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**A Systematic Review of Effective Modifications to Cognitive Behavioural Therapy for
Young People with Autism Spectrum Disorders**

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Abstract

The present review evaluated studies which effectively employed Cognitive Behavioural Therapy (CBT) to alleviate symptoms of common mental health problems in young people with Autism Spectrum Disorder (ASD). It assessed the modifications applied to CBT and compliance with recent guidelines from the National Institute of Health Care Excellence (NICE). Systematic searches of electronic databases, reference lists and journals identified 12 studies meeting predetermined inclusion criteria. Results indicated that modified CBT yielded reductions in anxiety, Obsessive-Compulsive Disorder (OCD), and depression. There was a lack of gold-standard research into the effects of CBT for disorders other than anxiety. A greater number of modifications than recommended by NICE were consistently employed, including disorder-specific modifications. Implications for clinical intervention and future research are discussed.

Key Words: Autism Spectrum Disorders, Cognitive Behaviour Therapy (CBT), Anxiety, OCD, Depression, Young People

The prevalence of Autism Spectrum Disorder (ASD) ranges from 0.6-1.0% of the child and adolescent population (Gillberg & Billstedt, 2000; Simonoff et al., 2008). Increasing numbers of people are diagnosed with ASD and co-morbid mental health problems in the UK, placing increased demands on services (Langdon et al., 2013). Among young people (≤ 18 years of age) with ASD, mood and affective disorders have been reported to occur at a greatly increased rate when compared to rates among typically developing populations (Ozsivadjian & Knott, 2011; White, Oswald, Ollendick & Scahill, 2009). Mental health co-morbidities can result in more frequent referrals into services (Matson & Nebel-Schwalm, 2007) and 1 in 10 young people engaging with Child and Adolescent Mental Health Services (CAMHS) are thought to have an ASD (Wistow & Barnes, 2009). The additional impairment for young people and increased burden on families and mental health services has increased the necessity for successful and cost-effective treatments for co-morbid mental health needs in the context of ASD (e.g. Donoghue, Stallard, & Kucia, 2011; Kannabiran & McCarthy, 2009; Langdon et al., 2013; Reichow, Doehring, Cicchetti, & Volkmar, 2011).

Cognitive Behaviour Therapy (CBT) has been proposed as a potential intervention for young people with ASD. There is a substantial evidence base relating to the effectiveness of CBT in treating mood and affective disorders in typically developing young people (e.g. Cartwright-Hatton, Roberts, Chitsabesan, Fothergill, & Harrington, 2004; POTS, 2004; Reinecke, Ryan, & Dubois, 1998; Wethington et al., 2008). However, core features of ASD such as social communication difficulties, concrete thinking, and deficits in emotional literacy (Baron-Cohen, Leslie, & Frith, 1985; Leyfer et al., 2006; Minshew, Goldstein, & Siegel, 1997; Ozonoff, Pennington, & Rodgers, 1991; Simonoff et al., 2008) are thought to inhibit the efficacy of standard treatment (Lickel, Maclean, Blakeley-Smith, & Hepburn,

2012). This has led to a debate about whether CBT is appropriate for this population (Chalfant, Rapee, & Carroll, 2007; Lickel et al., 2012).

There have been a number of narrative reviews (Donoghue, et al., 2011; Reaven, 2009; Rotheram-Fuller & MacMullen, 2011; Scattone & Mong, 2013; White et al., 2009) and 1 systematic review (Lang, Regester, Lauderdale, Ashbaugh & Haring, 2010) which have collated the findings of empirical studies evaluating the effectiveness of CBT for people with ASD. The majority of these reviews include 4-9 studies with designs ranging from randomised controlled trials to uncontrolled treatment evaluations. Most reviews are focused on studies considering the use of CBT in treating anxiety in young people with ASD. Conclusions are largely in favour of CBT as an effective intervention. Three of the six reviews conducted identify modifications to CBT in order to enhance efficacy for young people with ASD (Donoghue et al, 2011; Reaven, 2009; Rotheram-Fuller & MacMullen, 2011). However, the reviews often lack a clear critique of the quality of study design and the lack of systematic reviews limits the extent to which conclusions can be drawn regarding the effective application of modifications to clinical interventions.

Despite this, such studies have informed the guidance recently published by NICE to inform clinical management and support of children and young people on the autism spectrum (Baird et al., 2013; Guideline Development Group). This document recommends a number of modifications when using CBT for anxiety in young people with ASD as detailed in table 1.

Table 1 to appear here

As shown in Table 1, the modifications are largely focused on the structure and mode of delivery of CBT rather than the content of the intervention and point to the need to reduce,

or simplify, cognitive components. The guideline acknowledges additional mental health problems including depression, Obsessive Compulsive Disorder (OCD), Body Dysmorphic Disorder (BDD) and Post-Traumatic Stress Disorder (PTSD). However, rather than referring to disorder-specific modifications for any of these disorders, clinicians are advised to follow recommendations for typically developing young people.

It is believed that the lack of specific guidance in relation to disorders other than anxiety may reflect the limited or weak published evidence (Wood, Fuji, & Renno, 2011). While young people with ASD ‘may be candidates for talk-based therapies similar to those employed with children and adults with mental health disorders’ (p.197; Wood et al., 2011), this has yet to be consistently empirically confirmed. It is important to ensure that clear and comprehensive guidelines pertaining to the delivery of effective interventions are available to support consistency in the administration of successful treatment for the broad spectrum of comorbid mental health disorders in young people with ASD (Wood et al., 2011). Specifically, there has been a call to ‘determine the core ingredients of effective treatment, how traditional CBT strategies may need to be modified for children with ASD, and how treatment should be delivered’ (p. 18, White et al, 2009).

This paper seeks to respond to this call and provide a comprehensive review of published original studies using CBT to treat mood and affective disorders in young people with ASD. It seeks to build on existing systematic reviews (e.g. Lang, Regester, Lauderdale, Kristen, & Haring, 2010; Scattone & Mong, 2013; Vasa et al, 2014; White et al, 2009; Wood et al., 2011) by critically appraising the quality, efficacy and nature of modifications to CBT reported in the treatment of anxiety as well as OCD and depression, in young people with ASD. Crucially, this review aims to adopt a systematic search *and* review of the literature in order to draw robust conclusions about how CBT should be modified to effectively reduce

symptoms of co-morbid mental health disorders in young people with ASDs. The specific research questions being asked of this literature include

- 1) How many published studies report a significant effect of a CBT intervention, for young people with ASD and co-morbid anxiety, OCD or depression?
- 2) Are these interventions using the modifications recommended by NICE guidance?
- 3) Are additional adaptations being employed that have implications for practice?

The objective of considering these questions is to provide a comprehensive document which can be used to supplement NICE CG170 recommendations and inform clinical practice with a typically hard-to reach, treatment resistant, but in-need population (Langdon et al., 2013; Wood et al., 2011).

Method

A systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA; Liberati et al., 2009) to improve the rigor of data extraction and reporting.

Protocol: Methods of review and inclusion criteria were specified in a research proposal that was reviewed for feasibility, a priori, by the second and third authors. All authors are qualified clinical psychologists with experience of cognitive behavioural interventions with young people with ASD and co-morbid mental health problems as well as having experience of evaluating research in the fields of CBT and ASD.

Eligibility Criteria: *Inclusion criteria:* Studies reporting original outcome data about a CBT intervention for young people with ASD and co-morbid mental health problems were included. Inclusion criteria followed the the PICOS approach recommended in PRISMA (Liberati et al., 2009) to identify Participants, Interventions, Comparators, Outcomes and Study design of interest.

Types of participants: Children and young people (≤ 18 years of age) with a diagnosis of ASD (Autism, Asperger's or PDD-NOS). Diagnosis of ASD had to be confirmed within the study design section and methods include a standardised assessment tool such as the Autism Diagnostic Observation Schedule (ADOS) (Lord, Rutter, DiLavore & Risi, 1989). Participants also had to have scores within the clinical range on standardised measures of mental health symptoms such as anxiety, OCD or depression.

Intervention: Studies were included if they reported using a CBT intervention to ameliorate mental health symptoms. The method sections were screened to ensure that studies had (a) employed a manualised CBT intervention or (b) reported cognitive and behavioural intervention techniques in keeping with those described by Velting, Setzer & Albano (2004) as necessary components of a CBT intervention. Absence of reported modifications to the CBT intervention was not an exclusion criteria as efficacy of non-modified CBT for this population would have been of equal interest. However, all eligible studies reported some degree of modification.

Studies reporting on interventions for OCD were reviewed separately to studies employing an intervention for anxiety despite the fact that many anxiety studies included participants with a diagnosis of OCD. The anxiety studies did not report on the efficacy of the intervention by diagnosis and treatment protocols have been developed for treating OCD in children which are distinct from anxiety treatments (e.g. March & Mulle, 1998). It was considered clinically relevant to review the effects of these interventions separately.

Comparator: The treatment group had to be compared to a control population, who either received an alternative intervention or were waitlisted for the duration of the study. Single case design studies and studies that didn't have a comparator group were excluded as

the primary focus of this study was on effective interventions and it is difficult to infer efficacy of a specific intervention with no comparison group.

Outcome: The primary outcome of interest for the current study was the modifications applied to an effective CBT intervention. For the purposes of this review, ‘efficacy’ was defined as (a) a statistically significant reduction in target mental health symptoms from pre - to post-treatment and/or (b) a clinically meaningful change in symptoms such that post treatment scores were below the clinical cut-off of a scale or criteria for diagnosis was no longer met.

Study Design: Randomised control trials (RCTs) and case-control studies were included provided the above criteria were met. Studies had to include measures of mental health symptoms and symptoms must have been measured at pre and post-intervention as a minimum.

Exclusion Criteria: Non-English language studies were excluded due to lack of resources for translation. The decision was also made to exclude all grey material for two main reasons; there is a risk of bias through including literature which has not successfully passed peer review where methodology has the potential to be less rigorous. Furthermore, in order to address the question posed by this review it was necessary to consider studies with significant effects and studies which do not yield clinically significant effects typically do not achieve publication (Hopewell, Clarke, Stewart, & Tierney, 2007).

Information Sources and Search Terms: Systematic searches of four electronic databases were included; PubMed, Scopus, PsychINFO and WEB of SCIENCE. Publication year was not limited. Reference lists of most-cited articles and recent review papers were searched by hand, as were databases of the journals most frequently used (Journal of Autism and Developmental Disorders, Journal of Child Psychology and Psychiatry).

The following terms were used: ‘CBT’ or ‘Cognitive Behaviour Therapy’, ‘Autism’, ‘Young People’ (also children and adolescents separately) and ‘[mental health disorder] (anxiety, depression, OCD, BDD, PTSD; *no papers were found for the BDD search in any search engines and only one case study was found for PTSD so these disorders are not referred to within results*). Searches were initially expanded to include specific mental health disorders and young people. This was followed by a simplified search including just ‘CBT’ and ‘Autism’ ((CBT[Title/Abstract] AND autism[Title/Abstract]) (PubMed example) which returned all studies identified in the more complex search plus additional relevant studies. Overall search results are reported in the Prisma flow diagram (see Figure 1).

Study Selection and Data Extraction Process: The first author completed the searches and reviewed the title and abstract of all returned results to confirm whether studies met eligibility criteria. Of those studies which met eligibility criteria, the first author completed data extraction on all data items of interest for the research question including participants, intervention characteristics, study design and measures, efficacy of intervention at reducing mental health symptoms (pre and post measures, statistical significance and report of change index or results in relation to clinical cut-off) and modifications to interventions. The second and third authors reviewed the data extraction table to confirm study inclusion and although frequent consultation was had between authors on study selection and data extraction, the second and third authors did not complete independent inter-ratings of these stages.

Risk of Bias: The Newcastle Ottawa Scale of assessment (NOS; Wells, Shea, O'Connell, Peterson, Welch, Losos, Tugwell, 2014) was employed as a quality assessment tool. The NOS is recommended by the Cochrane Handbook as suitable for the evaluation of non-randomised clinical trials and thus able to assess quality across the range of study designs captured by the present review. The NOS permitted assessment of risk of bias in individual studies across participant selection (score range 0-4), comparability of treatment to

control group (score of 0-2) and measure of exposure (impact) of treatment (score 0-3). Overall scores were categorised into high (1-3), moderate (4-6) and low (7-9) risk of bias. An additional scale was developed for the purpose of this review to assess the content of CBT within the modified intervention. This scale followed the structure of the NOS scales and was designed to measure adherence to the 6 components of CBT as identified by Velting and colleagues (2004). These comprise psychoeducation, somatic management, cognitive restructuring, problem solving, exposure and relapse prevention. Full adherence to the CBT model or clearly defined cognitive and behavioural components were summarised to provide a score (0-1). A score of 1 denotes either a) evidence of all 6 components of CBT or b) clear evidence of core cognitive *and* behavioural components (e.g. cognitive restructuring and exposure).

Results

Study Selection: Titles and abstracts of the 468 studies initially identified were scanned according to the eligibility criteria. Non-eligible studies and duplicate titles were removed. This resulted in 39 full text articles being considered for review. Data was extracted from each study and was summarised in terms of a) participant characteristics, b) quality of study design and measures according to the NOS, c) efficacy of intervention at reducing mental health symptoms and d) modifications to interventions including the extent to which cognitive components of intervention were retained. At this stage a further 27 studies were excluded from the final review of data for the following reasons. Eight studies were reports of secondary data (Boyd, McDonough, & Bodfish, 2012; King & Desaulnier, 2011; Lang et al., 2010; Langdon et al., 2013; Reaven, 2009, 2011; Rotheram-Fuller & MacMullen, 2011; Scattone & Mong, 2013), one study (Sze & Wood, 2008) was a duplicate that had not been previously filtered out, one (White et al, 2013) reported a non-significant effect of the intervention, 5 studies reported the effects of CBT for core features of ASD rather than

mental health symptoms (Drahota, Wood, Sze & Van Dyke, 2011; Kenworthy et al, 2014; Scarpa & Reyes, 2011; Wood et al, 2009; Wood, Fujii, Renno & Van Dyke, 2014) and 12 included ($n=1$) designs (Cook, Kieffer, Charak, & Leventhal, 1993; Lehmkuhl, Storch, Bodfish, & Geffken, 2008; Nadeau, Arnold, Storch, & Lewin, 2014; Reaven & Hepburn, 2003; Schleismann & Gillis, 2011; Sze & Wood, 2007, 2008) or did not have a comparator group (Reaven, Blakeley-Smith, Leuthe, Moody, & Hepburn, 2012b; Ooi et al., 2008; Ozsivadjian & Knott, 2011; White et al., 2010; White, Ollendick, Scahill, Oswald, & Albano, 2009).

Figure 1 to appear here

Outcome of interventions

Anxiety Disorders

The current study reviewed 10 studies which met eligibility criteria to answer the primary research questions. Results follow subheadings from the NOS scale to summarise study characteristics and expand upon scores detailed in Table 2 relating to risk of bias in interpretation of findings.

Table 2 to appear here

Participants: A total of 423 young people with ASD and co-morbid anxiety were recruited to group or individual CBT-based interventions with sample sizes ranging from 12 to 71. Study designs included Controlled Trials and Randomised Controlled Trials (RCT; Chalfant et al., 2007; Fuji et al., 2013; McNally Keehn, Lincoln, Brown, & Chavira, 2013;

Reaven, Blakeley-Smith, Culhane-Shelburne, & Hepburn, 2012a; Reaven et al., 2009; Sofronoff, Attwood, & Hinton, 2005; Storch et al., 2013; Sung et al., 2011; Wood et al., 2009a; Wood et al., 2015).

The majority of participants were male ($n= 353$ or 83.5%; 70 females); which broadly equates to the ratio of males to females diagnosed with ASD (4:1; Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). Ages ranged from 7-16 years with the majority of studies recruiting older children and just one study recruiting adolescents (Wood et al, 2015). All participants were high functioning with average or above IQ . The majority of participants had a diagnosis of High Functioning Autism (HFA; 47.7%) or Asperger's Syndrome (28.4%) with the remainder (10.2%) described as having Pervasive Developmental Disorder- Not Otherwise Specified (PDD-NOS) or jointly categorised as Autism with PDD-NOS (13.7%). The spectrum of anxiety disorders were identified and treated including Social Phobia, Separation Anxiety, Specific Phobias, Generalised Anxiety Disorder, Panic Disorder, Agoraphobia and OCD.

Participant Selection and Comparability to Controls

The majority of studies included strong participant selection methods with 8 of the studies achieving a score of 3-4/4. The 2 remaining studies (McNally Keehn et al., 2013; Sofronoff et al., 2005) scored 2/4 due to potential selection bias limiting the representativeness of their samples. Sofronoff et al. (2005) recruited through community adverts rather than clinics, potentially introducing bias by including participants who self-refer to studies. McNally, Keehn et al. (2013) described recruitment through local agencies and non-profit organisations but there was not sufficient detail to permit replication. Studies were typically poor on defining whether the anxiety problem was of recent onset or an historical difficulty. In terms of concomitant medication, 50% of the studies indicated that

participants were accepted if they were medicated providing the dose was stable (Fuji et al., 2013; Reaven et al., 2009; Storch et al., 2013; Sung et al., 2011; Wood et al., 2009). There were strengths in respect of the validation of case definition with all studies confirming ASD diagnosis via a standardised measure such as the ADOS (Lord, et al., 1989). The majority also confirmed the diagnosis of anxiety with an interview such as the Anxiety Disorders Schedule for children/parents (ADIS C/P; Albano & Silverman, 1996), although one, (Sung et al., 2011), relied on the child Spence Children's Anxiety Scale (SCAS; Nuata et al., 1998). All studies reported random allocation to the treatment or comparator condition but just 50% of the studies actively assessed comparability of participants to controls either through matching based on demographics in the study design or controlling for baseline anxiety in the analysis (Fuji et al., 2013; McNally Keehn et al., 2013; Sofronoff et al., 2005; Wood et al., 2009; Wood et al., 2015).

Intervention Characteristics: The duration of interventions ranged from 6-32 sessions (modal number 16 sessions) lasting between 50 and 120 minutes (modal time 90 minutes). Four studies delivered a group intervention (Chalfant et al., 2007; Reaven et al., 2012a; Sofronoff et al., 2005; Sung et al., 2011), one study delivered a group intervention with individual components (Reaven et al., 2009) and the remaining 5 studies evaluated an individual intervention. Studies employed a variety of designs including intervention compared to waitlist (WL; $n=5$), intervention compared to treatment as usual (TAU; $n=3$), child compared to child plus parent compared to WL ($n=1$) and CBT intervention compared to a social program ($n=1$).

Five studies modified CBT programs designed for typically developing young people including Building Confidence (Wood & McLeod, 2008) Coping Cat (Kendall, 1992), Cool Kids (Lyneham, Abbott, Wignall, & Rapee, 2003) and Exploring Feelings (Attwood, 2004). Three studies employed manuals specifically developed for young people with autism

(Facing your Fears; Reaven et al., 2009; Reaven et al., 2012a) or an unstandardized program (Sofronoff et al., 2005); two studies (Storch et al., 2013; Wood et al., 2015) employed Behavioural Interventions for Anxiety in Children with Autism (BIACA; Wood & Drahota, 2005).

CBT component: All studies described between 3 and 6 components of CBT. The most frequently reported were psychoeducation about emotions particularly affect recognition, problem-solving and exposure to feared outcomes. The majority of studies reported a reduced cognitive component with greater employment of behavioural strategies such as exposure and relaxation. Relaxation activities were delivered in a more directive way than would be expected for CBT with a typically developing population. Cognitive restructuring was typically delivered in a creative way through the use of acronyms such as KICK- Knowing I'm nervous, Icky thoughts, Calming thoughts, Keep practicing (Wood et al., 2015); through guided discovery pretending to be scientists (Sofronoff et al., 2005); or through the use of lists of unhelpful and helpful thoughts from which alternative thinking strategies could be chosen rather than generated. Similarly, problem solving was introduced through acronyms such as STAR- Stop, Think, Act, Reflect (Sung et al., 2011) or social stories and most exposure was completed as home practices. Relapse prevention plans were not reported, with the exception of 2 studies (Chalfant et al., 2007; Sofronoff et al., 2005),

It is of interest to note that it was the studies employing 5 or 6 components of CBT (Chalfant et al., 2007; McNally Keehn et al., 2013; Sofronoff et al., 2005; Sung et al, 2011; Wood et al., 2015) which found significant reductions in child-reports of anxiety or an increased use of coping strategies.

Ascertainment of Exposure (Outcome Measures): A variety of measures were used across the studies to assess change in anxiety symptoms. All studies relied on standardised

measures validated in a typically developing population, rather than with samples of young people with ASD. The most commonly used measures included an interview (ADIS C/P) and a parent and child-report questionnaire (SCAS). Sofronoff et al. (2005) used an idiographic measure to assess change in the ability to generate strategies to manage anxiety which was developed specifically for young people with ASDs. All studies employed the same measures across control and treatment groups demonstrating a strength of ascertainment of impact. More than half the studies employed a multi-informant design and incorporated a mix of questionnaire/rating scales and interviews, reporting on parent and/or child report, as well as clinician-based observation ratings (Chalfant et al., 2007; McNally Keehn et al., 2013; Storch et al., 2013; Sung et al., 2011; Wood et al., 2009; Wood et al., 2015). Six studies also reported rigour in methods in this area, reducing bias by including independent evaluators, blind to treatment condition, to complete measures of anxiety (Fuji et al., 2013; McNally Keehn et al., 2013; Reaven et al., 2012a Storch et al., 2013; Wood et al., 2009; Wood et al., 2015). Bias was introduced to studies through variation in reports of non-response across studies, including no drop-out in either group (McNally Keehn et al., 2013; Sofronoff et al., 2005), equal rates (Sung et al., 2011; Wood et al., 2009; Wood et al., 2015), different rates across groups (Fuji et al., 2013; Storch et al., 2013) and drop-out not being reported for the control group (Chalfant et al., 2007; Reaven et al., 2009; Reaven et al., 2012).

Outcomes and Overall Risk of Bias: As a requirement of the review, all studies reported a positive effect of intervention at reducing anxiety on at least one measure. One study demonstrated a significant effect of the intervention but this was not significantly different to the control intervention (Social Recreation Program; Sung et al., 2011). All studies reported pre and post-treatment effects, in addition to at least one follow-up measure

indicating that gains had been maintained over time, with the exception of 3 studies (Chalfant et al., 2007; Fuji et al., 2013; Reaven et al., 2009).

Four studies found child-reported reductions in anxiety (Chalfant et al., 2007; McNally Keehn et al., 2013; Sung et al., 2011; Wood et al., 2015), one study found child reported reduction in anxious arousal (Storch et al., 2013), and one reported that children demonstrated an increased use of strategies to cope with anxiety (Sofronoff et al., 2005). All 10 studies reported a parent and/or clinician rated reduction in anxiety. However, only 6/10 used clinician ratings blind to treatment condition and as all parents were involved in the treatment process (with the exception of McNally Keehn et al. (2013)), possible bias arising from investment in outcome may exist. Where effect sizes were reported, all were classified as 'large' with the exception of Sung et al. (2011). These authors reported between-group differences in child-reported anxiety over time with a small effect size of .06. A small effect size is consistent with the lack of significant difference found between the CBT and comparator intervention.

The effective studies included a mix of individual (Fuji et al., 2013; McNally Keehn et al., 2013; Storch et al., 2013; Wood et al., 2009; Wood et al., 2015) and group (Chalfant et al., 2007; Reaven et al., 2009; Reaven et al., 2012a; Sofronoff et al., 2005; Sung et al., 2011) interventions. The majority of studies achieved scores of between 4 and 6 on the NOS indicating a moderate risk of bias. Four studies achieved a score of 7 or 8 indicating low risk of bias (Fuji et al., 2013; McNally Keehn et al., 2013; Wood et al., 2009; Wood et al., 2015) but no study achieved a full score on this scale. Typical areas of weakness across studies included a lack of reported history of symptoms across the treatment and control group, a lack of independent evaluators of outcome, blind to treatment condition and narrow recruitment from non-clinical populations. Each of these factors introduce the potential for bias within the sample or interpretation of effect.

Modifications: Only 2 studies employed all 7 of the NICE recommended modifications (Reaven et al., 2009; Reaven et al., 2012a) and these developed a tailored treatment manual for the study rather than using a modified version of an existing manual. All studies implemented the NICE recommendations regarding the use of visual aids and providing emotion recognition. All apart from one study (McNally Keehn et al., 2013) involved parents, either as co-therapists in sessions or through a separate parent component. There were also a wide range of additional modifications employed across the studies which largely related to the content of material delivered and specific therapeutic techniques employed (see Table 2). Consistently reported modifications are summarised in Table 3. It is important to note that many interventions for anxiety focus on improving social skills (e.g. Storch et al, 2013; White et al., 2013; Wood et al, 2009; Wood et al, 2015) but none of these studies report an improvement in child-reported anxiety and White et al. (2013) found no effect of the MASSI program which specifically targets social skills and anxiety. As such, although this is a modification it is not one that appears to be recommended for use in isolation.

Table 3 to appear here

Obsessive-Compulsive Disorder

One study was identified which met the eligibility criteria for the current study. Russell et al., (2013) recruited 46 participants aged 14-65 years from a range of clinical settings including ASD clinics, adult and paediatric OCD clinics and CAMHS clinics, generating a clinically representative sample. Although this study largely recruited adult participants, 20% of the sample were aged 18 or under and analysis revealed that outcomes

were the same for adults and young people. All participants had a verbal IQ of >70 but specific ASD diagnosis was not described. ASD diagnosis was independently validated using the ADI-R and ADOS and the presence of OCD was verified with the Yale Brown Obsessive Compulsive Scale (YBOCS). Participants were recruited and randomly allocated to the CBT or Anxiety Management (AM) treatment group indicating an appropriate selection of clinic-based controls. History of OCD was established in both groups and baseline symptom severity was controlled for in the analysis, reducing risk of bias to detect effects.

The intervention included up to 20 x one hour individual sessions although there was great variation in this with treatment completers being defined as attending a minimum of seven sessions. The CBT intervention was based on a treatment manual designed specifically for clients with ASD and included 4 components of CBT; psychoeducation about anxiety and the cognitive cycle, problem solving, cognitive restructuring and Exposure and Response Prevention (ERP). The intervention was compared with an AM intervention providing psychoeducation about anxiety and relaxation strategies. The main outcome measure, the Y-BOCS was administered by independent evaluators blind to treatment condition at pre, post and follow-up sessions. Drop-out rate was comparable across groups reducing risk of bias in ascertainment of efficacy. Findings indicated a significant reduction in OCD symptoms and a greater number of treatment responders in the CBT compared to AM group but differences were not significant between groups. Effect sizes were small which is again consistent with the lack of significant difference between groups. However, this study design achieved an overall NOS score of 8 indicating low risk of bias, implying that findings of a lack of significance of CBT over anxiety management for OCD in this population should be considered a reliable finding.

Modifications: This study included 5 of the NICE recommended modifications.

Parents were not included, but this would not have been appropriate given the broad range of

ages of participants, and there was no report of offering regular breaks. Additional modifications employed were disorder specific (see Table 4) confirming the need to differentiate from anxiety treatment.

Table 4 to appear here

Depression

Only one study was identified which met the eligibility criteria for the current study for treating depression in young people with ASD. McGillivray and Evert (2014) recruited 32 high functioning participants (23 males) from a community sample aged between 15 and 25 years, diagnosed with Asperger's Syndrome (n=23) and HFA (n=9), through community-based advertisements. ASD diagnosis was confirmed with a telephone interview only and the presence of depression was determined through a self-report questionnaire (Depression Anxiety Stress Scales) indicating poor representativeness and validation of case definition. Participants were recruited and randomly allocated to CBT or WL generating an appropriate selection of clinic-based controls. History of depression was assessed and reported in both groups. There were no significant differences between groups on demographics but comparability of cases and controls was not ensured through matching variables in design or controlling for differences/ base-line symptoms in analysis.

This intervention was developed specifically for people with depression and ASD and was based on the literature reporting that social difficulties associated with ASD can lead to negative views of self and relationships with others. The study was a controlled trial with an intervention compared to WL group. The intervention was developed as a brief manualised program named 'Think Well, Feel Well and Be Well', and comprised of 9 x 2-hour group sessions. Four components of CBT were incorporated, namely psychoeducation, somatic

management, problem solving and cognitive restructuring. The intervention had a cognitive rather than behavioural emphasis. Drop-outs from either group were not described.

Participants from both groups completed the DASS and the Automatic Thoughts Questionnaire. There was no effect of intervention in terms of the between group comparison. However, those in the CBT group who scored above the clinical cut-off at baseline had significantly reduced depression symptoms when compared to WL post-treatment. There was no significant effect of intervention on negative automatic thoughts compared to WL, despite the substantial cognitive component. Effect sizes were small but 60% in the CBT group were reported to make substantial improvements compared to 20% in the WL and gains were maintained at 9 month follow-up.

This study design was relatively flawed in terms of areas of potential bias and achieved an overall NOS score of 3 indicating high risk. Thus the findings should be interpreted with caution but this is the only study of its kind investigating the impact of a CBT intervention for young people with ASD and depression and should therefore be reviewed as a benchmark from which to develop more robust interventions.

Modifications: This study included only one of the NICE recommended guidelines; emotional recognition training. As with the OCD intervention, some recommendations would not be applicable, such as including parents due to the age range of the sample. This study did employ a range of additional modifications which are disorder specific, again confirming the need to differentiate from anxiety treatment.

Table 5 to appear here

Discussion

This review included 12 studies exploring the impact of CBT v WL, TAU or less structured intervention programs in 501 young people with ASD and a co-morbid mental health difficulty. In order to meet eligibility, studies had to report a significant effect of the intervention on mental health symptoms and meet rigorous design criteria. Studies recruited a mix of clinic and community-based samples, used group and individual therapeutic interventions based on modified or specially developed manuals containing most, if not all, components required for CBT. Measurement of outcome was typically multi-modal comprising child, parent and clinician reports. Results indicated a significant reduction in mental health symptoms as a result of the intervention on at least one outcome measure. With the exception of McGillivray and Evert's (2014) study, all interventions achieved moderate to low risk of bias indicating a high quality of study design and implying that conclusions can be drawn with relative confidence.

Largely consistent with the NICE guidelines (NICE CG170, 2013), the evidence suggests that CBT with specific adaptations, can be an effective intervention for young people with ASD and comorbid anxiety, OCD, and possibly depression. The limited evidence comparing CBT to an active intervention has not shown CBT to be superior in reducing symptoms of anxiety (Sung et al., 2011), or OCD (Russell et al., 2013). However, CBT yields significant clinical improvements in this population, can be delivered in a group or individual format with equal success and in a relatively time-limited intervention. Furthermore, studies employing CBT interventions to target the core features of ASD, which may increase vulnerability to develop mental ill health, have been equally successful (e.g. impaired social skills (Wood et al., 2009b), emotion regulation (Scarpa & Reyes, 2011), reduced independence of daily living (Drahota, Wood, Sze, & Van Dyke, 2011) and executive dysfunction (Kenworthy et al., 2014). This suggests that, among this population, modified CBT may reduce immediate emotional distress and act to enhance resilience against

developing future mood or affective disorders. More research is needed but modified ‘cognitive methods appear to be a feasible treatment option when applied to the mental health needs of such young people’ (p. 98, Donoghue et al, 2011).

In consideration of the primary research questions, among these studies the extent to which modifications recommended by NICE are employed varied greatly from one (McGillivray & Evert, 2014) to all 7 (Reaven et al, 2009; Reaven et al., 2012a). The adaptations identified follow recommendations for enhancing accessibility of CBT for young people with ASD by making sessions more concrete, practical and creative with a general emphasis on affect recognition, increased exposure opportunities and parental involvement (e.g. Donoghue et al, 2011; Rotheram-Fuller & MacMullen, 2011; White et al, 2009). However, the broad variation across studies may suggest that just employing basic modifications to delivery is not sufficient to meet the needs of young people with ASD.

The findings of the current review imply that the NICE guidelines may be a useful template from which to begin adapting interventions but additional modifications are also being routinely employed within research trials to meet neurodevelopmental needs and successfully treat the symptoms of co-morbid mental health disorders. Additional modifications identified within studies include (i) add-on components for parents rather than just involving them in the child intervention (e.g. Reaven et al, 2009; Reaven et al., 2012a) and (ii) techniques such as social stories, acronyms and role-plays to accommodate features of ASD including literal understanding and theory of mind deficits (e.g. Kenworthy et al., 2014; Rotheram-Fuller & MacMullen, 2011; Wood, Fuji, Renno, & Van Dyke, 2014). The successful results reported in the studies reviewed are highly promising but caution must be taken when attributing successes to the modifications specifically. To date there are no published studies comparing modified CBT to standard CBT interventions for this population. It is possible that the active component yielding positive results is the CBT rather

than the modifications. However, the Social Recreation (Sung et al, 2011) and Anxiety Management (Russell et al, 2013) programmes which were comparator interventions modified for the needs of people with ASD were as effective as the CBT intervention, suggesting that such modifications may be essential, active treatment ingredients.

Despite the dearth of literature exploring interventions for disorders other than anxiety, there is a trend to suggest that modifications to CBT should be disorder specific, as they would be for a typically developing population. Research would seem to suggest that the underlying cognitive mechanisms and manifestation of OCD, depression and even PTSD are the same in typically developing young people and those with ASD (e.g. Barnhill & Smith Myles, 2001; Boyd et al., 2012; Cook et al., 1993; Ghaziuddin, Ghaziuddin, & Greden, 2002; Hedley & Young, 2006; Howlin & Clemmets, 1995; Mehtar & Mukaddes, 2011; Whitehouse, Durkin, Jaquet, & Ziatas, 2009). This suggests that interventions should be tailored to directly target these symptoms and/or disorder specific manuals should be adapted to treat each separate disorder. Such findings have also led to consideration that ‘development of a cognitive model specific to this population is necessary in guiding therapeutic interventions’ (p. 212; Ozsivadjian & Knott, 2011).

There is some evidence to support the value of developing disorder specific CBT manuals for young people with ASD. For example, Russell and colleagues (2013) focused a large portion of their intervention on OCD specific ERP while McGillivray and Evert (2014) employed techniques such as mindfulness and dysfunctional thought records from the typically developing literature and both studies resulted in reduced symptomatology. Similarly, well-cited case studies describe modifying and implementing an OCD-specific treatment manual (March and Mulle, 1998) and achieving symptom remission and recovery (e.g. Lehmkuhl et al., 2008; Reaven & Hepburn, 2003). There is clearly a need for replication studies in each of these areas, but findings tentatively point to the benefit of developing

tailored interventions which specifically meet the neurodevelopmental and mental health needs of this population.

Clinical Implications

Collectively, the findings of this review highlight several key practice points for clinicians. Namely, CBT should be offered as an intervention for young people with ASD and co-morbid mental health problems including anxiety disorders, OCD and depression. Modifications should be applied to both the content and the structure of manualised interventions.

An enhanced emotional recognition component should be included to support young people to develop a way to communicate their feelings and recognise change in intensity of emotion throughout therapy. Cognitive components should be retained but may need to include less of a collaborative or Socratic approach and employ more structure, forced choice or multiple choice, with concrete, rather than hypothetical, examples. Sessions should employ clear, concrete visual prompts which act to enhance verbally mediated material and reduce the intensity of a 1:1 therapy session. Special interests can be used to provide engaging, concrete analogies to illustrate therapeutic principles, ensuring a thorough understanding of the model underpinning the intervention. Interventions should try and include parents within sessions where possible to support in-session communication and between session tasks. This can be enhanced by therapist modelling of therapeutic techniques, such as ERP, within sessions in the presence of parents.

Session materials should also be tailored to be age appropriate. The majority of studies reviewed included children but Reaven et al., (2012b) distinguish the developmental needs of adolescents from children and developed the Facing your Fears Adolescent program to meet those needs accordingly. For example, the parent component focuses on features of

the parent-teen relationship relevant to navigating the transition through adolescence and iPads are used to convey concepts of therapy and encourage home practice in a way that is accessible to typical adolescent functioning.

As indicated, findings tentatively point to the need to include disorder specific modifications to intervention. The review identified only 2 studies evaluating the impact of disorder-specific protocols, for depression and OCD. Methodological weaknesses however limit the extent to which the results of these studies can reliably inform future practice. Elevated prevalence rates of mental health problems such as OCD, PTSD and depression in young people with ASD (e.g. Ghaziuddin, Weidmer-Mikhail, & Ghaziuddin, 1998; Leyfer et al., 2006; Mehtar & Mukaddes, 2011) suggest that robust evaluations of disorder-specific treatment protocols are warranted.

Finally, all studies included in this review recruited participants with average or above IQ making it difficult to know how generalizable modified CBT is for young people with impaired language skills or more pervasive developmental delay often associated with Autism (Lang et al., 2010; Reaven, 2011; Van Steensel et al., 2011; Wood et al., 2011). It is beyond the scope of this review to make recommendations for young people with Autism and significant impairments in language or intellectual disability (ID). The practice implications may not be specific to ASD, or might be need to be combined with practice recommendations for people with ID. For example, Hassiotis et al., (2012) have published a therapist manual for adapting CBT for people with ID and there is considerable overlap with some of the recommendations from this review. The authors point to the need to use visual prompts, include carers and take a disorder specific approach, suggesting that such modifications may have a universally beneficial impact for this population but further research is required.

Limitations and directions for future research

This review employs rigorous criteria to identify effective studies investigating CBT for a range of mental health problems. However, there are several methodological aspects which introduce the potential for bias. The lack of 2 independent raters for study selection and data extraction may be a potential source of bias. All authors have qualifications and experience in evaluating research and many checks were put in place in an effort to limit bias, including the second author supervising each stage of the process, the use of the NOS to rate studies and multiple revisions to ensure an accurate narrative of findings. The bias introduced through having a single rater, however, should not be overlooked.

This review relied on published studies. Published work may be more likely to report larger effect sizes than unpublished studies (Hopewell et al., 2007; Reichow et al., 2011). However, bias can also be introduced by reporting effects of unpublished trials which have not been peer-reviewed for methodological rigor and may not be representative of all unpublished data (Egger, Juni, Bartlett, Holenstein, & Sterne, 2003). As such the decision was taken to review studies which had passed the peer-review process.

The inclusion criteria also specified using studies published in English. During the search, no non-English studies were identified but the possibility of a missed area of research should be acknowledged. Finally, only studies with a comparator group and significant effect of treatment were included. This may have meant effective modifications from non-significant treatment studies were omitted, or ineffective modifications from studies with a significant treatment effect were mis-identified.

Conclusion.

Limitations notwithstanding, the current study adds to the understanding of what works for young people with ASD attending mental health services for psychological interventions. Findings are clinically relevant and synthesise results from the most robust

published studies in the area. This review identifies meaningful techniques and methods of delivery which can support young people with ASD to engage with a program of therapy and experience reduction in anxiety. Preliminary evidence also points to the efficacy of targeted CBT for OCD and depression. There remains a need for future research but in the absence of such work, standardised treatment manuals for typically developing young people may effectively alleviate mental health symptoms in young people with ASD when adapted with NICE recommended modifications to structure, and disorder specific modifications to content.

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Figure Captions

Figure 1: Prisma Flow Diagram of study inclusion

Table 1: NICE guidance ((p. 22; CG170, 2013) regarding modifications to CBT for ASD and anxiety

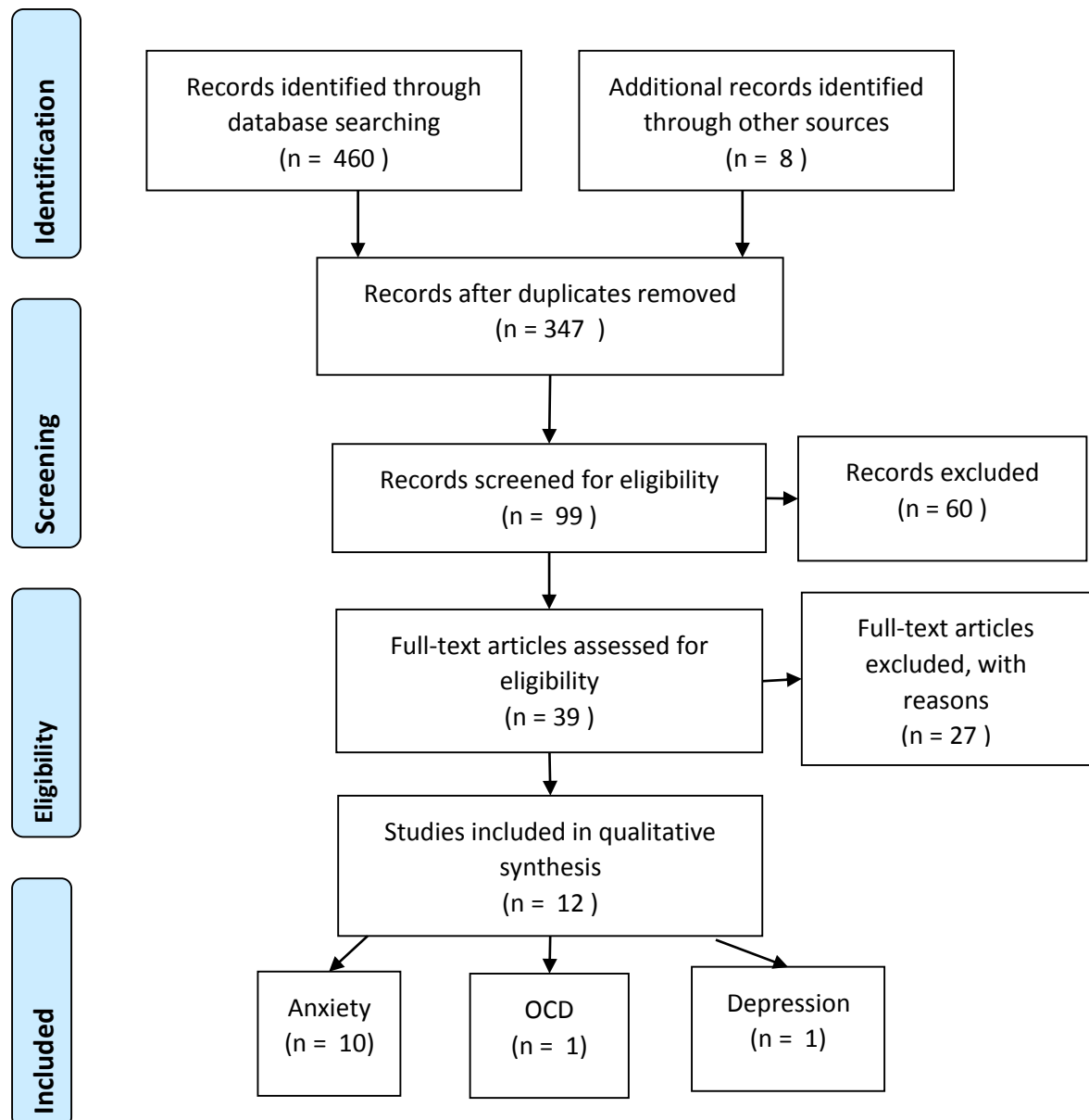
Table 2: Table of study characteristics including NOS subheadings

Table 3: Table of modifications employed for anxiety disorders

Table 4: Table of modifications employed for OCD

Table 5: Table of modifications employed for Depression

Figure 1: Prisma Flow Diagram of Inclusion



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

Table 1: NICE guidance ((p. 22; CG170, 2013) regarding modifications to CBT for ASD and anxiety

NICE Recommended modifications to apply to CBT for young people with ASD and anxiety
<ol style="list-style-type: none">1. Emotion recognition training2. Greater use of written and visual information and structured worksheets3. A more cognitively concrete and structured approach4. Simplified cognitive activities, for example, multiple-choice worksheets5. Involving a parent or carer to support the implementation of the intervention, for example, involving them in therapy sessions6. Maintaining attention by offering regular breaks7. Incorporating the child or young person's special interests into therapy if possible.

Table 2: Table of study characteristics including NOS subheadings

Anxiety Disorders						
Study Details	Participant Selection	Comparability	Exposure (Measures)	CBT content and score	Outcome and NOS score 0 high risk of bias- 10 low risk	Modifications
<p>Sofronoff, Attwood & Hinton (2005) RCT- 3 armed intervention; child only, child and parent, waitlist. Group intervention</p> <p>71 10-12 year olds with high functioning autism</p> <p>Community based sample</p>	<p>Existing diagnosis of Asperger's verified by the CAST (Scott et al, 2002) Anxiety established through phone interview and measured at baseline with parent report. (1)</p> <p>Community sample recruited through newspaper and radio adverts- potential selection bias</p> <p>Random allocation of controls from same community recruited sample (1)</p> <p>No mention of history of anxiety</p>	<p>Matched at design by age and sex (1)</p>	<p>Parent report of anxiety only using Spence Child Anxiety Scale-Parent (SCAS-P; Nuata et al, 2004) Social Worries Questionnaire- Parent (SWQ-P; Spence, 1995)</p> <p>Child report of anxiety management James and the maths test (anxiety management; Attwood, 2002)</p> <p>Same method of assessment for all groups (1) No drop out across groups (1)</p>	<p>All 6 components of CBT; Psychoeducation of affect, somatic management strategies, problem solving, cognitive restructuring, home based exposure, relapse prevention (1)</p>	<p>Significant decline in parent reported anxiety and social worries from pre-treatment to FU and compared to waitlist.</p> <p>Combined parent and child group resulted in greatest improvement</p> <p>NOS score = 5 (moderate)</p>	<p><u>NICE recommended</u></p> <ul style="list-style-type: none"> Brief intervention- 6 2 hour group sessions Structured workbooks Emotion recognition training Involving parents <p><u>Additional</u></p> <ul style="list-style-type: none"> Use of metaphors- child as scientist to encourage home exposure Tool box of feeling, social and thinking tools for problem solving Social stories for cognitive restructuring (antidote to noxious thoughts) Idiosyncratic rating scales of feelings and concrete strategies (fear thermometer; James and the maths test) to measure anxiety.
<p>Chalfant, Rapee & Carroll (2007) RCT group intervention V WL 47 8-13 year old children HFA</p>	<p>Existing diagnosis of Asperger's or HFA confirmed through observation during interview Anxiety established through baseline ADIS C/P (1)</p> <p>Mix of community, medical and self-referral (1)</p> <p>Random allocation of controls from sample (1)</p>	<p>No significant differences between groups but treatment and control were not matched in study design</p>	<p>Interviewer not blind to status</p> <p>Anxiety Disorders Interview Schedule for parents and child (ADIS-C/P; Albano & Silverman, 1996) Child and Parent report Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978)</p>	<p>All 6 components of CBT but with a slightly reduced cognitive restructuring component. (1)</p>	<p>Significant reduction in anxiety diagnoses over time and compared to waitlist $\eta^2 = .59$</p> <p>Significant reduction in self-reported anxiety over time and</p>	<p><u>NICE recommended</u></p> <ul style="list-style-type: none"> More focus on concrete exercises Structured workbooks and visual aids Emotion recognition training Simplified cognitive component choosing restructuring ideas from lists Parent involvement <p><u>Additional</u></p>

<p>Community and clinic based sample</p> <p>Adapted version of the 'Cool Kids' program (Lyneham et al, 2003)</p>	<p>No mention of history of anxiety</p>		<p>SCAS; Spence, 1998; SCAS-P; Nuata et al, 2004</p> <p>Same measures used for treatment an waitlist participants (1)</p> <p>4 dropouts from treatment not reported from WL</p>		<p>compared to waitlist (RCMAS $\eta^2=.61$; SCAS $\eta^2=.53$) And in parent reported anxiety (SCAS-P $\eta^2=.54$)</p> <p>NOS score = 4 (moderate)</p>	<ul style="list-style-type: none"> • 12 sessions Administered over 6 months with booster sessions to aid learning • Inclusion of large component of relaxation strategies • Parent program teaching management strategies and psychoed
<p>Reaven et al (2009) 33 children aged 7-14 Group intervention v WL</p> <p>Original manual for ASD</p> <p>Community based sample</p>	<p>Existing ASD diagnosis confirmed with ADOS and social communication questionnaire and Kiddie Schedule for Affective Disorders (Kauffman et al, 1997) used to screen for anxiety (1)</p> <p>Wide range of referral sites (clinic, parents support groups, workshops, seminars and schools) good representation (1)</p> <p>Same method of recruitment for sample and allocated to group based on order of entry to study (1)</p> <p>Group and Controls included with history of anxiety providing medication was stable (1)</p>	<p>No significant differences on descriptives but not matched in design</p>	<p>Parent and Child Screen for Child Anxiety and Related Emotional Disorders (SCARED; Birmaher et al, 1999) used to rate anxiety</p> <p>SCARED completed by both groups (1)</p> <p>2 families dropped out of treatment not reported for WL</p>	<p>4 components of CBT (psychoed, somatic management, cognitive restructuring, exposure) (1)</p> <p>Reduced cognitive component</p>	<p>Significant reduction in parent reported anxiety over time and compared to waitlist. Significant reduction to below the clinical cut off for CBT compared to WL</p> <p>No significant effect on child report.</p> <p>NOS score =5 (moderate)</p>	<p><u>NICE recommended</u></p> <ul style="list-style-type: none"> • More concrete approach • Visual structure • Written worksheets and multiple choice lists • Emotion recognition training • Simplified cognitive component including choosing coping statements rather than generating restructured cognitions • Parental involvement • Focus on special interests <p><u>Additional</u></p> <ul style="list-style-type: none"> • Token reinforcement to promote in group behaviour • Inclusion of large component of relaxation strategies • Use of video modelling • Parent component addressing overprotective parenting
<p>Wood et al (2009) RCT 1:1 intervention V WL</p>	<p>Existing diagnosis of ASD confirmed with ADOS, ADI-R and a parent checklist</p> <p>ADIS C/P used to diagnose anxiety 15% independently verified (1)</p>	<p>Matched for age and gender during block allocation to group (1)</p>	<p>ADIS C/P completed by independent blind evaluators (1)</p> <p>MASC (Multidimensional Anxiety Scale for Children;</p>	<p>4 elements of CBT (affect recognition, cognitive restructuring, exposure and school support</p>	<p>Significantly greater reduction in clinician rated and parent reported anxiety post treatment compared to WL</p>	<p><u>NICE recommended</u></p> <ul style="list-style-type: none"> • Emotion recognition training • 1:1 child then parent and child session <p><u>Additional</u></p> <ul style="list-style-type: none"> • Focus on improving social skills

<p>40 7-11 year old children with autism, Asperger's or PDD-NOS</p> <p>Community sample</p> <p>Modified building Confidence program (Wood & McLeod, 2008)</p>	<p>Wide range of referral sites (medical clinic, parents support groups and school inclusion specialists) good representation (1)</p> <p>Controls randomly allocated (1)</p> <p>Group and Controls included with history of anxiety providing medication was stable and no other psychosocial treatment (1)</p>		<p>March, 1998) completed by parents and children</p> <p>Same measures used for waitlist administered by blind evaluators (1)</p> <p>Equal response rate across groups (2 treatment, 1 WL) (1)</p>	<p>to limit relapse) (1)</p>	<p>(Clinician effect size 2.46, parent effect size 1.23)</p> <p>No significant difference on child reported anxiety</p> <p>Gains maintained at 3 month F/U</p> <p>NOS score = 8 (low)</p>	<ul style="list-style-type: none"> • Integrated with school to increase school-base support
<p>Sung et al (2011)</p> <p>RCT group intervention v Social Recreation program</p> <p>70 young people 9-16 years old</p> <p>Clinic and community sample</p> <p>Modified Coping Cat (Kendall, 2000) and Exploring Feelings (Attwood, 2004)</p>	<p>Sample referred from clinician with existing diagnosis of ASD confirmed with the ADOS Screened using the SCAS (1)</p> <p>Wide range of referral sites (child guidance clinic, paediatricians, school inclusion specialists) good representation (1)</p> <p>Controls randomly allocated (1)</p> <p>Group and Controls included with history of anxiety providing medication was stable (1)</p>	<p>No significant difference in variables but not matched in design</p>	<p>Child report SCAS Clinician CGI-severity but not blind to status</p> <p>Same measures used for both groups (1)</p> <p>Equal response rate across groups (3 CBT, 3 SRP) (1)</p>	<p>5 elements of CBT (psychoed., somatic management, cognitive restructuring, problem solving exposure) (1)</p> <p>SR-social skills taught and group activities of crafts and preparing meals</p>	<p>Both groups showed significant reductions on child reported GAD ($\eta^2 = .06$) and total anxiety ($\eta^2 = .06$) at 6 month FU. SR group also reported significantly reduced anxiety post-treatment.</p> <p>45% CBT and 55% SR showed reliable clinical improvement at 6 month FU. CBT and SR were not significantly different</p>	<p><u>NICE recommended</u></p> <ul style="list-style-type: none"> • Structured worksheets • Emotion recognition training • Visual aids • Involving parents • Concrete replacement of thinking errors with helpful thoughts <p><u>Additional</u></p> <ul style="list-style-type: none"> • Role plays • Social Stories • Acronyms for problem solving STAR • Use of metaphors- cleaning tools to encourage the use of cognitive restructuring • Relaxation strategies • Increased use of games and visual aids for younger children

					NOS score = 6 (moderate)	
<p>Reaven, Blakeley-Smith, Culhae-Shelburne & Hepburn (2012) 50 7-14 year old children RCT Facing your Fears group intervention V Treatment as Usual (TAU) (psychosocial and pharmacological interventions) Community based sample</p>	<p>Existing diagnosis of ASD confirmed by ADOS and SCQ Anxiety confirmed with SCARED C/P and ADIS C/P (1)</p> <p>Wide range of referral sites (advertises in parent groups, schools and clinics) good representation (1)</p> <p>Controls randomly allocated following recruitment (1)</p> <p>Excluded if presence of additional mental health problems but no mention of history of anxiety</p>	<p>No significant differences but not controlled for in design or analysis</p>	<p>Independent clinical evaluators blind to condition completed the ADIS C/P (1)</p> <p>Same method of assessment for treatment and control groups (1)</p> <p>3 drop outs reported from treatment, not reported for TAU</p>	<p>4 components of CBT (psychoed, somatic management, cognitive restructuring, exposure) (1)</p>	<p>Significant reduction in clinician rated severity CBT group compared to TAU and significant reduction in GAD diagnosis for CBT compared to TAU ($d=.85$). Significantly more children in CBT attained a positive treatment response than TAU ($d=1.03$)</p> <p>Gains maintained at 6 month FU</p> <p>NOS score =5 (moderate)</p>	<p><u>NICE recommended</u></p> <ul style="list-style-type: none"> • More concrete approach • Visual structure • Written worksheets and multiple choice lists • Emotion recognition training • Simplified cognitive component including choosing coping statements rather than generating restructured cognitions • Focus on special interests • Parental involvement <p><u>Additional</u></p> <ul style="list-style-type: none"> • Token reinforcement to promote in group behaviour • Inclusion of large component of relaxation strategies • Use of video modelling • Parent component addressing overprotective parenting
<p>McNally, Lincoln, Brown & Chavira, (2013) RCT 1:1 16 week manualised Coping Cat Program V WL 22 8-14 years old Community sample</p>	<p>Existing diagnosis of ASD confirmed with ADOS and ADI. ADIS C/P employed to confirm anxiety diagnosis (1)</p> <p>Recruited from local agencies and non-profit organisations but these are not described</p> <p>Participants recruited and then allocated to treatment or WL (1)</p> <p>No description of symptoms other than baseline measures</p>	<p>Stratified on age and IQ and pre-treatment anxiety severity in study design (2)</p>	<p>ADIS C/P completed by interviewers blind to condition (1) SCAS C/P</p> <p>Same methods of assessment for treatment and controls (1)</p> <p>No drop out in either condition (1)</p>	<p>5 components of CBT (psychoed, somatic management, cognitive restructuring, problem solving, exposure) (1)</p>	<p>Significantly reduced parent reported anxiety ($d=1.35$) and marginally significantly reduced child-reported anxiety ($d=.51$) in CBT group compared to WL. 58% of CBT v 0% WL no longer met criteria for</p>	<p><u>NICE recommended</u></p> <ul style="list-style-type: none"> • Written and visual materials using concrete language. • Incorporating special interests • Emotion recognition training • Increased focus on concrete exposure • Movement breaks <p><u>Additional</u></p> <ul style="list-style-type: none"> • Longer sessions to offer matched pace (60-90 minutes) • Post session re-cap to revise session content

					<p>primary diagnosis post intervention</p> <p>Gains maintained at 2 month FU</p> <p>NOS score =7 (low)</p>	<ul style="list-style-type: none"> • Role plays • Focus on relaxation
<p>Storch et al (2013) RCT 1:1 Behavioural Interventions for Anxiety in Children with Autism (BIACA) v TAU</p> <p>45 7-11 year old children</p> <p>Clinic based sample</p>	<p>Existing diagnosis of ASD confirmed with ADOS and ADI. Anxiety diagnosis confirmed with ADIS C/P and Paediatric Anxiety Rating Scale (PARS; RUPP, 2002) (1)</p> <p>Referrals, advertisements and patient flow through a university mental health clinic- representative of clinic sample only (1)</p> <p>Participants equally recruited then allocated to CBT v TAU (1)</p> <p>Existing anxiety disorders included as long as medication was stable (1)</p>	<p>No significant differences on demographics but not matched in design or analysis</p>	<p>ADIS C/P and PARS completed by independent evaluators blind to condition (1)</p> <p>RCMAS</p> <p>Same method of assessment for treatment and control group (1)</p> <p>Different drop-out rates (7 CBT v 0 TAU)</p>	<p>3 components of CBT (somatic management, problem solving, exposure)</p> <p>Predominantly behavioural and concrete in approach</p>	<p>29% reduction in clinician rated anxiety post intervention compared to 9% TAU ($d=1.03$)</p> <p>Significantly more treatment responders in the intervention group (75% compared to 14% TAU; $d=1.59$)</p> <p>Significantly more young people achieved remission in the intervention group (38% compared to Tau (5% $d=1.37$))</p> <p>Significantly declined Child reported anxious arousal in CBT V TAU</p> <p>Gains were maintained at 3 month F/U</p> <p>NOS score =6 (moderate)</p>	<p><u>NICE recommended</u></p> <ul style="list-style-type: none"> • Increased focus on structured behavioural exposure • Incorporating special interests • Involving parents <p><u>Additional</u></p> <ul style="list-style-type: none"> • Token reinforcement • Relaxation strategies • Social skills training • Parent component teaching parenting skills and supporting facilitation of home practice

<p>Fujii et al (2013) 12 7-11 year old children 1:1 modified building Confidence program v TAU</p> <p>Community sample</p>	<p>Existing ASD diagnosis confirmed by ADOS and ADI. Anxiety diagnosis confirmed with ADIS C/P (1)</p> <p>Wide recruitment all participants referred by professionals from autism clinics, centres, parents support groups and schools (1)</p> <p>Participants equally recruited then allocated to CBT v TAU (1)</p> <p>Existing anxiety disorders included as long as medication was stable (1)</p>	<p>Block randomisation to treatment or TAU, matched on age and gender (1)</p>	<p>ADIS- C/P completed by independent assessors blind to treatment condition (1)</p> <p>Same method of assessment for treatment and controls (1)</p> <p>Different rate of drop out 3 CBT 1 TAU</p>	<p>3 components of CBT (problem solving, cognitive restructuring using Socratic Questioning and exposure)</p>	<p>71% of children in the intervention group no longer met criteria compared to 0% in the TAU group</p> <p>Significantly lower clinician rated severity for CBT than TAU post intervention</p> <p>NOS score =7 (low)</p>	<p><u>NICE recommended</u></p> <ul style="list-style-type: none"> • Emotion recognition training • 1:1 child then parent and child session <p><u>Additional</u></p> <ul style="list-style-type: none"> • Longer program of therapy 32 sessions • Focus on improving social skills • Integrated with school to increase school-base support • Parent component
<p>Wood et al, (2015) RCT 1:1 modified BIACA v WL</p> <p>33 11-15 year old adolescents</p> <p>Community sample</p>	<p>Existing ASD diagnosis confirmed with ADOS and ADI and anxiety diagnosis confirmed with the ADIS and PARS (1)</p> <p>Self-referral through research sites only so potential for bias</p> <p>Participants recruited then allocated to CBT or WL (1)</p> <p>Existing anxiety disorders included as long as medication was stable and no psychosocial intervention administered (1)</p>	<p>Block randomisation to treatment or TAU, matched on age and gender and base line anxiety measures (2)</p>	<p>ADIS C/P and PARS completed by independent assessors blind to treatment condition (1)</p> <p>Same method of assessment for treatment and WL (1)</p> <p>Same drop-out rate of 3 per group (1)</p>	<p>5 components of CBT (psychoed, somatic management, problem solving, cognitive restructuring, exposure) (1)</p>	<p>Significant effect of intervention on the clinician reported anxiety symptoms ($d = .74$)</p> <p>Significantly more treatment responders CBT (79%) V waitlist (28.6%)</p> <p>32% intervention compared to 21% waitlist no longer met criteria for their primary anxiety diagnosis post intervention</p> <p>Child reported anxiety symptoms not significantly</p>	<p><u>NICE recommended</u></p> <ul style="list-style-type: none"> • Increased focus on structured behavioural exposure • Incorporating special interests • Involving parents <p><u>Additional</u></p> <ul style="list-style-type: none"> • Use of acronym KICK to encourage cognitive restructuring • Token reinforcement • Relaxation strategies • Social skills training • Parent component teaching parenting skills and supporting facilitation of home practice

					different to waitlist Gains maintained at 1 month FU NOS score =8 (low)	
Obsessive Compulsive Disorder						
Russell et al (2013) RCT 1:1 vs anxiety management 46 14-65 year olds Largely ERP approach including cognitive components AM included psychoed and relaxation Clinic sample	Existing diagnosis of ASD confirmed with ADOS and ADI OCD diagnosis confirmed with Y-BOCS (1) Representative of clinical sample recruited from OCD clinics paediatric clinics and mental health services (1) All recruited in the same way then randomly allocated to CBT or AM (1) History of OCD established in both groups (1)	Base level symptom severity controlled for in analysis (1)	Assessors completed Yale-Brown Obsessive Compulsive Scale (YBOCS; Goodman et al, 1989) Clinical Global Impression Scale (CGI; Guy, 1976) blind to treatment condition (1) All participants completed the YBOCS (1) Same rate of Discontinued intervention 2 CBT and 3 AM (1)	Exposure and Response prevention with an average of 2.7 sessions employing cognitive elements of psychoed, problem solving or cognitive restructuring (1)	CBT was significantly effective although not more so than AM on overall Y-BOCS reductions. ($d=.40$). CGI ratings indicated higher number of treatment responders for CBT compared to AM but these were not significantly different ($d=.30$). CBT continued improvement between 1- 12 month FU NOS score = 8 (low)	<u>NICE recommended</u> <ul style="list-style-type: none"> Emotion recognition training Increased focus on structure Simplified cognitive component replaced with behavioural exposure Incorporating special interests Use of visual tools <u>Additional</u> <ul style="list-style-type: none"> Up to 20 sessions to permit a longer assessment period Standard treatment approach for OCD employed intervention predominantly focused on ERP using a graded hierarchy and home practices
Depression						
McGillivray & Evert (2014)	Diagnosis of ASD verified by a psychologist and depression confirmed with the DASS	No significant difference in demographics	Self-report completion of Depression Anxiety Stress Scales (DASS; Lovibond &	4 components of CBT (psychoed, somatic	Overall reduction in depression over time but no effect	<u>NICE recommended</u> <ul style="list-style-type: none"> Emotion recognition training <u>Additional</u>

<p>Think well, feel well and be well group versus wait list control, non-random allocation</p> <p>32 15-25 year old males (23) and females (9)</p>	<p>Advertisement through community organisations – potential for bias</p> <p>Same population allocated to WL (1)</p> <p>History of depression assessed and included in both groups (1)</p>	<p>but not matched in design or analysis.</p>	<p>Lovibond, 1995) and Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980)</p> <p>Same method of assessment for both groups (1)</p> <p>Drop outs during intervention not described</p>	<p>management, strong cognitive restructuring, problem solving)</p> <p>No exposure and minimal behavioural elements</p>	<p>of intervention for whole group ($\eta^2 = .06$)</p> <p>Clinically depressed participants reported significantly reduced depression ($\eta^2 = .15$) but no significant improvement in ATQ compared to WL</p> <p>60% made substantial improvements compared to 20% of the wait list for depression; Gains maintained at 9 month F/U</p> <p>NOS score =3 (high)</p>	<ul style="list-style-type: none"> • Shorter program (9 weeks) • Strong emphasis on challenging negative thoughts • Introduction of thought records • Mindfulness rather than relaxation • Less of a behavioural emphasis consistent with cognitive not behavioural activation intervention • Strategies to manage the ‘internal critic’ through thought catching and replacing • Teaching links between behaviour and mood • Improving social resources
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Table 3: Summary of recommended modifications to the content and delivery of interventions for anxiety.

Recommended Adaptations to CBT for Anxiety Disorders
<ul style="list-style-type: none"> • Longer duration of sessions to allow more time to match children's pace and repeat content to aid learning • Use of metaphors e.g. child as scientist to encourage guided discovery • Use of acronyms e.g. STAR and KICK to introduce problems solving and cognitive restructuring • Use of social stories for cognitive restructuring and problem solving (e.g. antidote to noxious thoughts; Sofronoff et al., 2005) • Use of idiosyncratic rating scales such as James and the Maths test and a feelings thermometer to concretely measure change instead of asking about feelings directly • Incorporate a Relaxation strategy section into the program to support affect management concretely • Tangible reinforcement program in session which can be translated to home and school such as a token reinforcement program • Use of video modelling and role play to teach coping strategies • Increased use of games to convey concepts and maintain interest for younger children • Employ an additional parenting component to teach parents about the role of over-protective parenting in anxiety disorders and strategies to support their child and manage their own feelings of anxiety • Link with schools to increased school-based support and generalisation of concepts.

Table 4: Summary of additional modifications made to the treatment of OCD in an ASD population

Recommended Adaptations to CBT for OCD
<ul style="list-style-type: none">• Up to 20 sessions to allow for a longer assessment period to differentiate compulsions from rituals and access for meanings attributed to intrusive thoughts• Standard treatment approach for OCD employed intervention predominantly focused on ERP using a graded hierarchy and home practices

Table 5: Summary of specific modifications to treat depression in YP with ASDs

Recommended Adaptations to CBT for Depression
<ul style="list-style-type: none"> • Shorter program (9 weeks) • Strong emphasis on challenging negative thoughts • Introduction of thought records • Mindfulness rather than relaxation • Less of a behavioural emphasis consistent with cognitive not behavioural activation intervention • Strategies to manage the ‘internal critic’ through thought catching and replacing • Teaching links between behaviour and mood • Improving social resources