0207 1048055

Please note: This is the favourable opinion of the REC only and does not allow you to start your study at NHS sites in England until you receive HRA Approval

16 February 2018

Mrs Jessica Maxwell
Doctorate in Clinical Psychology
Ridley Building, Newcastle University
Newcastle upon Tyne
NE1 7RU

Dear Mrs Maxwell

Study title:	**Understanding and addressing Intolerance of Uncertainty in children with ASD and intellectual disability: Adaptation and evaluation of Coping with Uncertainty in Everyday Situations (CUES).**
REC reference:	**18/SC/0082**
IRAS project ID:	**236354**

Thank you for your letter of 14 February 2018, responding to the Proportionate Review Sub-Committee's request for changes to the documentation for the above study.

The revised documentation has been reviewed and approved by the sub-committee.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this favourable opinion letter. The expectation is that this information will be published for all studies that receive an ethical opinion but should you wish to provide a substitute contact point,

wish to make a request to defer, or require further information, please contact please contact hra.studyregistration@nhs.net outlining the reasons for your request.

Under very limited circumstances (e.g. for student research which has received an unfavourable opinion), it may be possible to grant an exemption to the publication of the study.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised.

Conditions of the favourable opinion

The REC favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements. Each NHS organisation must confirm through the signing of agreements and/or other documents that it has given permission for the research to proceed (except where explicitly specified otherwise).

Guidance on applying for HRA Approval (England)/ NHS permission for research is available in the Integrated Research Application System, www.hra.nhs.uk or at http://www.rdforum.nhs.uk.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of management permissions from host organisations.

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database. This should be before the first participant is recruited but no later than 6 weeks after recruitment of the first participant.

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g. when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.

To ensure transparency in research, we strongly recommend that all research is registered but for non-clinical trials this is not currently mandatory.

If a sponsor wishes to request a deferral for study registration within the required timeframe, they should contact hra.studyregistration@nhs.net. The expectation is that all clinical trials will be registered, however, in exceptional circumstances non registration may be permissible with prior agreement from the HRA. Guidance on where to register is provided on the HRA website.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" above).

Approved documents

The documents reviewed and approved by the Committee are:

Document	*Version*	*Date*
Copies of advertisement materials for research participants [CUES2 Parent Expression of Interest Form - IRAS ID 236354]	1	23 November 2017
Covering letter on headed paper [Cover Letter response to REC committee]	1	12 February 2018
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only) [CUES2 Newcastle University Insurance Certificate - CV Jacqui Rodgers November 2017 - IRAS ID 236354]	1	19 January 2018
Interview schedules or topic guides for participants [CUES2 Interview Schedule v1.12.01.18 - IRAS ID 236354]	1	12 January 2018
IRAS Application Form [IRAS_Form_14022018]		14 February 2018
IRAS Application Form XML file [IRAS_Form_14022018]		14 February 2018
IRAS Checklist XML [Checklist_14022018]		14 February 2018
Letter from sponsor [NTW Sponsorship Letter 09.01.18 - IRAS ID 236354]	1	09 January 2018
Letters of invitation to participant [CUES2 Parent Invitation Letter v1.12.01.18 - IRAS ID 236354]	1	12 January 2018
Other [HIGHLIGHTEDRevisedProtocol v2 09.02.18]	2	09 February 2018
Participant consent form [CUES2RevisedParentConsentFormv2.09.02.18 - IRAS ID 236354]	2	09 February 2018
Participant consent form [HIGHLIGHTEDRevisedConsentForm v2 09.02.18]	2	09 February 2018
Participant information sheet (PIS) [CUES2RevisedParentInfoSheet v2.09.02.18 - IRAS ID 236354]	2	09 February 2018
Participant information sheet (PIS) [HIGHLIGHTEDRevisedPIS v2 09.02.18]	2	09 February 2018
Referee's report or other scientific critique report [CUES2 Approval Letter - IRAS ID 236354]	1	24 November 2017
Research protocol or project proposal [CUES2 Protocol v2 09.02.2018 - IRAS ID 236354]	2	09 February 2018
Summary CV for Chief Investigator (CI) [CV Jessica Maxwell Jan 2018 - IRAS ID 236354]	1	09 January 2018

Summary CV for supervisor (student research) [CV Jacqui Rodgers November 2017 - IRAS ID 236354]	1	24 November 2017
Summary CV for supervisor (student research) [CV Victoria Grahame March 2017 - IRAS ID 236354]	1	24 November 2017
Validated questionnaire [DASS 21 Measure]		
Validated questionnaire [IUS-P Measure]		
Validated questionnaire [IUS-12 Measure]		
Validated questionnaire [ASC-ASD-P Measure]		
Validated questionnaire [RBQ2 Measure]		
Validated questionnaire [RULES Measure]		
Validated questionnaire [Vineland Baseline measure]		

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document "After ethical review – guidance for researchers" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

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

Feedback

You are invited to give your view of the service that you have received from the Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website:
http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance

We are pleased to welcome researchers and R & D staff at our RES Committee members' training days – see details at http://www.hra.nhs.uk/hra-training/

18/SC/0082	**Please quote this number on all correspondence**

With the Committee's best wishes for the success of this project.

Yours sincerely

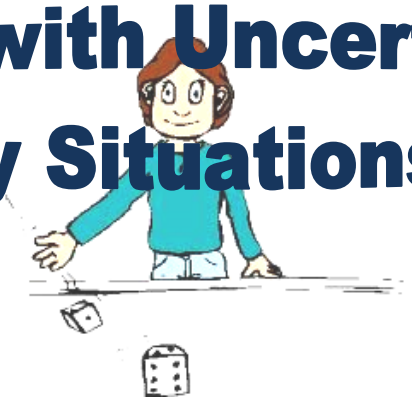
Mr Brian Birch
Chair

Email: nrescommittee.southcentral-hampshireb@nhs.net

Enclosures: *"After ethical review – guidance for researchers" [SL-AR2]*

Copy to: *Lyndsey Dixon, Northumberland, Tyne & Wear NHS Foundation Trust*

Coping with Uncertainty in Everyday Situations (CUES)



Dear Parent

Research Project Invitation - 'Coping with Uncertainty in Everyday Situations' adaptation (CUES2).

Does your child have ASD and a learning disability? Do they struggle with anxiety? Are they aged between 8 and 14?

Jessica Maxwell (Trainee Clinical Psychologist, Newcastle University), Dr Jacqui Rodgers (Senior Lecturer) and Dr Vicki Grahame (Consultant Clinical Psychologist) would like to invite you to take part in a research project. This project is to help adapt an existing group intervention for parents of young people with Autism Spectrum Disorder (ASD) so that is inclusive of children with ASD a learning disability (intellectual disability).

We enclose an information sheet about our research project and an expression of interest form. Please read through this information sheet carefully and either email us or return the completed expression of interest form if you are interested in participating in our research project, or finding out more.

Once we have received your email or expression of interest form, we will call you and give you the opportunity to ask any questions you might have about taking part. We will also arrange to meet with you to take consent and ask you to fill in some questionnaires. Following this, we will invite you to attend the group and confirm when and where the group will take place.

Yours sincerely,

Jessica Maxwell
Trainee Clinical Psychologist

Coping with Uncertainty in Everyday Situations (CUES)

Parent/Carer Information Sheet

You are invited to take part in this study. Before you decide to take part it is important for you to understand why the research is being done and what it involves. Please take time to read the following information carefully and discuss it with others if you wish. Please contact us if there is anything that is not clear or if you would like some more information.

What is the study about?

Children with Autism Spectrum Disorder (ASD) often experience difficulty with uncertainty which can lead to anxiety. An intervention has been developed to help parents of children with ASD support their child to cope with uncertain situations, called the 'Coping with Uncertainty in Everyday Situations' programme (CUES). The CUES programme has been run with parents of children with ASD, who found it relevant and helpful.

Many children with ASD also have an intellectual disability (learning disability), and so we want to make sure that the CUES intervention is suitable and relevant for these families also. This study will adapt the existing CUES parent group intervention, run it with parents of children with ASD and a co-occuring intellectual disability, and then ask parents to give us feedback about their experience of taking part in the intervention.

Why have I been invited to take part?

You have been approached because you have a child aged between 8 and 14 years who has a diagnosis of ASD and a co-occurring intellectual disability (ID). We will be asking about 12 parents to take part in total (in two groups of six).

Does this apply to my family?

We wish to involve parents who have a child with ASD and ID who recognise that their child finds it difficult to cope with uncertainty. We have included some examples of how intolerance of uncertainty might present in everyday situations in a separate sheet to help illustrate what we mean.

When we are uncertain it is difficult to predict what exactly will happen next. Sometimes uncertainty can feel stressful and upsetting and lead to anxiety. This is known as Intolerance of Uncertainty (IU). Our previous research indicates that intolerance of uncertainty may be a common experience for some children with ASD. If you feel that intolerance of uncertainty is something that affects your child we would like to invite you to take part in our study.

Coping with Uncertainty in Everyday Situations (CUES)

Expression of Interest Form

Thank you for your interest in our research study. If you would like us to contact you with further details or to take part, please email us at:

j.maxwell2@newcastle.ac.uk

or

Jacqui.rodgers@newcastle.ac.uk

Or alternatively fill in your details below, and return this form to:

Jessica Maxwell
Doctorate in Clinical Psychology
Ridley Building, Newcastle University
Newcastle
NE1 7RU

Name: _____

Telephone Number: _____

Address: _____

Post code: _____

Email address: _____

I would prefer to be contacted by (circle preference): Email Telephone

Name of child: _____

Age of child: _____

Coping with Uncertainty in Everyday Situations (CUES)

Feedback Interviews

Name:

Question Template

1. What did you think of participating in the programme? How did you find the sessions as a whole?

2. How was the pacing of sessions? (length of sessions, days, flexibility, frequency: more or less, more spread out, number of sessions etc.)

3. Was there a particular session in the programme which you found most helpful? Why do you think this was?

4. How helpful did you find the intervention (0, not helpful at all – 10, extremely helpful)?

5. What did you find helpful about the sessions?

6. Did you think the sessions were collaborative? Did you feel able to make contributions during sessions, for example, did you feel able to discuss any difficulties and reflect on anything that had happened in between the sessions? Did you feel like you had a say in how the programme was going?

7. Is there anything you would change about the sessions?

8. What did you not like or find unhelpful about the sessions?

9. What did you think of the tasks for home that were set for you in between the sessions? Was it too much/too little, did you feel this helped develop your understanding or try out new strategies? Anything you liked/disliked about the tasks for home?

10. Do you feel better able to manage your child's Intolerance of Uncertainty following the intervention? – Yes/No. Where would you rate yourself on this scale (0, unable to manage uncertain situations– 10, completely able to manage uncertain situations)?

11. Did you / do you continue to use any of the strategies introduced in the intervention? Yes/No Are they helpful? Yes/No

12. Which strategies did you use?

13. Would you recommend the programme to someone else?

Research-based:

1. How did you find filling in the Outcome Measures so far? (number of questionnaires, length, content, other outcome measures etc.) – bearing in mind they will be completing these twice more.

2. How could the programme be improved if it was being delivered on a larger scale to more parents of children with ASD and a learning disability?

3. Are there any topics you think we should have covered in the sessions that we didn't? Did we miss anything?

4. IS THERE ANYTHING ELSE YOU THINK WE SHOULD HAVE ASKED YOU? Any further comments?

What will happen if I take part?

First, if you are interested in taking part after reading this information sheet, please fill in the expression of interest form and return it to us in the envelope provided, or email using the details enclosed. You can also contact us with any questions you have – our contact details are on page three.

After we have received your expression of interest form or email, we will arrange to meet with you to discuss the study, answer any further questions you might have, discuss confidentiality with you, and ask you to sign a consent form. We will also ask you to complete some questionnaires about you and your child. These questionnaires will provide us with information about intolerance of uncertainty, anxiety and your child's ASD and development. We will then invite you to attend eight group sessions with approximately five other parents. Within these sessions, we will discuss your experiences of your child's anxiety and intolerance of uncertainty, as well as strategies and things to try that might help. Because of this, we will ask you to stick to some ground rules within the group, such as not discussing any other participant's experiences or views outside of the sessions. We would prefer that the same adult attends all sessions if possible, however we are happy for you to bring another adult from your family to the sessions if you wish. The sessions will last two hours and will take place about a week apart. There will be breaks during the school holidays. At the last session, we will ask you to complete the questionnaires again. We will also contact you approximately 8 and 16 weeks after the intervention finishes to ask you to fill in the same questionnaires. These questionnaires will help us with our evaluation of the intervention, and help us see if any changes last.

By taking part in the study you will be helping to adapt the content of the intervention so that it is more relevant for your child and we will ask for your opinions along the way.

After the intervention has finished we will arrange an individual session with you to discuss your opinions about the intervention and what changes, if any, you have observed in your child. This will last approximately 1 hour. The individual session will be arranged at your convenience at home or at our assessment rooms. Any travel expenses will be reimbursed.

By taking part in the study, we will be asking you to complete questionnaires, attend the eight group sessions and attend an individual session after the group has finished.

To help us to review the whole project, the group intervention sessions will be video recorded and the individual session will be audio recorded using a Dictaphone. The recordings of these sessions will be seen by members of the research team and will be stored in a secure, locked location.

What are the possible disadvantages and risks of taking part?

We think that the disadvantages or risks of participating in this study are minimal. The questionnaires ask about everyday behaviours so we do not anticipate that this will cause any problem for you. All travel expenses for attending sessions will be reimbursed.

You might find it distressing to discuss your child's feelings and reactions. If this happens the researchers will be available to support you and to signpost you to other local services for help, where appropriate.

What are the possible benefits of taking part?

This study will indicate how feasible and acceptable the 'Coping with Uncertainty in Everyday Situations' programme is for your family, as well as evaluating it or suggesting changes to improve the intervention so that it is relevant for your child.

We anticipate that parents attending the group will gain an understanding of intolerance of uncertainty and will be more likely to successfully manage their child's intolerance of uncertainty as well as providing us with help and guidance in adapting the intervention.

Do I have to take part?

Taking part in this study is entirely voluntary; it is up to you to choose whether to take part. If you do decide to take part, you can withdraw from the study at any time and this will not affect the care you or your child receive from your local services. If you do decide to withdraw, we will ask you to give us a reason if possible, but you will not be obliged to do so if you would prefer not to.

What if something goes wrong or if I have a question or complaint?

If you have any questions or concerns about the study, please contact Mr Simon Douglas, Research, Innovation & Clinical Effectiveness Senior Manager, Northumberland Tyne & Wear Trust (0191 223 2338, simon.douglas@ntw.nhs.uk).

Who will know about our participation?

We will ensure that your participation in this study is entirely confidential. Only the study team will know that you have taken part. When the research is published there will be no way of identifying anyone who took part in the study.

Will the information obtained be kept confidential?

All the information will be kept strictly confidential and will be password protected or locked away securely. You may tell us things during our sessions that would be useful to pass on to the other professionals treating your child, for instance, matters that might help in their treatment of your family. In this case we will discuss this with you and get your consent before any information is passed on in this way. Very occasionally information might be given during the sessions that we would have a legal obligation to pass on to others (for instance information which suggested your child was at risk of harm). You would be informed of this.

What will happen to the results of this study?

The data from the questionnaires, video recordings and audio recordings will be analysed after the study finishes. We will publish the main results in scientific publications and present our findings at conferences. None of this reporting will include any information that could identify you as an individual or family. We will provide a summary of the results for each parent taking part in the study on request.

If you give permission, we may use information gathered from this study (e.g. questionnaire totals; definitely no identifiable information about you or your child) in future data analyses by ourselves or other researchers undertaking similar research.

Who is organising and funding the research?

This research is being supported by Newcastle University and the research 'sponsor', who checks it is done correctly, is Northumberland, Tyne and Wear NHS Trust.

Who has reviewed the study?

The study has been reviewed by a Project Panel within the Doctorate in Clinical Psychology at Newcastle University.

Can I talk to someone before agreeing to take part?

If you would like to further information about this study before or after the intervention starts you can contact Jessica Maxwell, who is leading the study (see below). You are welcome to ask us any questions or discuss any worries you may have. In addition, you can ask in general about taking part in research by contacting your local Patient Advice Liaison Service (PALS) on 0800 0320202.

Thank you for reading this information sheet

Jessica Maxwell

Trainee Clinical Psychologist

j.maxwell2@newcastle.ac.uk

under the supervision of:

Dr Jacqui Rodgers,

Senior Lecturer in Clinical Psychology

jacqui.rodgers@ncl.ac.uk, 0191 222 7562