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# **Autistic characteristics in eating disorders: treatment adaptations and impact on clinical outcomes**

## **Abstract**

### **Objective**

Autistic people with eating disorders (ED) may have special needs that are not met in standard ED treatment, raising the need for treatment adaptations to accommodate co-existing autism spectrum condition (ASC). Little is currently known about the nature of existing treatment options or adaptations for this population. We conducted a pre-registered systematic review to: (1) identify research articles describing existing interventions for patients with ED and comorbid ASC, and to critically review evidence of their clinical effectiveness and cost-effectiveness (Review 1); (2) review the impact of ASC comorbidity on ED clinical outcomes (Review 2).

### **Method**

Peer-reviewed studies published until the end of December 2020 were identified through a systematic search of the electronic databases: Medline, Embase, PsycINFO, Web of Science, CINAHL, Scopus and Cochrane Library.

### **Results**

Only one clinical pathway of treatment adaptations (the 'PEACE' pathway) was identified in Review 1 with early evidence of cost-savings and favourable treatment outcomes. ASC characteristics were shown in Review 2 to have no direct impact on physical outcomes or ED symptoms, but could be associated with higher rates of comorbidities and greater use of intensive ED treatment. Additionally, patients with ASC characteristics may benefit more from individual, rather than group, sessions.

### **Conclusions**

Any new treatments or treatment adaptations may not directly impact on ED symptoms, but may be better able to support the complex needs of the ASC population, thus reducing subsequent need for intensive support. Future research is warranted to explore evidence of clinical and cost-effectiveness of interventions for this population.

## **Keywords**

Eating disorder

Autism

Systematic review

Treatment

Comorbidity

## 1. Introduction

The potential link between eating disorders (ED) and autism spectrum condition (ASC) was first conceptualized in the 1980s (Gillberg, 1983). Since then, growing research has attempted to explore the overlapping cognitive inefficiencies between the two conditions, including: set-shifting (Tchanturia et al., 2012; H Westwood et al., 2016), theory of mind (Leppanen et al., 2018), central coherence (Lopez et al., 2008; Oldershaw et al., 2011), and socio-emotional aspects such as alexithymia (Hobson et al., 2020; Poquérusse et al., 2018; Råstam et al., 1997), social anhedonia (Chevallier et al., 2012; Harrison et al., 2014) and social functioning (Tchanturia et al., 2013).

Multiple reviews have examined the overlap between EDs and ASC (Huke et al., 2013; Kinnaird & Tchanturia, 2021; Saure et al., 2020; Heather Westwood et al., 2016; Westwood & Tchanturia, 2017). Huke and colleagues (Huke et al., 2013) published the first systematic review to synthesize studies on the prevalence of ASC in ED populations. The mean estimated prevalence of ASC from this review was 23%, although six of the eight included studies in the review were from the same Swedish longitudinal cohort (Råstam et al., 1989) which could have contributed to potential bias. Another issue that was reported in the review was the lack of consistency in ASC screening measures in the included studies, which made comparison across studies difficult.

Westwood et al (Heather Westwood et al., 2016) conducted a systematic review of studies using the Autism Spectrum Quotient (AQ), a 50-item questionnaire investigating symptoms of autism spectrum conditions in adults (Baron-Cohen et al., 2001) or the shorter ten-item version AQ-10 (Allison et al., 2012) to assess autistic features in patients with anorexia nervosa (AN). The review concluded that individuals with AN had significantly more autistic features compared to healthy controls. An updated literature review by the same group later reported consistency in literature on the over-representation of symptoms of ASC in AN (Westwood & Tchanturia, 2017).

The most recent systematic review examined the association between characteristics of ASC and duration of illness of AN (Saure et al., 2020), and suggested that a prolonged course of AN appears to be associated with problems in central coherence, cognitive flexibility, and

emotion recognition, which are also underlying neuropsychological characteristics distinctive to ASC. This finding indicates similar characteristics between ASC and severe and enduring eating disorders based on self report.

A recent overview study (Kinnaird & Tchanturia, 2021) presented a framework of clinical features associated with autism in AN, including obsessional interests, emotional insight, social difficulties, attentional biases, preference for routines, and cognitive rigidity. These features, while common in autism, are more likely to be centred around food and weight in AN. For example, specific interests in autism could relate to any topic, e.g. animals, music, numbers, whereas in AN it is more likely to be centred around dieting. When these two conditions are combined, the paper pointed out, this could create an additive effect, with people with AN and autistic characteristics exhibiting additional difficulties not seen in AN only.

It is worth noting that only the first review (Huke et al., 2013) included studies on bulimia nervosa (BN) and ASC, whereas the other reviews all focused on ASC and AN only. Indeed, only a limited amount of studies to date have discussed links between ASC and ED subtypes other than AN such as BN or binge eating disorders (BED). A pilot study in 2017 reported for the first time that not only AN but also BN and BED patients show greater autistic characteristics compared to healthy controls (Gesi et al., 2017). More recently, studies have reported a high prevalence of AN and BED in individuals with childhood onset ASC and/or attention-deficit/hyperactivity disorder (Karjalainen et al., 2016), also that patients with BED show higher autistic characteristics compared to other subtypes (Numata et al., 2021).

These links between ED and ASC could have substantial implications for current treatment strategies for ED. Indeed, studies have found that having autistic characteristics is a negative predictor of treatment outcome for EDs (Nielsen et al., 2015; Speranza et al., 2007), raising the need for treatment programmes to be modified to accommodate co-existing ASC. Patients with AN and autistic characteristics may have more difficulties in expressing their needs and communicating during treatment sessions, and clinicians have also expressed their lack of confidence in treating patients with this comorbidity (Kinnaird et al., 2017). Furthermore, research has shown that over 90% of children and adults with autism have sensory abnormalities in specific domains of vision and smell/taste (Leekam et al., 2007), which may contribute to active avoidance of certain foods in AN patients with autistic characteristics.

These sensory difficulties may be hard to address without identifying and understanding the role of autism in the eating disorders, which again suggests the need for ED treatment options or treatment adaptations for patients with comorbid ASC.

New or adapted treatment options, however, should be evidence-based to ensure they are of clinical benefit for patients with both conditions. Little is currently known about the nature of existing ED treatment options or treatment adaptations for patients with comorbid ASC. In addition, any new treatment options or adaptations are likely to require additional resources to implement. In a health system with constrained resources, such additional costs must be justified through demonstration of value for money. Therefore, evidence of effectiveness and cost-effectiveness of existing options for patients with ED and ASC is required to justify the required resource allocation.

## **2. Methods**

### **2.1 Aims and objectives**

The primary aim of this systematic review was to identify research articles describing existing interventions for patients with ED and comorbid ASC, and to critically review evidence of their clinical effectiveness and cost-effectiveness (Review 1). We hypothesised that such interventions would be rare, therefore a secondary aim was included to systematically review the impact of ASC comorbidity on clinical outcomes in patients with ED (Review 2), in order to provide insight into whether patients with autism have different ED outcomes or trajectory compared to patients without comorbid ASC, and thus to provide evidence to support the need for new treatments or treatment adaptations.

It was hypothesized that the number of studies describing or evaluating the effectiveness or cost-effectiveness of adapted interventions for the comorbidity would be low, and that ASC comorbidity would result in poorer outcomes in patients with ED, such as slower weight improvement, longer hospital admissions, and poorer ED psychopathology outcome.

## **2.2 Eligibility Criteria**

Eligibility criteria were determined following the Population, Intervention, Comparison, Outcome and Study design (PICOS) Framework for both Review 1 (identification and evaluation of interventions for ED and ASC comorbidity) and Review 2 (impact of ASC comorbidity on clinical outcome in patients with ED).

### **2.2.1 Inclusion and exclusion criteria for Review 1**

Adults and young people over the age of 12 years, with an ED diagnosis and either autistic characteristics screened using a validated screening tool or a formal ASC diagnosis were included. ED diagnoses of AN (all subtypes), bulimia nervosa, binge-eating disorder or avoidant restrictive food intake disorder from the Diagnostic and Statistical Manual of Mental Disorders IV or 5 (DSM IV/5) (Association, 1994, 2013) or the International Classification of Diseases 10 or 11 (ICD 10/11) (Organization, 1993, 2018) were included.

Both service-level or treatment-level adaptations and new treatments for patients with comorbid ED and ASC were included. Service-level adaptations were defined as those applied to primary and secondary care ED services with the aim of changing the treatment environment, staff training, case management and referral process to make them more acceptable to individuals with autism. Examples include clinician training in the assessment and understanding of autism spectrum conditions, and adjusting treatment environment (noise reduction, decluttered walls etc.) in acknowledgement of atypical sensory profiles.

Treatment-level adaptations were defined as those applied to individual and group treatment processes and manuals to make them more effective for individuals with autism, such as individualised strategies modifying the length, pace, and focus of sessions, enhanced interviewing techniques, or adapted psychoeducation materials for patients and carers.

In this review, the term ‘intervention’ will be used when referring to new treatments or adaptations to existing treatments for patients with the comorbidity, including both treatment-level and service-level adaptations.

For studies describing interventions for patients with ED and ASC, without any assessment or effectiveness or cost-effectiveness, no comparison group was necessary and thus no inclusion criteria were applied. For studies evaluating the clinical effectiveness or cost-effectiveness of interventions for patients with ED and ASC, a comparison group was required. This could be a separate, concurrent control or comparison group or the cases could be acting as their own controls in a before-and-after design.

Any outcome and all study designs was included for studies that either described or evaluated the effectiveness or cost-effectiveness of interventions.

Non-English language publications, conference abstracts, letters and articles with no full-text available were excluded. Diagnosis of pica, rumination disorder, or feeding difficulties in children were excluded as they are not commonly treated at ED services.

### **2.2.2 Inclusion and exclusion criteria for Review 2**

The population of interest were the same as for Review 1. All types of interventions targeting people with EDs were included to consider outcomes in any setting, including hospital, community, school, care institution, or outpatient-based interventions.

To investigate the impact of ASC comorbidity on ED outcomes, studies comparing between individuals with and without ASC characteristics on outcomes commonly used in ED research (physical outcomes (such as BMI or weight change), psychopathological outcomes (ED symptoms or comorbid symptoms) or service use (such as premature discharge, treatment completion or augmentation)) were included.

Clinical and community studies that investigated ED outcomes were included, including randomised controlled trials, cohort studies, case-control studies, cross-sectional studies, case series and before-and-after observational studies.

Non-English language publications, conference abstracts, letters and articles with no full-text available were excluded. In terms of study designs, reviews and case reports of individual patients were excluded due to lack of statistical validity. Diagnosis of pica, rumination disorder, or feeding difficulties in children were excluded as they are not commonly treated at ED services.

## 2.3 Search Strategy

The same search strategies were used for Review 1 (interventions for patients with ED and comorbid ASC) and Review 2 (impact of ASC on clinical outcomes in patients with ED). This was accomplished by conducting a single, broad search with minimal limits, but applying different inclusion and exclusion criteria for the two reviews at the abstract screening stage. In accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines (Moher et al., 2009), the following electronic databases were searched for relevant literature from inception to the end of December 2020: Medline, Embase, PsycINFO, Web of Science, CINAHL, Scopus and Cochrane Library. Each search strategy followed a similar structure and included relevant Medical Subject Headings (MESH terms) and keywords limited to the title, abstract and keywords of publications. In addition, the NHS Economic Evaluation Database was searched for relevant economic evaluation studies.

Search terms were a combination of Medical Subject Headings (MeSH terms) and keywords in all possible permutations: (Anorexia Nervosa, Bulimia Nervosa, Eating Disorders, Eating Disorder Not Otherwise Specified, Avoidant Restrictive Food Intake Disorder, Purging Disorder, Binge Eating Disorder) AND (Autism Spectrum Disorder, Autism, Autistic Disorder, Asperger's Syndrome, Pervasive Developmental Disorder). No search term for intervention type was used to ensure comprehensiveness of the search. In addition, using only ED terms and ASC terms allowed the same search strategy to be used by both Review 1 and Review 2. The search strategy is provided in full in Supplementary Material.

Citations of all search results were first imported into the EndNote citation management software. Duplicates were removed. All abstracts were first screened by ZL for relevance and shortlisted for the two review questions, one shortlist for each. Where there was any uncertainty, abstracts were retained. Overlap was allowed and some studies were included in both shortlists. All shortlisted articles were then read in entirety by two reviewers (ZL and DH) independently to ascertain whether they met the corresponding inclusion criteria. Disagreements were discussed with supervisors SB and KT until a consensus was reached. References of included studies and relevant reviews identified by the search strategies were also checked by hand for additional eligible studies.



## **2.4 Analysis**

For review 1, it was hypothesized that the number of studies describing or evaluating such interventions would be very low, and any studies that evaluated the clinical effectiveness or cost-effectiveness of such interventions would be subject to significant heterogeneity in sample characteristics and outcome measures. Thus, a narrative synthesis of the results would be most appropriate. For review 2 on the impact of ASC on clinical outcomes in patients with ED, a narrative review was appropriate given the nature of the question. Overall, the main output of this systematic review was descriptive.

## **3. Results**

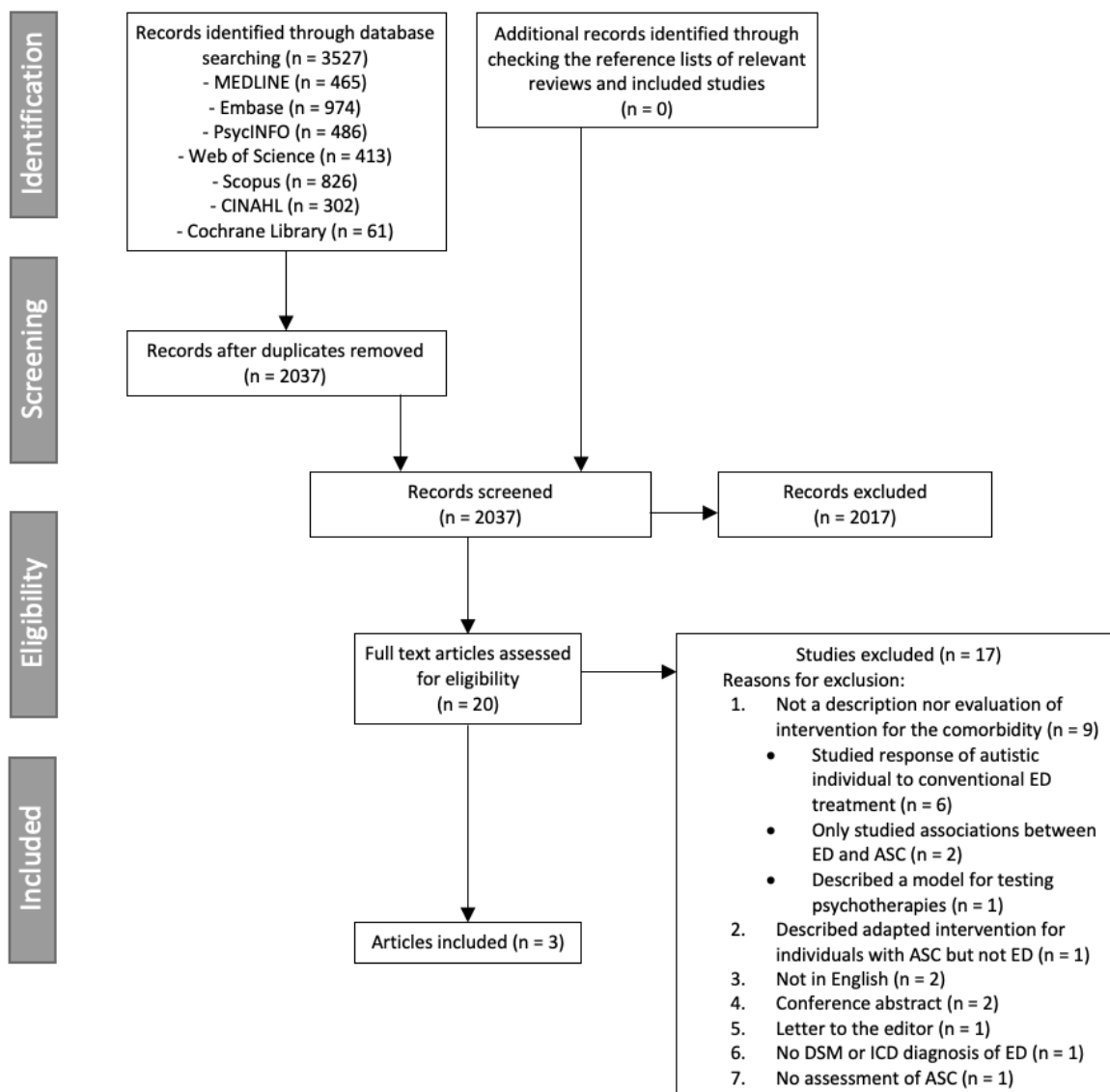
The initial search of the seven databases yielded 3,527 publications. The search located two relevant literature reviews that included studies of the impact of ASC on clinical outcomes in ED (Brown & Stokes, 2020; Westwood & Tchanturia, 2017). The reference lists for the reviews were checked and no additional studies were located. A search of the NHS Economic Evaluation Database also located no additional studies.

All 3,527 records were downloaded into Endnote and duplicates were removed, leaving 2,037 abstracts to be checked and shortlisted. At the full review stage, the two reviewers agreed on 100% of the abstracts for Review 1 and 93% of abstracts for Review 2. Disagreements in Review 2 were discussed with the supervisors until agreement was reached.

### **3.1 Screening of abstracts for Review 1**

Figure 1 provides the PRISMA flow diagram of the records retrieved for Review 1: description and evaluation of interventions for patients with ED and comorbid ASC. Out of the 2,037 records screened, 20 articles were identified as potentially meeting inclusion criteria for Review 1 and subject to full text review. Of these, 3 articles were met inclusion criteria (Smith & Tchanturia, 2020; K. Tchanturia et al., 2020; Kate Tchanturia et al., 2020), all published in the same year by the same research group, and either described or evaluated the Pathway for Eating disorders and Autism developed from Clinical Experience (PEACE pathway).

**Figure 1. PRISMA diagram of the records retrieved for Review 1**



The two articles describing the PEACE pathway intervention are summarized in Table 1. The first article (Kate Tchanturia et al., 2020) describes the design and implementation of the PEACE pathway. The pathway was co-developed by the clinical team and service users following a needs assessment, and piloted at an ED service in South London and Maudsley NHS Foundation Trust, London. All patients at the ED service received a DSM-5 diagnosis of ED. The implementation involved a series of treatment adaptations, including: adaptations to various therapeutic modalities such as cognitive behavioural therapy (CBT) and formulation-based approach, introduction of workshops and psychoeducation materials on sensory wellbeing and communication, and reinforcing carers' support. Service-level

adaptations were also described in this paper: the ward environment was redecorated, and clinician training on autism assessment (AQ-10, ADOS-2, ADI-R) and autism awareness was introduced.

The second article (Smith & Tchanturia, 2020) focused on one part of the implementation of the PEACE pathway: the PEACE huddles, which are brief, weekly meetings of the clinical teams to share feedback on PEACE patients and updates on the pathway implementation. The article included a study which aimed to evaluate clinicians' opinions on the benefits of the huddles in ED treatment settings in providing a higher level of care for patients with comorbid ASC. Because no patient-level measure of clinical effectiveness was evaluated and only clinician feedback was collected, the article was included in this review as a description of an intervention for ED and comorbid ASC, rather than as an evaluation of the effectiveness of an intervention for ED and comorbid ASC. A total of 283 responses evaluating huddles were collected from participating clinicians over a 12-months period, and the usefulness of the PEACE huddles were rated 84 out of 100 on average. Overall, the huddles were reported to be well-structured, focused, and well-received. Data extracted from this study are summarised in Table 1.

**Table 1. Data extracted from included articles describing interventions for ASC co-morbidity**

Author	Year	Country	Study design	Aim	Intervention
Tchanturia et al.	2020	UK	Implementation paper	To describe the design and implementation of the PEACE pathway	<p>Treatment-level adaptations:</p> <ul style="list-style-type: none"> <li>• Adaptations to therapeutic modalities (CBT, DBT, formulation-based approach, CRT, and CREST)</li> <li>• Introduction of workshops and psychoeducation materials</li> <li>• Reinforcing carers' support</li> </ul> <p>Service-level adaptations:</p> <ul style="list-style-type: none"> <li>• Redecoration of ward environment</li> <li>• Clinician training on autism assessment and awareness</li> </ul>
Smith & Tchanturia	2020	UK	Survey	To evaluate the clinicians' opinions on the benefits of PEACE huddles in ED treatment settings	<p>PEACE huddles, which are weekly meetings of the clinical team to:</p> <ul style="list-style-type: none"> <li>• Share feedback on PEACE patients who have comorbid ED and ASC</li> <li>• Share updates and gather feedback on the pathway implementation</li> <li>• Improve team communication</li> <li>• Update on any other PEACE-related business</li> </ul>

The third article (K. Tchanturia et al., 2020), summarised in Table 2, was a preliminary economic evaluation exploring the cost-savings generated by the PEACE pathway and was the only manuscript identified which contained an evaluation. Whilst not a formal assessment of cost-effectiveness, which requires the comparative analysis of both costs and effects, this was an early, hypothesis generating study to explore potential for cost-effectiveness and can be described as a partial economic evaluation, which are not themselves sufficient to inform decisions but often provide the key evidence required for decision-making (Drummond et al., 2015). The article was therefore included in the review.

The study was a service-level retrospective before and after evaluation comparing length of admission and cost of admission in patients with a DSM-5 diagnosis of ED with and without autistic characteristics. Data were collected from clinical records for 6 years before the PEACE pathway was introduced and 2 years after the pathway was introduced. Autistic characteristics were screened by ADOS-2 (Lord, 2012). Before the pathway was implemented, the average length of admission for autistic patients was longer (mean 19 weeks) than non-autistic patients (mean 16 weeks). This finding was reversed after the pathway was implemented, with autistic patients spending less time in hospital (mean 13 weeks) than non-autistic patients (mean 17 weeks) on average. Cost-savings associated with the reduction in length of admission of patients with autistic characteristics were estimated to be £22,837 per patient and approximately £275,000 per year for the service as a whole.

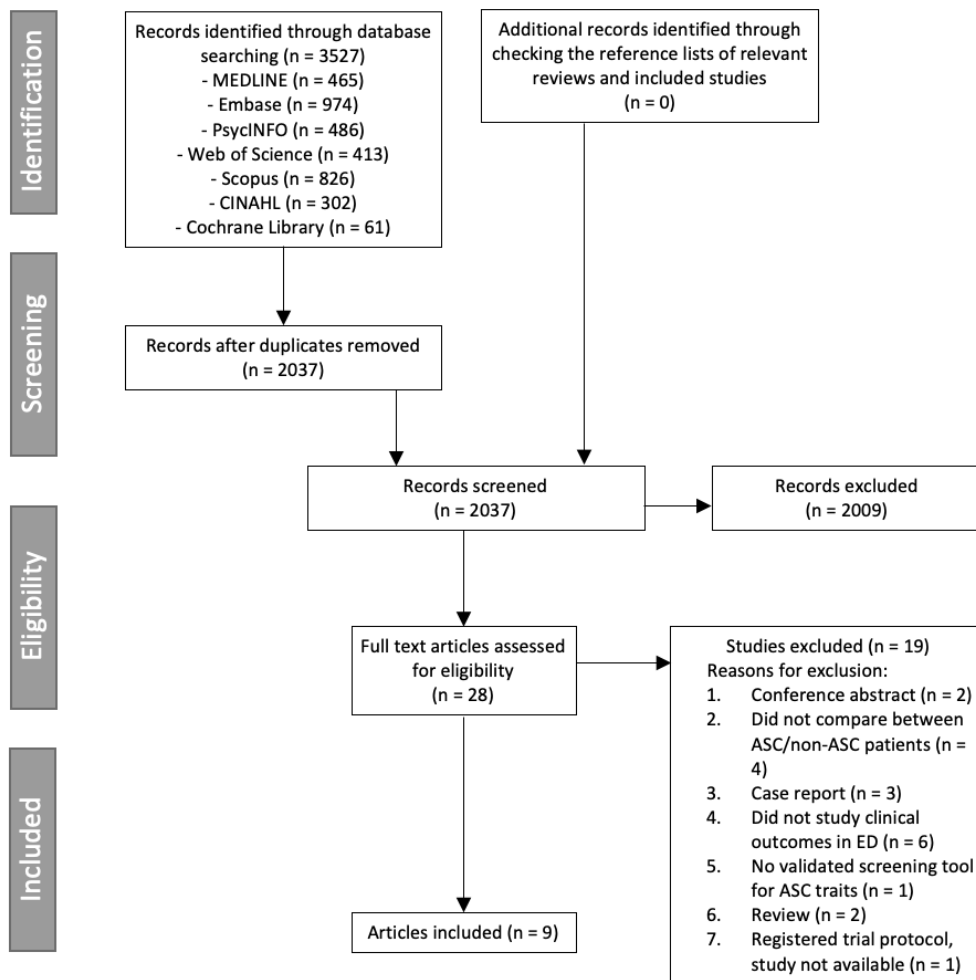
**Table 2. Data extracted from included evaluations of interventions for ASC comorbidity**

Author	Year	Country	Study design	Aim	Sample	ED diagnosis	ASC assessment	Outcome	Result
Tchanturia et al	2020	UK	Cohort study	To explore the impact of the development of the PEACE pathway on the length and cost of hospital admissions.	Not reported in the text but known to the author who was a co-author on the paper: N = 333 Female = 331 (99%) Age range = 18 – 65 (mean = 28.3)	AN (DSM-V)	ADOS-2	Length of admission; cost of admission	Implementation of the pathway is associated with a reduction in length of admission of patients with autistic characteristics, leading to estimated cost-savings of £22,837 per patient and approximately £275,000 per year for the service.

### 3.2 Screening of records for Review 2

Figure 2 shows the PRISMA diagram for review 2: impact of ASC comorbidity on clinical outcome in patients with ED. Out of the 2,037 records, 28 articles were initially identified as potentially meeting inclusion criteria for review 2 and were subject to full text review. Of these 28 articles, 9 met the inclusion criteria.

**Figure 2. PRISMA diagram of the records retrieved for Review 2**



The economic evaluation (K. Tchanturia et al., 2020) included in Review 1 was also eligible for inclusion in Review 2, since it explored the impact of ASC comorbidity on the length of hospital admission, which is a treatment outcome. Of the eight remaining studies eligible for this research question, the majority (n = 6) were carried out in the UK. The remaining two

studies were carried out in Sweden. All were published between 2012 and 2020.  
Characteristics of the included articles are summarised in Table 3.



**Table 3. Data extracted from studies included in Review 2**

Author (Year)	Country	Study Type	Aim	Sample	ED diagnosis	ASC assessment	Outcomes measured	Results
Anckarsäter et al (2012)	Sweden	Cross-sectional, with control	To compare clinical outcomes and cognitive test results between patients with AN with and without an ASC diagnosis.	N = 51 Female = 48 (94%) Age range not reported (mean = 32)	AN (DSM-IV)	ASDI <sup>1</sup> ; DSM-IV diagnosis	Overall clinical outcome based on five scales (Morgan–Russell outcome assessment schedule; MROAS): <ul style="list-style-type: none"> <li>• food intake and weight concern</li> <li>• menstrual pattern</li> <li>• disturbance of mental state</li> <li>• psychosexual state</li> <li>• social relationships and employment activity</li> </ul>	<ul style="list-style-type: none"> <li>• Individuals with AN and comorbid ASC had worse overall outcome (body weight, diet restriction, menstruation, attitude to sex and menstruation, social relationships, relationship with family, and mental state) compared to individuals with AN without ASC and healthy controls.</li> </ul>
Huke et al (2014)	UK	Cross-sectional	To examine ASC features in relation to treatment completion and ED psychopathology in patients with AN.	N = 32 Female = 32 (100%) Age range not reported (mean = 28.7)	AN (DSM-IV)	AQ <sup>2</sup>	ED symptoms (EDE-Q <sup>3</sup> ); Treatment completion	<ul style="list-style-type: none"> <li>• There was no significant relationship between ED symptoms and ASC characteristics.</li> <li>• Patients with ASC were more likely to complete ED treatment as planned compared to patients without ASC, although this result was not statistically significant.</li> </ul>
Nielsen et al (2015)	Sweden	Cohort study	To analyse the influence of	N = 51	AN (DSM-IV)	ASDI; AQ	Overall clinical outcome based on five scales	<ul style="list-style-type: none"> <li>• Presence of ASC in individuals with AN</li> </ul>

			diagnostic stability of ASC on clinical outcome in patients with teenage onset AN.	Female = 48 (94%) Mean age = 32			(Morgan–Russell outcome assessment schedule; MROAS): <ul style="list-style-type: none"> <li>• food intake and weight concern</li> <li>• menstrual pattern</li> <li>• mental state</li> <li>• psychosexual state</li> <li>• social relationships and employment activity</li> </ul>	was negatively associated with mental state, psychosexual state and social relationships and employment activities.
Tchanturia et al (2016)	UK	Case series	To investigate the effects of group cognitive remediation therapy (group CRT) for AN patients with and without ASC characteristics	N = 35 Female = 35 (100%) Age range not reported (mean age = 26.2)	AN (DSM-V)	AQ-10 <sup>4</sup> ; ADOS <sup>5</sup>	Cognitive flexibility (DFlex <sup>6</sup> ); Self-reported ability to change (Motivational ruler)	<ul style="list-style-type: none"> <li>• Patients with low ASC characteristics showed significantly more increase in self-reported ability to change and improvement in cognitive flexibility after the intervention, compared to the high ASC group.</li> <li>• Current brief group cognitive remediation therapy (group CRT) had no influence on cognitive flexibility or motivation to change in patients with ASC.</li> </ul>
Stewart et al (2017)	UK	Cross-sectional	To report the impact of ASC characteristics on treatment outcomes of girls with AN, EDNOS-restrictive subtype, or atypical anorexia.	N = 409 Female = 409 (100%) Age range = 9 to 18 (mean = 14.6)	AN (DSM-IV and V), EDNOS-Restrictive (DSM-IV), Atypical Anorexia (DSM-V)	AQ; SAS <sup>7</sup>	Composite outcome on BMI, bulimic symptoms and menstrual pattern (Morgan Russell Criteria); ED symptoms (EDE-Q); Depression symptoms (Moods and Feelings Questionnaire);	<ul style="list-style-type: none"> <li>• There was no significant difference in BMI, bulimic symptoms or menstrual pattern between patients with high and low ASC characteristics.</li> </ul>

							<p>Anxiety symptoms (Screen for Child Anxiety Related Disorders);  Obsessive and compulsive disorder symptoms (Child Obsessional Compulsive Inventory);  Treatment augmentation (through admission to inpatient or intensive day patient programme)</p>	<ul style="list-style-type: none"> <li>• ASC characteristics were not correlated with ED symptoms.</li> <li>• ASC characteristics were significantly correlated with depression, anxiety, and obsessive compulsive symptoms.</li> <li>• Patients with ASC characteristics showed a greater need for treatment augmentation compared to patients without ASC.</li> </ul>
Nazar et al. (2018)	UK	Cross-sectional study	To examine the clinical outcomes of adolescents and young adults with anorexia nervosa (AN) comorbid with broad autism spectrum disorder (ASC) or ASC characteristics.	N = 149 Female = 137 (92%) Age range = 13 to 21 (mean = 16.9)	AN, EDNOS, Atypical AN (DSM-IV)	ASC diagnosis (DSM-IV and ICD 10); SAS	<p>BMI increase;  ED symptoms (SEED<sup>8</sup>);  Socioemotional difficulties (SDQ<sup>9</sup>);  Treatment augmentation (through admission to inpatient or intensive day patient programme)</p>	<ul style="list-style-type: none"> <li>• There was no significant difference in change in BMI or ED symptoms between patients with or without ASC.</li> <li>• The ASC group appeared to have more socioemotional difficulties compared to those without ASC.</li> <li>• The ASC group showed a greater need for treatment augmentation compared to patients without ASC.</li> </ul>
Tchanturia et al (2020)	UK	Cohort study	To explore the impact of the development of the PEACE pathway on	Not reported in the text but known to the author	AN (DSM-V)	ADOS	Length of admission; cost of admission	<ul style="list-style-type: none"> <li>• Prior to implementation of adapted interventions, patients with ASC had</li> </ul>

			the length and cost of hospital admissions.	who was a co-author on the paper: N = 333 Female = 331 (99%) Age range = 18 – 65 (mean = 28.3)				longer admissions compared to patients without ASC <ul style="list-style-type: none"> <li>Implementation of the pathway is associated with a reduction in length and therefore costs of admission of patients with ASC characteristics</li> </ul>
Dandil et al (2020)	UK	Case series	Examine the effects of individual cognitive remediation therapy (individual CRT) treatment for adult women with AN with or without ASC characteristics.	N = 99 Female = 99 (100%) Age range not reported (mean = 23.9)	AN (DSM-V)	AQ-10	Bigger picture thinking (ROCF <sup>10</sup> ); Set shifting (Brixton Spatial Anticipation Test)	<ul style="list-style-type: none"> <li>High ASC characteristics did not impact the effects of individual cognitive remediation therapy (CRT); both groups with or without ASC characteristics showed improvement in set shifting after individual CRT treatment.</li> </ul>
Li et al (2020)	UK	Cross-sectional	To examine the outcomes in patients with AN with and without ASC characteristics in three different treatment settings: inpatient, day treatment, and step-up treatment	N = 476 Female = 466 (98%) Age range = 18 to 65 (mean = 26.9)	AN (DSM-V)	AQ-10	BMI; ED symptoms (EDE-Q); Anxiety and depression symptoms (HADS <sup>11</sup> ); Work and social functioning (WSAS <sup>12</sup> )	<ul style="list-style-type: none"> <li>There was no difference in discharge BMI and ED symptoms between patients with and without ASC characteristics.</li> <li>Patients with ASC characteristics showed more severe depression and anxiety symptoms as well as more severe social impairment compared to patients without ASC characteristics.</li> </ul>

<sup>1</sup>ASDI=Asperger Syndrome Diagnostic Interview; <sup>2</sup>AQ=Autism-Spectrum Quotient; <sup>3</sup>EDE-Q=eating disorders evaluation questionnaire; <sup>4</sup>AQ-10=Autism-Spectrum Quotient 10-item version; <sup>5</sup>ADOS=Autism Diagnostic Observation Schedule; <sup>6</sup>DFlex=Detail and Flexibility questionnaire; <sup>7</sup>SAS=Social Aptitude Scale; <sup>8</sup>SEED=Short Evaluation of Eating Disorders; <sup>9</sup>SDQ=Strengths and Difficulties Questionnaire; <sup>10</sup>ROCF=Rey-Osterrieth Complex Figure test; <sup>11</sup>HADS=hospital anxiety and depression scale; <sup>12</sup>WSAS=Work and Social Adjustment Scale

### *Swedish studies*

Two of the included studies (Anckarsäter et al., 2012; Nielsen et al., 2015) were based on a Swedish longitudinal cohort initiated in the mid 1980s (Råstam et al., 1989). The longitudinal cohort sample contained 51 participants with AN and 51 gender-matched controls in Gothenburg, Sweden who were examined with assessments of psychiatric disorders, health-related quality of life and general outcomes on different occasions: at the ages of 16 (baseline, Study 1), 21 (Study 2), 24 (Study 3), 32 (Study 4). All AN cases fulfilled DSM-III-R (APA, 1987) and subsequently DSM-IV (APA, 1994) criteria for AN within a year of the assessment of Study 1 (Råstam, 1992; Råstam et al., 1989). At all four occasions, an investigator blinded to group status assigned ASC diagnoses using instruments that were most up-to-date and comprehensive at each time point: a structured interview with the mother was used at baseline; the Dewey social awareness test (Dewey, 1991), DSM-III-R and a checklist for Asperger's syndrome outlined by Gillberg and Gillberg (Gillberg & Gillberg, 1989) were used at Study 2; the ASDI (Gillberg et al., 2001), DSM-IV and the checklist for Asperger's syndrome were used at Study 3; and the ASDI, DSM-IV, the checklist for Asperger's syndrome and the Autism-Spectrum Quotient (AQ) (Baron-Cohen et al., 2001) were used at Study 4.

Anckarsäter et al, published in 2012, used cross-sectional data from Study 4 (at mean age 32 years) of the Swedish longitudinal cohort to investigate the ASC symptoms, personality profiles, neurocognition and outcomes in the sample (Anckarsäter et al., 2012). A lifetime prevalence of ASC of 33.3% was noted in the AN sample at this time point, compared with 2% prevalence in the matched controls (Anckarsäter et al., 2012). Outcomes were measured with the Morgan-Russell outcome assessment schedule (MROAS) (Morgan & Hayward, 1988), a clinical assessment of AN which summarises outcome data on five dimensions: food intake and weight concern; menstrual pattern; mental state; psychosexual state; and social relationships and employment activity. The results indicate that participants with AN and comorbid ASC had higher prevalence of personality disorders (20%) and poorer overall outcomes as measured by the MROAS ( $p < 0.01$ ) compared to participants without ASC.

Nielsen et al, published in 2015, used data from Study 1 to Study 4 of the Swedish longitudinal cohort to investigate the impact of ASC diagnostic stability on outcomes in AN (Nielsen et al., 2015). Outcomes were measured with the MROAS (Morgan & Hayward, 1988) at each follow-up. Additionally, the Morgan-Russell criteria of

good/intermediate/poor, based on the combined status of BMI, bulimic symptoms and menstrual pattern, were reported. The results indicated that positive development in body weight, dietary restriction, menstrual pattern, sexual behaviour and social relationship was limited to those individuals who had never been assigned an ASC diagnosis. Additionally, the diagnostic stability of ASC, particularly when ASC was present at all examinations, contributed to poorer outcomes in mental state, psychosexual state, social relationships and employment activity compared with individuals with no ASC diagnosis.

### ***UK Studies***

The remainder of the included studies were from the UK. Huke and colleagues (Huke et al., 2014) investigated the relationship between ASC features and treatment completion and ED psychopathology in patients with AN. Thirty-two participants with AN were recruited from the Yorkshire Centre for Eating Disorders (YCED, Leeds, UK), all were female and the mean age was 28.7 years. Healthy controls (n = 32) were matched for age and gender. Supervisor KT was familiar with the YCED and was able to confirm that all patients received a DSM diagnosis of ED in the service. ASC characteristics were measured with the AQ (Baron-Cohen et al., 2001). Outcomes measures included ED symptoms assessed with the Eating Disorders Evaluation Questionnaire (EDE-Q) (Fairburn et al., 1993) and treatment completion ('premature termination of treatment' vs 'treatment completed as planned'). Obsessive-compulsive characteristics and anxiety and depression symptoms were also assessed, although not compared between those with and without ASC. The results indicate that there was no significant relationship between ASC characteristics and ED symptoms, nor between ASC characteristics and premature termination of treatment. One non-significant but interesting finding was that 87.5% (n = 7/8) of participants with ASC completed treatment as planned compared with 50% (n = 12/24) of those without ASC. This may suggest enhanced treatment adherence in ASC patients, who may respond well to the rules and routines in an inpatient ward since these may ease anxieties in a novel environment.

Tchanturia et al, published in 2016, examined the treatment response of group format Cognitive Remediation Therapy (CRT) for AN patients with and without ASC characteristics (Tchanturia et al., 2016). The study recruited 35 participants from an inpatient ED unit in London. All were female with a mean age of 26.2 years. All had a DSM-5 (Association, 2013) diagnosis of AN. ASC characteristics were assessed with either the AQ-10 (Allison et al., 2012) or the Autism Diagnostic Observation Schedule (ADOS) (Gotham et al., 2007).

Motivation and cognitive styles (rigidity and attention to detail) were assessed with motivational ruler (Miller & Rollnick, 2012) and DFlex (Roberts et al., 2011) before and after the groups received the CRT intervention, and compared between patients with and without ASC characteristics. The results indicate that patients without ASC showed significant improvement in cognitive rigidity ( $p = 0.007$ ) and self-reported ability to change ( $p = 0.004$ ). However, patients with ASC characteristics showed no significant improvement in self-reported cognitive flexibility or in motivation; and the effect sizes were negligible.

Dandil et al, published by the same research group in 2020, carried out an evaluation in the same London ED unit which aimed to examine the treatment response to individual format (rather than group format) CRT for AN patients with and without ASC characteristics (Dandil et al., 2020). A total of 99 inpatients were recruited. All were female with a mean age of 23.9 years, and all had a DSM-5 diagnosis of AN. ASC characteristics were screened using the AQ-10. Treatment outcome was measured in change in cognitive styles (bigger picture thinking assessed with Rey-Osterrieth Complex Figure (ROCF) test (Rey, 1941) and set shifting assessed with Brixton Spatial Anticipation Test (Burgess & Shallice, 1996)) and compared between patients with and without ASC characteristics. The results showed that although neither group saw improvement in central coherence after CRT, there was positive improvement in set shifting in both groups with and without ASC characteristics ( $p < 0.001$  for both groups), and high ASC characteristics did not impact the effects of individual CRT.

Stewart et al, published in 2017, investigated through clinical audit the impact of ASC characteristics on treatment outcomes of patients at a specialist outpatient child and adolescent ED service in London (Stewart et al., 2017). A total of 409 female patients were recruited, with a mean age of 14.6 years. All patients had a DSM-IV or DSM-V diagnosis of AN, restrictive subtype Eating Disorder Not Otherwise Specified or Atypical Anorexia. ASC characteristics were measured using the Social Aptitude Scale (Liddle et al., 2009) and the AQ (Baron-Cohen et al., 2001). Morgan-Russell criteria of good/intermediate/poor (based on the combined status of BMI, bulimic symptoms and menstrual pattern) were used to classify physical treatment outcomes. ED psychopathology was also measured using the EDE-Q. The results showed no differences in physical outcomes and ED psychopathology between patients with and without ASC characteristics. However, ASC characteristics were associated with symptoms of depression ( $p < 0.001$ ), anxiety ( $p < 0.001$ ), OCD ( $p < 0.001$ ) and



treatment augmentation reflected by greater use of the intensive day patient or inpatient treatment ( $p < 0.01$ ).

Nazar et al, published in 2018, also examined the impact of ASC characteristics on clinical outcomes of patients with AN (Nazar et al., 2018). This study was a secondary data analysis from a multi-centre randomized controlled trial in the UK. A total of 149 patients were recruited, 137 were female and the mean age was 16.9 years. All patients received a DSM-IV or ICD-10 diagnosis of AN or atypical AN. Formal diagnosis of ASC was based on DSM-IV and ICD 10, and ASC characteristics were additionally assessed with the Social Aptitude Scale (SAS) (Liddle et al., 2009). Patients with and without ASC showed similar reductions in ED symptoms and BMI change at 12-month follow-up. However, social difficulties and global dysfunctioning remained higher in the ASC group at follow-up compared to those without ASC ( $p = 0.002$ ). In addition, the ASC group showed treatment augmentation marked by a greater use of intensive inpatient or day-patient treatment ( $p = 0.015$ ) and medication use prior to admission to hospital ( $p < 0.001$ ).

Lastly, Li et al, published in 2020, investigated the treatment outcomes in inpatient and day-patient treatment settings through clinical audit data (Li et al., 2020). Impact of ASC characteristics on the clinical outcomes was evaluated as part of the study objectives. Data from 476 patients were collected, 466 of whom were female, and the mean age was 26.9 years. All patients had a DSM-V diagnosis of AN. ASC characteristics were assessed with the AQ-10. Outcomes were measured by BMI, ED symptoms represented by the EDE-Q, comorbid depression and anxiety symptoms and social impairment, and all outcomes were compared between patients with and without ASC characteristics. The results indicate no difference in discharge BMI and ED symptoms between patients with and without ASC characteristics. However, patients with ASC characteristics exhibited more severe depression symptoms ( $p = 0.009$ ), anxiety symptoms ( $p = 0.013$ ) and social impairment ( $p = 0.008$ ) compared to patients with no ASC characteristics.

## **4. Discussion**

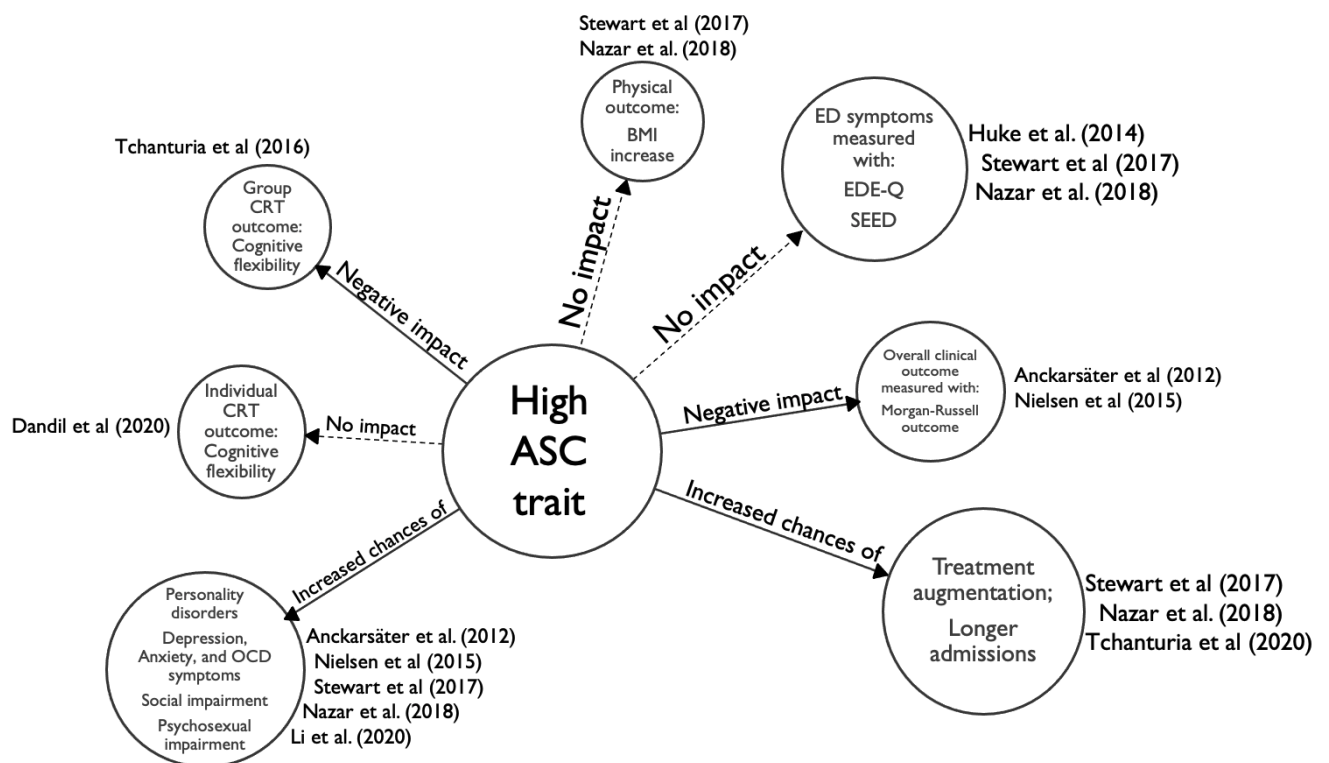
Overall, the number of studies identified in Review 1 (description or evaluation of treatments or adaptations for comorbid ASC) was low and all related to the same intervention – the PEACE pathway. The PEACE Pathway was the only intervention for patients with ED and comorbid ASC that has been described and evaluated in published manuscripts (Smith & Tchanturia, 2020; K. Tchanturia et al., 2020; Kate Tchanturia et al., 2020), despite the broad search strategy, indicating that few such treatments have been developed and few adaptations have been carried out. No RCTs of treatments or adaptations were identified, and the partial economic evaluation of the PEACE pathway (K. Tchanturia et al., 2020) explored cost-savings only and so does not provide any evidence of either effectiveness or cost-effectiveness. This means there is currently no evidence base to support the development of interventions to improve the effectiveness of ED services for patients with comorbid ASC and no evidence of cost-effectiveness.

Nine studies were identified for Review 2 (impact of ASC on treatment outcomes in AN), including the partial economic evaluation identified in Review 1. These studies were predominantly cross-sectional or case series and all were published in the past decade. The main findings from the studies included in review 2 are clustered and visualized in a diagram (Figure 3). ASC characteristics were shown to have no impact on physical outcomes or ED symptoms in studies using the EDE-Q, SEED or BMI change to assess ED symptomatology (Huke et al., 2014; Nazar et al., 2018; Stewart et al., 2017). However, when an overall clinical outcome was measured with the Morgan-Russell assessment schedule (Anckarsäter et al., 2012; Nielsen et al., 2015), ASC characteristics came to have a negative impact on the outcomes. It is worth noting that the Morgan-Russell outcome is a composite score summarizing an individual's food intake, weight concern, mental state, psychosexual state and social relationships, whereas the EDE-Q and the SEED target food intake and weight concerns only. Subsequently, social-emotional processing difficulties and cognitive rigidity which are common features of an autistic individual (Davies et al., 2016; South et al., 2007) might be reflected negatively on the Morgan-Russell assessment, but would not have an impact on the EDE-Q or SEED outcome. Hence, when evaluating treatment outcomes in patients with ASC features, the outcome measure should be chosen and interpreted with caution. The majority of the included studies also found a positive association between ASC characteristics and other comorbidities such as personality disorders (Anckarsäter et al., 2012), depression and anxiety symptoms (Li et al., 2020; Stewart et al., 2017), obsessive

compulsive symptoms (Stewart et al., 2017), and social and psychosexual impairment (Li et al., 2020; Nazar et al., 2018; Nielsen et al., 2015).

High ASC characteristics were also shown by a number of studies to lead to treatment augmentation either through greater use of intensive day-patient or inpatient treatment (Nazar et al., 2018; Stewart et al., 2017) or longer hospital admissions (K. Tchanturia et al., 2020) compared to patients without ASC characteristics (Figure 3). Since patients with ASC characteristics showed no difference in ED symptoms or rate of BMI change compared to others without ASC, this treatment augmentation could potentially be explained by the high rate of other comorbidities that could have an impact on treatment effectiveness. Indeed, in one of the included studies, ASC characteristics did not predict treatment augmentation once levels of depression had been accounted for (Stewart et al., 2017). Thus, the need for treatment augmentation in high ASC patients may be a result of untreated comorbidities or unfulfilled emotional needs.

**Figure 3. Visual synthesis of the findings of the included studies**



Items in bigger circles appeared in the findings of more studies; their related studies are listed next to the circles.

## **4.1 Clinical implications of ASC comorbidity in ED treatment**

Patients with high ASC showed a need for treatment augmentation and prolonged hospitalization in ED units (Nazar et al., 2018; Stewart et al., 2017; K. Tchanturia et al., 2020), indicating that they were not responding well to conventional treatment which primarily targets ED cognitive symptoms. Moreover, the high rate of comorbidities associated with autistic characteristics might be a risk factor for future relapse. Therefore, these patients with ASC characteristics may be in need of alternative treatment strategies in order to recover fully and prevent relapse.

Two case series included in this review examined treatment response to group and individual format of CRT respectively (Dandil et al., 2020; Tchanturia et al., 2016). Patients with high ASC did not respond to group CRT and did not report any significant improvement in cognitive flexibility, and the negligible effect sizes suggest that it is unlikely due to the power of the study. The individual CRT study, on the other hand, reported favorable outcomes in autistic patients. This indicates that the group environment may have presented difficulties for patients on the autism spectrum. Future treatment adaptations could take into account social difficulties, and it is possible that the group setting, dosage or style of delivery of CRT sessions could be modified for people with both AN and ASC.

It was also suggested in a study that common autistic features, such as preference for routines and difficulties in set shifting, may enhance treatment completion and adherence (Huke et al., 2014). Thus, modifying psychological therapies for ASC processing styles could in turn enhance treatment effectiveness. Indeed, as was demonstrated in the partial economic evaluation of a novel pathway for patients with the comorbidity (K. Tchanturia et al., 2020), once appropriate adaptations had been made in treatment settings, patients with autistic characteristics showed reduced lengths of hospital admission compared to ASC patients prior to the introduction of the pathway and compared to non ASC patients, which may suggest the pathway generated comparatively more favourable treatment outcomes, although further research is needed to confirm this .

## **4.2 Screening tools**

One main issue arising from this review is the lack of a consistent screening system for ASC in ED, similar to previous reviews on the ASC and ED population (Huke et al., 2013). A variety of screening measures were used in the included studies, such as the AQ, AQ-10, ADOS, ASDI, SAS, Dewey social awareness test and more. This lack of consistency in screening measures makes comparison across studies difficult. Some of the earlier studies also used screening tool that had not been specifically tested for reliability or validity (Nielsen et al., 2015). More recently, there has been an increase in studies using the AQ or the shorter version AQ-10 to examine ASC characteristics in clinical groups (Allison et al., 2012; Baron-Cohen et al., 2001; Kinnaird et al., 2020; Li et al., 2020; Mealey et al., 2014; Mito et al., 2014). Although self-report measures such as the AQ or AQ-10 have the benefit of being brief and low cost, it is worth noting that they only focus on the present time-frame and the information provided by the patients themselves, missing early developmental history and input from carers which are two crucial elements in a formal ASC assessment. Specific to assessing ASC in patients with AN, there is the possibility that social withdrawal and social anhedonia exacerbated by ongoing starvation (Keys et al., 1950) could also confound the results of ASC screening, if only current presentation is considered and developmental aspects are not screened. Moreover, it has been suggested that the common tools for screening ASC do not adequately identify difficulties in girls who may have a qualitatively different presentation than boys (Halladay et al., 2015). Indeed, females often show fewer repetitive and restricted behaviors than males and are more prone to “camouflage” their social difficulties (Hull et al., 2020; Westwood et al., 2017) leading to increased obstacle to assessing ASC using the available tools. Hence, there is an urgent need for a pragmatic and universal screening tool for ASC in a predominantly female population with ED.

### **4.3 Eating Disorders Diagnoses**

Although we used a broad search strategy that covered all ED subtypes, almost all identified studies focused on AN. A possible explanation could be that compared to other subtypes, AN is associated with more intensive service use given the need for medical stabilization, and therefore generates more data available for publication. Patients with bulimia nervosa (BN), on the other hand, are less likely to be hospitalised despite the often serious physical complications brought by purging, because they tend to be at a healthier weight, more active sexually, and more likely to menstruate regularly in contrast with patients with AN (Russell, 1979). Binge-eating disorder (BED), despite being the the most prevalent ED (Kornstein et

al., 2016), is often underdiagnosed and undertreated (with < 40% of individuals with BED having ever been treated for an ED), partly because BED was only widely recognised as a diagnostic entity in the early 1990s (Stice, 1999), and partly because individuals with BED may be reluctant to seek treatment because of shame and lack of awareness of the disorder (Kornstein et al., 2016).

There has been a wealth of work showing that children, young people and adults on the spectrum are more likely to be overweight or obese than their non-autistic peers (Broder-Fingert et al., 2014; Hill et al., 2015; Sedgewick et al., 2019). This finding has implications for association between autistic characteristics and BED, a disorder frequently observed among overweight or obese individuals. Indeed, recent pilot data showed that not only AN but also BN and BED patients exhibited greater autistic characteristics compared to controls (Gesi et al., 2017). In this study, patients with BN also scored higher than patients with AN on sensory difficulties, and the BED group showed the most mentalizing deficits. In a more recent study investigating ASC characteristics in patients with binge-purge AN, restrictive AN, BN and BED, an association was found between high autistic characteristics and non-vomiting behaviour (Numata et al., 2021). Of the four ED subtypes, the BED group had the highest ASC characteristics.

Given that the consequences of other subtypes could be just as debilitating as AN, and ‘crossovers’ between ED subtypes are not uncommon, it is worth expanding the scope of research on autism comorbidity to BN and BED as well. Further research on how treatments can be adapted for autistic individuals with BN or BED is warranted.

#### **4.4 Strengths and Limitations of the Reviews**

To our knowledge, this is the first review of new or adapted treatments for ED and comorbid ASC, and of the impact of ASC comorbidity on clinical outcomes in patients with ED, that has used a broad range of databases and a systematic search strategy. An earlier literature review which focused on ASC in AN briefly explored the potential impact of ASC symptoms on treatment outcome in ED groups as a sub-topic (Westwood & Tchanturia, 2017) and included three publications (Nielsen et al., 2015; Stewart et al., 2017; Tchanturia et al., 2016), all of which were included in the current review.

This review has some limitations. Including manuscripts in English language only could potentially lead to loss of data when studies are excluded. Search strategies were therefore carefully tested and bibliographies of included studies and relevant reviews hand checked to minimise data loss. A number of the included studies suffered from small sample sizes, with five (55%) having fewer than 100 and two (22%) having fewer than 50 participants, which may have led to a lack of power to identify true differences between patients with and without ASC. Missing data was another pervasive problem in the clinical studies included in this review, with one case series reporting only 41% complete data for patients with high autistic features (Dandil et al., 2020), and another cross-sectional study using audit data also reporting high attrition rates at follow-up (Li et al., 2020). Nevertheless, the results synthesised from these early studies are hypothesis generating and warrant future research on ASC and EDs with more robust study designs.

## **5. Conclusion and Future directions**

There has been only one identifiable clinical pathway of treatment adaptations for patients with AN and comorbid ASC – the PEACE pathway. Early studies, one focusing on the value of a single component of the pathway (PEACE huddles), as perceived by clinicians, and one focusing on the impact of the pathway on length of hospital stay and associated costs, have produced positive indications to hypothesise that the PEACE pathway may generate benefits for ASC comorbid patients. Results from the cost-savings analysis, in particular, may suggest that the PEACE pathway is better able to support patients with comorbid ASC, leading to reduced lengths of hospital stay, however further research is needed to confirm this. Evidence of clinical and cost-effectiveness is therefore needed to determine whether similar adaptations should be implemented in more ED services.

Studies exploring the impact of ASC comorbidity on treatment outcomes in patients with ED suggest that ASC characteristics have no impact on ED symptoms and physical outcomes of treatment, but could be associated with higher rates of comorbidities and greater use of, and thus perhaps need for, intensive treatment. This may suggest that any new treatments or adaptations to existing treatments may not directly impact on ED symptoms, but may be better able to support the complex needs of the ASC population, thus reducing subsequent need for intensive support. Initial evidence from the PEACE pathway supports this

hypothesis that treatment and service level adaptations may help to reduce this greater use of intensive treatment. Nevertheless, controlled studies utilising a robust longitudinal design and following stringent diagnostic criteria are clearly needed to further elucidate the relationship between ASC characteristics and treatment outcomes in ED. A universal screening tool for ASC in ED is also needed to establish consistency across studies.

## References

- Allison, C., Auyeung, B., & Baron-Cohen, S. (2012). Toward brief “red flags” for autism screening: the short autism spectrum quotient and the short quantitative checklist in 1,000 cases and 3,000 controls. *Journal of the American Academy of Child & Adolescent Psychiatry, 51*(2), 202-212. e207.
- Anckarsäter, H., Hofvander, B., Billstedt, E., Gillberg, I. C., Gillberga, C., Wentz, E., & Råstama, M. (2012). The sociocommunicative deficit subgroup in anorexia nervosa: autism spectrum disorders and neurocognition in a community-based, longitudinal study. *Psychological Medicine, 42*(9), 1957-1967. doi:10.1017/S0033291711002881
- Association, A. P. (1987). *Diagnostic and statistical manual of mental disorders (DSM-III-R)* (3rd ed.). Washington DC: American Psychiatric Press.
- Association, A. P. (1994). *Diagnostic and statistical manual of mental disorders (DSM-IV)* (4th ed.). Washington DC: American Psychiatric Press.
- Association, A. P. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)* (5th ed.). Washington DC: American Psychiatric Press.
- Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (2001). The Autism-Spectrum Quotient (AQ): Evidence from Asperger Syndrome/High-Functioning Autism, Males and Females, Scientists and Mathematicians. *Journal of Autism and Developmental Disorders, 31*(1), 5-17. doi:10.1023/A:1005653411471
- Broder-Fingert, S., Brazauskas, K., Lindgren, K., Iannuzzi, D., & Van Cleave, J. (2014). Prevalence of overweight and obesity in a large clinical sample of children with autism. *Academic pediatrics, 14*(4), 408-414.
- Brown, C. M., & Stokes, M. A. (2020). Intersection of Eating Disorders and the Female Profile of Autism. *Child and Adolescent Psychiatric Clinics of North America, 29*(2), 409-417. doi:<https://doi.org/10.1016/j.chc.2019.11.002>
- Burgess, P. W., & Shallice, T. (1996). Bizarre responses, rule detection and frontal lobe lesions. *Cortex, 32*(2), 241-259.
- Chevallier, C., Grèzes, J., Molesworth, C., Berthoz, S., & Happé, F. (2012). Brief report: Selective social anhedonia in high functioning autism. *Journal of Autism and Developmental Disorders, 42*(7), 1504-1509.
- Dandil, Y., Smith, K., Adamson, J., & Tchanturia, K. (2020). Individual cognitive remediation therapy benefits for patients with anorexia nervosa and high autistic features. *European Eating Disorders Review, 28*(1), 87-91. Retrieved from <https://openathens.ovid.com/secure-ssl/home.oa?idpselect=https://kclidp.kcl.ac.uk/idp/shibboleth&entityID=https://kclidp>



[kcl.ac.uk/idp/shibboleth/?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medl&AN=31713309](http://kcl.ac.uk/idp/shibboleth/?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medl&AN=31713309)

[http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1002%2Ferv.2707&genre=article&atitle=Individual+cognitive+remediation+therapy+benefits+for+patients+with+anorexia+nervosa+and+high+autistic+features.&title=European+Eating+Disorder+s+Review&issn=1072-4133&date=2020&volume=28&issue=1&spage=87&aulast=Dandil+Y&isbn=&char\\_set=utf8](http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1002%2Ferv.2707&genre=article&atitle=Individual+cognitive+remediation+therapy+benefits+for+patients+with+anorexia+nervosa+and+high+autistic+features.&title=European+Eating+Disorder+s+Review&issn=1072-4133&date=2020&volume=28&issue=1&spage=87&aulast=Dandil+Y&isbn=&char_set=utf8)

- Davies, H., Wolz, I., Leppanen, J., Fernandez-Aranda, F., Schmidt, U., & Tchanturia, K. (2016). Facial expression to emotional stimuli in non-psychotic disorders: A systematic review and meta-analysis. *Neurosci Biobehav Rev*, *64*, 252-271. doi:10.1016/j.neubiorev.2016.02.015
- Dewey, M. (1991). Living with Asperger's syndrome. *Autism and Asperger syndrome*, 184-206.
- Drummond, M. F., Sculpher, M. J., Claxton, K., Stoddart, G. L., & Torrance, G. W. (2015). *Methods for the Economic Evaluation of Health Care Programmes*. Oxford, UNITED KINGDOM: Oxford University Press.
- Fairburn, C. G., Cooper, Z., & O'Connor, M. (1993). The eating disorder examination. *International Journal of Eating Disorders*, *6*, 1-8.
- Gesi, C., Carmassi, C., Luciano, M., Bossini, L., Ricca, V., Fagiolini, A., . . . Dell'Osso, L. (2017). Autistic Traits in Patients with Anorexia Nervosa, Bulimia Nervosa or Binge Eating Disorder: A Pilot Study. *European Psychiatry*, *41*(S1), S100-S100. doi:10.1016/j.eurpsy.2017.01.310
- Gillberg, C. (1983). Are autism and anorexia nervosa related? *The British Journal of Psychiatry*, *142*(4), 428-428.
- Gillberg, C., Gillberg, C., Råstam, M., & Wentz, E. (2001). The Asperger Syndrome (and high-functioning autism) Diagnostic Interview (ASDI): a preliminary study of a new structured clinical interview. *Autism*, *5*(1), 57-66. doi:10.1177/1362361301005001006
- Gillberg, I. C., & Gillberg, C. (1989). Asperger Syndrome—Some Epidemiological Considerations: A Research Note. *Journal of Child Psychology and Psychiatry*, *30*(4), 631-638. doi:<https://doi.org/10.1111/j.1469-7610.1989.tb00275.x>
- Gotham, K., Risi, S., Pickles, A., & Lord, C. (2007). The Autism Diagnostic Observation Schedule: revised algorithms for improved diagnostic validity. *Journal of Autism and Developmental Disorders*, *37*(4), 613-627.
- Halladay, A. K., Bishop, S., Constantino, J. N., Daniels, A. M., Koenig, K., Palmer, K., . . . Szatmari, P. (2015). Sex and gender differences in autism spectrum disorder: summarizing evidence gaps and identifying emerging areas of priority. *Molecular Autism*, *6*(1), 36. doi:10.1186/s13229-015-0019-y
- Harrison, A., Mountford, V. A., & Tchanturia, K. (2014). Social anhedonia and work and social functioning in the acute and recovered phases of eating disorders. *Psychiatry Research*, *218*(1-2), 187-194.
- Hill, A. P., Zuckerman, K. E., & Fombonne, E. (2015). Obesity and autism. *Pediatrics*, *136*(6), 1051-1061.
- Hobson, H., Westwood, H., Conway, J., McEwen, F. S., Colvert, E., Catmur, C., . . . Happe, F. (2020). Alexithymia and autism diagnostic assessments: evidence from twins at genetic risk of autism and adults with anorexia nervosa. *Research in Autism Spectrum Disorders*, *73*, 101531.
- Huke, V., Turk, J., Saeidi, S., Kent, A., & Morgan, J. F. (2013). Autism spectrum disorders in eating disorder populations: a systematic review. *European Eating Disorders Review*, *21*(5), 345-351.

- Huke, V., Turk, J., Saeidi, S., Kent, A., & Morgan, J. F. (2014). The clinical implications of high levels of autism spectrum disorder features in anorexia nervosa: a pilot study. *European Eating Disorders Review*, 22(2), 116-121. Retrieved from <https://openathens.ovid.com/secure-ssl/home.ova?idpselect=https://kclidp.kcl.ac.uk/idp/shibboleth&entityID=https://kclidp.kcl.ac.uk/idp/shibboleth&T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=med11&AN=24277715>  
[http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1002%2Ferv.2269&genre=article&atitle=The+clinical+implications+of+high+levels+of+autism+spectrum+disorder+features+in+anorexia+nervosa%3A+a+pilot+study.&title=European+Eating+Disorders+Review&issn=1072-4133&date=2014&volume=22&issue=2&spage=116&aulast=Huke+V&isbn=&\\_char\\_set=utf8](http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1002%2Ferv.2269&genre=article&atitle=The+clinical+implications+of+high+levels+of+autism+spectrum+disorder+features+in+anorexia+nervosa%3A+a+pilot+study.&title=European+Eating+Disorders+Review&issn=1072-4133&date=2014&volume=22&issue=2&spage=116&aulast=Huke+V&isbn=&_char_set=utf8)
- Hull, L., Petrides, K., & Mandy, W. (2020). The female autism phenotype and camouflaging: A narrative review. *Review Journal of Autism and Developmental Disorders*, 1-12.
- Karjalainen, L., Gillberg, C., Råstam, M., & Wentz, E. (2016). Eating disorders and eating pathology in young adult and adult patients with ESSENCE. *Comprehensive Psychiatry*, 66, 79-86. doi:<https://doi.org/10.1016/j.comppsy.2015.12.009>
- Keys, A., Brožek, J., Henschel, A., Mickelsen, O., & Taylor, H. L. (1950). The biology of human starvation.(2 vols).
- Kinnaird, E., Dandil, Y., Li, Z., Smith, K., Pimblett, C., Agbalaya, R., . . . Tchanturia, K. (2020). Pragmatic Sensory Screening in Anorexia Nervosa and Associations with Autistic Traits. *Journal of Clinical Medicine*, 9(4), 20. Retrieved from <https://openathens.ovid.com/secure-ssl/home.ova?idpselect=https://kclidp.kcl.ac.uk/idp/shibboleth&entityID=https://kclidp.kcl.ac.uk/idp/shibboleth&T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=prem6&AN=32326069>  
[http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.3390%2Fjcm9041182&genre=article&atitle=Pragmatic+Sensory+Screening+in+Anorexia+Nervosa+and+Associations+with+Autistic+Traits.&title=Journal+of+Clinical+Medicine&issn=2077-0383&date=2020&volume=9&issue=4&spage=1182&aulast=Kinnaird+E&isbn=&\\_char\\_set=utf8](http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.3390%2Fjcm9041182&genre=article&atitle=Pragmatic+Sensory+Screening+in+Anorexia+Nervosa+and+Associations+with+Autistic+Traits.&title=Journal+of+Clinical+Medicine&issn=2077-0383&date=2020&volume=9&issue=4&spage=1182&aulast=Kinnaird+E&isbn=&_char_set=utf8)
- Kinnaird, E., Norton, C., & Tchanturia, K. (2017). Clinicians' views on working with anorexia nervosa and autism spectrum disorder comorbidity: a qualitative study. *BMC psychiatry*, 17(1), 1-8.
- Kinnaird, E., & Tchanturia, K. (2021). Looking beneath the surface: Distinguishing between common features in autism and anorexia nervosa. *Journal of Behavioral and Cognitive Therapy*, 31(1), 3-13. doi:<https://doi.org/10.1016/j.jbct.2020.09.001>
- Kornstein, S. G., Kunovac, J. L., Herman, B. K., & Culpepper, L. (2016). Recognizing Binge-Eating Disorder in the Clinical Setting: A Review of the Literature. *The primary care companion for CNS disorders*, 18(3), 10.4088/PCC.4015r01905. doi:10.4088/PCC.15r01905
- Leekam, S. R., Nieto, C., Libby, S. J., Wing, L., & Gould, J. (2007). Describing the sensory abnormalities of children and adults with autism. *Journal of Autism and Developmental Disorders*, 37(5), 894-910.
- Leppanen, J., Sedgewick, F., Treasure, J., & Tchanturia, K. (2018). Differences in the Theory of Mind profiles of patients with anorexia nervosa and individuals on the autism spectrum: A meta-analytic review. *Neuroscience & Biobehavioral Reviews*, 90, 146-163. doi:<https://doi.org/10.1016/j.neubiorev.2018.04.009>

- Li, Z., Dandil, Y., Toloza, C., Carr, A., Oyeleye, O., Kinnaird, E., & Tchanturia, K. (2020). Measuring Clinical Efficacy Through the Lens of Audit Data in Different Adult Eating Disorder Treatment Programmes. *Frontiers in psychiatry Frontiers Research Foundation*, *11*, 599945. Retrieved from <https://openathens.ovid.com/secure-ssl/home.ovidpselect=https://kclidp.kcl.ac.uk/idp/shibboleth&entityID=https://kclidp.kcl.ac.uk/idp/shibboleth&T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=prem&AN=33335491>  
<http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.3389%2Ffpsyt.2020.599945&genre=article&atitle=Measuring+Clinical+Efficacy+Through+the+Lens+of+Audit+Data+in+Different+Adult+Eating+Disorder+Treatment+Programmes.&title=Frontiers+in+psychiatry+Frontiers+Research+Foundation&issn=1664-0640&date=2020&volume=11&issue=&spage=599945&aurlast=Li+Z&isbn=& charset=utf8>
- Liddle, E. B., Batty, M. J., & Goodman, R. (2009). The social aptitudes scale: an initial validation. *Social psychiatry and psychiatric epidemiology*, *44*(6), 508.
- Lopez, C., Tchanturia, K., Stahl, D., Booth, R., Holliday, J., & Treasure, J. (2008). An examination of the concept of central coherence in women with anorexia nervosa. *International Journal of Eating Disorders*, *41*(2), 143-152.
- Lord, C. R., M.; DiLavore, PC.; Risi, S.; Gotham, K.; Bishop, S. (2012). *Autism Diagnostic Observation Schedule, Second Edition (ADOS-2) Manual (Part I): Modules 1–4*. Torrance, CA: Western Psychological Services.
- Mealey, A., Abbott, G., Byrne, L. K., & McGillivray, J. (2014). Overlap between autistic and schizotypal personality traits is not accounted for by anxiety and depression. *Psychiatry Res*, *219*(2), 380-385. doi:10.1016/j.psychres.2014.05.040
- Miller, W. R., & Rollnick, S. (2012). *Motivational interviewing: Helping people change*: Guilford press.
- Mito, H., Matsuura, N., Mukai, K., Yanagisawa, Y., Nakajima, A., Motoyama, M., . . . Matsunaga, H. (2014). The impacts of elevated autism spectrum disorder traits on clinical and psychosocial features and long-term treatment outcome in adult patients with obsessive-compulsive disorder. *Compr Psychiatry*, *55*(7), 1526-1533. doi:10.1016/j.comppsy.2014.05.005
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Group, P. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS medicine*, *6*(7), e1000097.
- Morgan, H., & Hayward, A. (1988). Clinical assessment of anorexia nervosa: the Morgan-Russell outcome assessment schedule. *The British Journal of Psychiatry*, *152*(3), 367-371.
- Nazar, B. P., Peynenburg, V., Rhind, C., Hibbs, R., Schmidt, U., Gowers, S., . . . Treasure, J. (2018). An examination of the clinical outcomes of adolescents and young adults with broad autism spectrum traits and autism spectrum disorder and anorexia nervosa: A multi centre study. *International Journal of Eating Disorders*, *51*(2), 174-179. Retrieved from <https://openathens.ovid.com/secure-ssl/home.ovidpselect=https://kclidp.kcl.ac.uk/idp/shibboleth&entityID=https://kclidp.kcl.ac.uk/idp/shibboleth&T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=med15&AN=29331075>  
<http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1002%2Feat.22823&genre=article&atitle=An+examination+of+the+clinical+outcomes+of+adolescents+and+young+adults+with+broad+autism+spectrum+traits+and+autism+spectrum+disorder+and+anorexia+nervosa%3A+A+multi+centre+study.&title=International+Journal+of+Eating+Disorders&issn=0276->

[3478&date=2018&volume=51&issue=2&spage=174&aulast=Nazar+BP&isbn=&\\_char\\_set=utf8](#)

- Nielsen, S., Anckarsater, H., Gillberg, C., Gillberg, C., Rastam, M., & Wentz, E. (2015). Effects of autism spectrum disorders on outcome in teenage-onset anorexia nervosa evaluated by the Morgan-Russell outcome assessment schedule: a controlled community-based study. *Molecular Autism*, 6, 14. Retrieved from <https://openathens.ovid.com/secure-ssl/home.oa?idpselect=https://kclidp.kcl.ac.uk/idp/shibboleth&entityID=https://kclidp.kcl.ac.uk/idp/shibboleth&?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=prem1&AN=25774282>
- [http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1186%2Fs13229-015-0013-4&genre=article&atitle=Effects+of+autism+spectrum+disorders+on+outcome+in+teenage-onset+anorexia+nervosa+evaluated+by+the+Morgan-Russell+outcome+assessment+schedule%3A+a+controlled+community-based+study.&title=Molecular+Autism&issn=2040-2392&date=2015&volume=6&issue=&spage=14&aulast=Nielsen+S&isbn=&\\_char\\_set=utf8](http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1186%2Fs13229-015-0013-4&genre=article&atitle=Effects+of+autism+spectrum+disorders+on+outcome+in+teenage-onset+anorexia+nervosa+evaluated+by+the+Morgan-Russell+outcome+assessment+schedule%3A+a+controlled+community-based+study.&title=Molecular+Autism&issn=2040-2392&date=2015&volume=6&issue=&spage=14&aulast=Nielsen+S&isbn=&_char_set=utf8)
- Numata, N., Nakagawa, A., Yoshioka, K., Isomura, K., Matsuzawa, D., Setsu, R., . . . Shimizu, E. (2021). Associations between autism spectrum disorder and eating disorders with and without self-induced vomiting: an empirical study. *Journal of Eating Disorders*, 9(1), 1-9.
- Oldershaw, A., Treasure, J., Hambrook, D., Tchanturia, K., & Schmidt, U. (2011). Is anorexia nervosa a version of autism spectrum disorders? *European Eating Disorders Review*, 19(6), 462-474.
- Organization, W. H. (1993). *The ICD-10 classification of mental and behavioural disorders: diagnostic criteria for research* (Vol. 2): World Health Organization.
- Organization, W. H. (2018). *International classification of diseases for mortality and morbidity statistics (11th Revision)*.
- Poquérusse, J., Pastore, L., Dellantonio, S., & Esposito, G. (2018). Alexithymia and autism spectrum disorder: a complex relationship. *Frontiers in psychology*, 9, 1196.
- Råstam, M. (1992). Anorexia nervosa in 51 Swedish adolescents: premorbid problems and comorbidity. *J Am Acad Child Adolesc Psychiatry*, 31(5), 819-829. doi:10.1097/00004583-199209000-00007
- Råstam, M., Gillberg, C., & Garton, M. (1989). Anorexia Nervosa in a Swedish Urban Region: A Population-Based Study. *British Journal of Psychiatry*, 155(5), 642-646. doi:10.1192/bjp.155.5.642
- Råstam, M., Gillberg, C., Gillberg, I. C., & Johansson, M. (1997). Alexithymia in anorexia nervosa: a controlled study using the 20-item Toronto Alexithymia Scale. *Acta Psychiatrica Scandinavica*, 95(5), 385-388.
- Rey, A. (1941). L'examen psychologique dans les cas d'encéphalopathie traumatique.(Les problems.). *Archives de psychologie*.
- Roberts, M. E., Barthel, F. M.-S., Lopez, C., Tchanturia, K., & Treasure, J. L. (2011). Development and validation of the Detail and Flexibility Questionnaire (DFlex) in eating disorders. *Eating behaviors*, 12(3), 168-174.
- Russell, G. (1979). Bulimia nervosa: an ominous variant of anorexia nervosa. *Psychological Medicine*, 9(3), 429-448. doi:10.1017/S0033291700031974
- Saure, E., Laasonen, M., Lepisto-Paisley, T., Mikkola, K., Algars, M., & Raevuori, A. (2020). Characteristics of autism spectrum disorders are associated with longer duration of anorexia nervosa: A systematic review and meta-analysis. *International*

- Journal of Eating Disorders*, 53(7), 1056-1079. Retrieved from <https://openathens.ovid.com/secure-ssl/home.ovid?idpselect=https://kclidp.kcl.ac.uk/idp/shibboleth&entityID=https://kclidp.kcl.ac.uk/idp/shibboleth&?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=prem6&AN=32181530>
- [http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1002%2Feat.23259&genre=article&atitle=Characteristics+of+autism+spectrum+disorders+are+associated+with+longer+duration+of+anorexia+nervosa%3A+A+systematic+review+and+meta-analysis.&title=International+Journal+of+Eating+Disorders&issn=0276-3478&date=2020&volume=53&issue=7&spage=1056&aulast=Saure+E&isbn=&\\_char\\_set=utf8](http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1002%2Feat.23259&genre=article&atitle=Characteristics+of+autism+spectrum+disorders+are+associated+with+longer+duration+of+anorexia+nervosa%3A+A+systematic+review+and+meta-analysis.&title=International+Journal+of+Eating+Disorders&issn=0276-3478&date=2020&volume=53&issue=7&spage=1056&aulast=Saure+E&isbn=&_char_set=utf8)
- Sedgewick, F., Leppanen, J., & Tchanturia, K. (2019). Autistic adult outcomes on weight and body mass index: A large-scale online study. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, 1-7.
- Smith, K. A., & Tchanturia, K. (2020). Are Huddles the Missing PEACE of the Puzzle in Implementing Clinical Innovation for the Eating Disorder and Autism Comorbidity? *Frontiers in psychiatry*, 11, 593720. doi:10.3389/fpsy.2020.593720
- South, M., Ozonoff, S., & McMahon, W. M. (2007). The relationship between executive functioning, central coherence, and repetitive behaviors in the high-functioning autism spectrum. *Autism*, 11(5), 437-451.
- Speranza, M., Loas, G., Wallier, J., & Corcos, M. (2007). Predictive value of alexithymia in patients with eating disorders: A 3-year prospective study. *Journal of psychosomatic research*, 63(4), 365-371.
- Stewart, C. S., McEwen, F. S., Konstantellou, A., Eisler, I., & Simic, M. (2017). Impact of ASD Traits on Treatment Outcomes of Eating Disorders in Girls. *European Eating Disorders Review*, 25(2), 123-128. Retrieved from <https://openathens.ovid.com/secure-ssl/home.ovid?idpselect=https://kclidp.kcl.ac.uk/idp/shibboleth&entityID=https://kclidp.kcl.ac.uk/idp/shibboleth&?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=med14&AN=28058799>
- [http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1002%2Ferv.2497&genre=article&atitle=Impact+of+ASD+Traits+on+Treatment+Outcomes+of+Eating+Disorders+in+Girls.&title=European+Eating+Disorders+Review&issn=1072-4133&date=2017&volume=25&issue=2&spage=123&aulast=Stewart+CS&isbn=&\\_char\\_set=utf8](http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1002%2Ferv.2497&genre=article&atitle=Impact+of+ASD+Traits+on+Treatment+Outcomes+of+Eating+Disorders+in+Girls.&title=European+Eating+Disorders+Review&issn=1072-4133&date=2017&volume=25&issue=2&spage=123&aulast=Stewart+CS&isbn=&_char_set=utf8)
- Stice, E. (1999). Clinical implications of psychosocial research on bulimia nervosa and binge-eating disorder. *Journal of Clinical Psychology*, 55(6), 675-683. doi:[https://doi.org/10.1002/\(SICD\)1097-4679\(199906\)55:6<675::AID-JCLP2>3.0.CO;2-3](https://doi.org/10.1002/(SICD)1097-4679(199906)55:6<675::AID-JCLP2>3.0.CO;2-3)
- Tchanturia, K., Dandil, Y., Li, Z., Smith, K., Leslie, M., & Byford, S. (2020). A novel approach for autism spectrum condition patients with eating disorders: Analysis of treatment cost-savings. *European Eating Disorders Review*, 10, 10. Retrieved from <https://openathens.ovid.com/secure-ssl/home.ovid?idpselect=https://kclidp.kcl.ac.uk/idp/shibboleth&entityID=https://kclidp.kcl.ac.uk/idp/shibboleth&?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medp&AN=32648631>
- <http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1002%2Ferv.2760&genre=article&atitle=A+novel+approach+for+autism+spectrum+condition+patients+with+eating+disorders%3A+Analysis+of+treatment+cost-savings.&title=European+Eating+Disorders+Review&issn=1072->

[4133&date=2020&volume=&issue=&spage=&aulast=Tchanturia+K&isbn=&\\_char\\_set=utf8](#)

- Tchanturia, K., Davies, H., Roberts, M., Harrison, A., Nakazato, M., Schmidt, U., . . . Morris, R. (2012). Poor cognitive flexibility in eating disorders: examining the evidence using the Wisconsin Card Sorting Task. *PLoS One*, 7(1), e28331.  
doi:10.1371/journal.pone.0028331
- Tchanturia, K., Hambrook, D., Curtis, H., Jones, T., Lounes, N., Fenn, K., . . . Davies, H. (2013). Work and social adjustment in patients with anorexia nervosa. *Comprehensive Psychiatry*, 54(1), 41-45.
- Tchanturia, K., Larsson, E., & Adamson, J. (2016). How anorexia nervosa patients with high and low autistic traits respond to group Cognitive Remediation Therapy. *BMC Psychiatry*, 16(1), 334. Retrieved from <https://openathens.ovid.com/secure-ssl/home.oa?idpselect=https://kclidp.kcl.ac.uk/idp/shibboleth&entityID=https://kclidp.kcl.ac.uk/idp/shibboleth&T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medp&AN=27682072>  
[http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1186%2Fs12888-016-1044-x&genre=article&atitle=How+anorexia+nervosa+patients+with+high+and+low+autistic+traits+respond+to+group+Cognitive+Remediation+Therapy.&title=BMC+Psychiatry&issn=1471-244X&date=2016&volume=16&issue=1&spage=334&aulast=Tchanturia+K&isbn=&\\_char\\_set=utf8](http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1186%2Fs12888-016-1044-x&genre=article&atitle=How+anorexia+nervosa+patients+with+high+and+low+autistic+traits+respond+to+group+Cognitive+Remediation+Therapy.&title=BMC+Psychiatry&issn=1471-244X&date=2016&volume=16&issue=1&spage=334&aulast=Tchanturia+K&isbn=&_char_set=utf8)
- Tchanturia, K., Smith, K., Glennon, D., & Burhouse, A. (2020). Towards an Improved Understanding of the Anorexia Nervosa and Autism Spectrum Comorbidity: PEACE Pathway Implementation. *Frontiers in psychiatry*, 11(640).  
doi:10.3389/fpsyt.2020.00640
- Westwood, H., Eisler, I., Mandy, W., Leppanen, J., Treasure, J., & Tchanturia, K. (2016). Using the autism-spectrum quotient to measure autistic traits in anorexia nervosa: a systematic review and meta-analysis. *Journal of Autism and Developmental Disorders*, 46(3), 964-977.
- Westwood, H., Mandy, W., & Tchanturia, K. (2017). Clinical evaluation of autistic symptoms in women with anorexia nervosa. *Molecular Autism*, 8, 12. Retrieved from <https://openathens.ovid.com/secure-ssl/home.oa?idpselect=https://kclidp.kcl.ac.uk/idp/shibboleth&entityID=https://kclidp.kcl.ac.uk/idp/shibboleth&T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=med14&AN=28331571>  
[http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1186%2Fs13229-017-0128-x&genre=article&atitle=Clinical+evaluation+of+autistic+symptoms+in+women+with+anorexia+nervosa.&title=Molecular+Autism&issn=2040-2392&date=2017&volume=8&issue=&spage=12&aulast=Westwood+H&isbn=&\\_char\\_set=utf8](http://sfx.kcl.ac.uk/kings?sid=OVID:medline&id=pmid:&id=doi:10.1186%2Fs13229-017-0128-x&genre=article&atitle=Clinical+evaluation+of+autistic+symptoms+in+women+with+anorexia+nervosa.&title=Molecular+Autism&issn=2040-2392&date=2017&volume=8&issue=&spage=12&aulast=Westwood+H&isbn=&_char_set=utf8)
- Westwood, H., Stahl, D., Mandy, W., & Tchanturia, K. (2016). The set-shifting profiles of anorexia nervosa and autism spectrum disorder using the Wisconsin Card Sorting Test: a systematic review and meta-analysis. *Psychological Medicine*, 46(9), 1809-1827.
- Westwood, H., & Tchanturia, K. (2017). Autism Spectrum Disorder in Anorexia Nervosa: An Updated Literature Review. *Current psychiatry reports*, 19(7), 41-41.  
doi:10.1007/s11920-017-0791-9

