Systematic Reviews

Autism spectrum disorder and personality disorders: Comorbidity and differential diagnosis

Camilla Rinaldi, Margherita Attanasio, Marco Valenti, Monica Mazza, Roberto Keller

Abstract

**BACKGROUND**
Differential diagnosis, comorbidities and overlaps with other psychiatric disorders are common among adults with autism spectrum disorder (ASD), but clinical assessments often omit screening for personality disorders (PD), which are especially common in individuals with high-functioning ASD where there is less need for support.

**AIM**
To summarize the research findings on PD in adults with ASD and without intellectual disability, focusing on comorbidity and differential diagnosis.

**METHODS**
PubMed searches were performed using the key words “Asperger’s Syndrome”, “Autism”, “Personality”, “Personality disorder” and “comorbidity” in order to identify relevant articles published in English. Grey literature was identified through searching Google Scholar. The literature reviews and reference sections of selected papers were also examined for additional potential studies. The search was restricted to studies published up to April 2020. This review is based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses method.

**RESULTS**
The search found 22 studies carried out on ASD adults without intellectual disability that met the inclusion criteria: 16 evaluated personality profiles or PD (comorbidity), five compared ASD and PD (differential diagnosis) and one performed both tasks. There were significant differences in the methodological...

---

**ORCID number:** Camilla Rinaldi 000000026873927; Margherita Attanasio 0000-0002-4571-3173; Marco Valenti 0000-0001-943-3456; Monica Mazza 0000-0003-4050-2243; Roberto Keller 0000-0002-6873-9827.

**Author contributions:** Rinaldi C wrote the paper and collected and interpreted the data; Attanasio M incorporated changes during the course of review and edited the paper; Valenti M and Mazza M reviewed and critically revised the paper; Keller R conceived, supervised and reviewed the study and finalized the manuscript. All authors read and approved the final manuscript.

**Conflict-of-interest statement:** The authors declare no conflict of interests for this article.

**PRISMA 2009 Checklist statement:** The authors have read the PRISMA 2009 Checklist, and the manuscript was prepared and revised according to the PRISMA 2009 Checklist.

**Country/Territory of origin:** Italy

**Specialty type:** Psychiatry

**Provenance and peer review:** Invited article; Externally peer reviewed.

**Peer-review model:** Single blind
Autism spectrum disorder (ASD) is a neurodevelopmental disorder with an early onset and a genetic component. ASD is characterized by deficits in socio-emotional reciprocity, by impaired verbal and non-verbal communication skills, and by an inability to develop and maintain adequate social relationships with peers, and is associated with the presence of repetitive verbal and motor behaviours, restricted patterns of interest, the need for an unchanging (or at least predictable and stable) environment and hypo- or hypersensitivity to sensory inputs. The onset of clinical symptoms occurs during the early years of life[1].

The severity of ASD symptoms, intellectual functioning, age at diagnosis and psychiatric comorbidity have been shown to account for heterogeneity in clinical presentation, functioning and outcome[2-4].

The Diagnostic and Statistical Manual of Mental Disorders, 5th Edition[1] classifies three levels of ASD functioning. Level 1, which requires support, is the best functioning and includes the previous definitions of high-functioning ASD (a term commonly used in clinical practice) and Asperger’s syndrome (AS), the closest to neurotypical functioning[1]. ASD level 1 may not have been diagnosed in adulthood and may also have been misdiagnosed as a psychiatric disorder[5,6]. Late-diagnosed individuals show higher levels of co-occurring psychiatric conditions, potentially related to the long-term stress in adaptation to daily life in society[7].

The most common coexisting psychiatric disorders in subjects with ASD include attention deficit hyperactivity disorder (ADHD)[8], obsessive–compulsive disorder[9,10], psychosis[11-13] and mood and anxiety disorders[14-16]. It is possible that adults with ASD level 1 are vulnerable to such disorders[17], in part because of their greater insight into their deficits[18] and greater sensitivity to discrimination[19].

The high frequency of co-occurring disorders and the development of learnt or camouflaging strategies[20] make it difficult to diagnose ASD in adults, especially in women[21,22]. Misdiagnosis, differential diagnoses, comorbidities and overlapping behaviour with other psychiatric diagnoses, as well as personality disorders (PD), should be considered[23]. While these patients are usually screened for the presence of approaches, including the ASD diagnostic instruments and personality measures. Cluster A and cluster C PD are the most frequent co-occurring PD, but overlapping features should be considered. Data on differential diagnosis were only found with cluster A and cluster B PD.

CONCLUSION
ASD in high-functioning adults is associated with a distinct personality profile even if variability exists. Further studies are needed to explore the complex relationship between ASD and PD.

Key Words: Autism spectrum disorder; Asperger’s Syndrome; Personality disorder; Adulthood; Comorbidity; Differential diagnosis
Axis I disorders, Axis II comorbidities are less often evaluated in this sample of patients[15]. However, in a recent survey Keller et al[24] found a PD comorbidity in ASD in 24% of the sample.

PD are enduring and pervasive patterns of inner experience and behaviour that deviate markedly from the expectations of the individual’s culture, resulting in distress and impairment[1]. Both PD and ASD are life-long and egosyntonic disorders.

There is a growing interest in exploring the complex relationship between ASD and PD, because a better understanding of this topic may enhance the diagnostic process and also inform targeted interventions.

The purpose of this review is to summarize the research findings on PD in adults with ASD, focusing on comorbidity and differential diagnosis.

**MATERIALS AND METHODS**

The present review adhered to the standards set out in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines[25]. A systematic review of the literature was performed through PubMed, using combinations of the following search terms: Asperger’s Syndrome or Autism + Personality/Personality disorder or + comorbidity. The search was restricted to studies published up to April 2020. Grey literature was identified through searching Google Scholar. The literature reviews and reference sections of selected papers were also examined for additional potential studies. All records that remained following the removal of duplicates were screened for the inclusion criteria.

Studies were included in this review if they examined PD (as a comorbid or differential diagnosis) in ASD samples. Only studies published in the English language and performed on adults without intellectual disability were selected. In studies for which IQ data were not reported, the participants had to be diagnosed with AS or high-functioning autism (HFA)/ASD level 1. Investigations carried out on non-clinical samples were excluded. Studies evaluating autistic traits in PD patients were also excluded. There were no restrictions made for the geographical region or setting of the study.

**RESULTS**

Figure 1 shows a PRISMA flow diagram of the systematic research process. The database search yielded a total of 6936 articles. Three additional records were identified through other techniques (ancestry method, grey literature searches and expert consultation). Following the removal of duplicates, 5808 articles remained for screening.

Upon screening of the records, a further 5735 articles were excluded for a variety of reasons, including a focus on different research topics or a failure to satisfy the inclusion criteria. Thus, the full texts of 74 articles were assessed, 22 of which qualified for inclusion.

In order to perform a better analysis, the studies were grouped into two main classes: Those examining personality or PD in ASD adults using categorical and dimensional models (comorbidity); and those comparing ASD with PD on personality traits or psychological functioning (differential diagnosis). In addition, one study[26] performed both tasks.

The characteristics of the studies included in this review are summarized in Table 1.

Seven reviews on psychiatric comorbidity/differential diagnosis of adults with ASD that also referred to PD were found[5,27-32], but only two papers were specifically focused on PD[33,34].

**Personality disorders as comorbid diagnosis**

Among studies exploring personality features in ASD, only a few assessed PD as a categorical diagnosis using the Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II)[35,36] or the International Personality Disorder Examination (IPDE)[37] (see Table 2). As autistic traits overlap with aspects of several PD, dimensional measures were preferred to assess personality in adults with ASD.

**Structured Clinical Interview for DSM-IV**

A study[14] carried out on 117 patients with ASD found that 62% of the sample met
| Ref. | Setting | Aim | Statistical methods | Limitations |
|------|---------|-----|---------------------|-------------|
| Soderstrom et al [50], 2002 | Neuropsychiatric Clinic in Sweden | To study the personality characteristics of adults with AS | One sample t-test | Small sample size |
| Anckarsäter et al [47], 2006 | Neuropsychiatric Clinic in Sweden | To describe PD in relations to ADHD and ASD symptoms | One sample t - test | Non-specific symptoms may be overselected |
| Ketelaars et al [43], 2008 | Center of Expertise for Autism in Netherlands | To explore difference between patients with mild ASD and patients without ASD in term of AQ scores and psychiatric comorbidity | $\chi^2$ test | Small sample size |
| Rydén and Bejerot [40], 2008 | Psychiatric setting (tertiary unit) in Sweden | To characterize psychiatric patients with ASD in regard to demographical factors, psychiatric comorbidity and personality traits and compare the ASD group with a psychiatric control group; to compare differences of personality traits between females and males in the ASD group. | Fisher exact test; t-test; Kruskal-Wallis test | Not ADOS/ADI-R for assessing ASD; A naturalistic study |
| Hofvander et al [14], 2009 | Neuropsychiatric Hospital in France Neuropsychiatric Clinic in Sweden | To describe the clinical presentation and psychosocial outcome of a group of normal intelligence adults with ASD | $\chi^2$ test | Lack of comparison group; Two studies sites; Prevalence of comorbid psychiatric conditions may be overestimated |
| Sizoo et al [49], 2009 | Two diagnostic centers specialized for adult patients with developmental disorders in Netherlands | To test whether adults with ASD or ADHD have distinct personality profiles, to assess how personality profiles in these groups differed by SUD status | One sample t-test | The clinically based diagnostic procedures; The absence of a psychiatic control group; All participants were diagnosed in adulthood |
| Geurts and Jansen [44], 2011 | Tertiary psychiatric unit from diagnosing ASD in Netherlands | To draw the pathway to a diagnosis for adults referred to ASD assessment | Mann-Whitney U tests; Kruskal-Wallis tests; $\chi^2$ test | Retrospective chart study; Not standardized clinical interviews for assessing axis I and axis II diagnosis |
| Kanai et al [59], 2011 | University Hospital in Japan | To examine the clinical characteristics of adults with AS | Spearman’s rank correlation coefficient | Small sample size |
| Kanai et al [67], 2011 | University Hospital in Japan | To examine the clinical characteristics of adults with AS | Mann-Whitney U test | Small sample size |
| Lugnegård et al [34], 2012 | Neuropsychiatric clinics in Sweden | To explore the presence of PD in young adults with AS | $\chi^2$ test | Small sample size |
| Schriber et al [55], 2014 | Local recruitment by physicians, psychologists, speech and language pathologists, occupational therapists, advocacy groups, regional centers, ASD support groups in United States | To compare self-reports of Big Five personality traits in adults with ASD to those of typically developing adults. | Independent sample t test | Small sample size |
| Hesselmark et al [62], 2015 | Tertiary psychiatric unit for diagnosing ASD; a community based facility for ASD; a website for ASD | To test validity and reliability of self-report data using the NEO-PI-R in adults with ASD | Independent sample t - test | Small sample size |
| Strunz et al [26], 2015 | Department of Psychiatry at a University Hospital in Germany | To identify personality traits in adults with ASD and to differentiate them from patients with NPD, BPD and NCC | MANOVA | Selection bias (BPD and NPD were inpatients, while ASD were outpatients) |
| Helles et al [52], 2016 | Neuropsychiatric Centre in Sweden | To examine temperament and character in males who were diagnosed with AS in childhood and followed prospectively over almost two decades | t-test; Kruskal-Wallis H testDunn’s post hoc test | Only men with AS |
| Authors               | Location                          | Methodology                                                                                           | Results                                                                 |
|----------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Schwartzman et al[36], 2016 | On line recruitment United States | To assess and compare personality traits of adults with and without elevated ASD traits using, the Five Factor Model of personality | t-test | Online administration of self-report questionnaires; Sample was not representative of adult population with ASD |
| Vuijk et al[31], 2016 | Expertise Centre for Autism in Netherland | To investigated temperament and character dimensions of men with ASD by individual case matching to a comparison group. | t-test | Only men with ASD |
| Ozonoff et al[65], 2005 | University Child and Adolescent specialized clinic in United States | To explore personality and psychopathology in adult with ASD | Independent sample | Small sample size |
| López-Pérez et al[95], 2017 | Four different mental health institutions in Spain | To examine use of different interpersonal ER strategies in BPD and AS compared to normative control participants | ANOVA | Self-reports of interpersonal ER; ToM was not assessed |
| Dudas et al[92], 2017 | CARD, online responders to a website | To compare ASC, BPD, and comorbid patients in terms of autistic traits, empathy, and systemizing | ANOVA | Diagnosis was based on self-report of patients |
| Murphy[100], 2006 | High security psychiatric care in UK | To compare the ToM performance of three forensic patient groups (AS, Schizophrenia and PD patients) | Kruskal-Wallis H test | No control for the potential influence of medication on cognitive functioning |
| Stanfield et al[67], 2017 | Clinical and support services in Scotland; Nonpsychotic people who had previously participated in the EHRS of schizophrenia | To compare Social Cognition in ASD and SPD using functional magnetic resonance imaging (fMRI). | Kruskal-Wallis tests | Small sample size |
| Bouules-Katri et al[84], 2019 | Patients and relatives of schizophrenia patients attending psychiatric service at a hospital in Spain; Public advertisements | To compare the ToM performance of a group of HFA and SSPD with a matched HC group | t-test | SSPD sample consisted of non-clinical individuals |

ADHD: Attention deficit hyperactivity disorder; ADI-R: Autism diagnostic interview - revised; ADOS: Autism diagnostic observation schedule-generic; AQ: Autism quotient; AS: Asperger Syndrome; ASC: Autism spectrum condition; ASD: Autism spectrum disorder; BPD: Borderline personality disorder; Er: emotion regulation; HC: Health control; HFA: High-functioning autism; NCC: Non-clinical controls; NEO-PI-R: NEO personality inventory revised; NPD: Narcissistic personality disorder; PD: Personality disorder; SPD: Schizotypal personality disorder; SSPD: Schizotypal-schizoid personality disorder; SUD: Substance use disorder; ToM: Theory of mind.

the criteria for at least one PD: primarily obsessive–compulsive (32%), avoidant (25%) and schizoid PD (21%). Concerning cluster B PD, rates of comorbidity were low, but antisocial disorder was common in the pervasive developmental disorder subgroup. A high number of patients (35%) had more than two PD. The prevalence of PD did not differ between genders, with the exception of schizoid PD, which was significantly more common among women.

Lugnegård et al[38] reported that 48% of a sample of 54 young adults with AS fulfilled the criteria for a cluster A or cluster C PD diagnosis. This evidence was in line with Gillberg and Billstedt’s review[27] reporting no cluster B PD comorbidity in this sample of patients. It is surprising that paranoid and dependent PD diagnoses were not found. There was a significant difference in PD prevalence between genders: 65% in males versus 32% in females. Patients with AS and a concomitant PD showed more marked autistic features according to the autism spectrum quotient (AQ)[39].

Similarly, no cluster B PD comorbidity was found by Strunz et al[26]. In research examining personality pathology in ASD compared to specific PD, 45% of ASD patients met the criteria for an Axis II PD diagnosis. In particular, 36% of ASD patients
met the criteria for schizoid PD, 17% for obsessive–compulsive PD and 2% for avoidant and paranoid PD diagnoses.

These findings are in line with those reported by Rydén and Bejerot[40]. They assessed adults with ASD having no intellectual disability using the structured clinical interview for DSM-IV (SCID-II) screen[41] and the Swedish Universities Scales of Personality[42]. Avoidant and schizotypal personality traits were more common in patients with ASD compared to the control group (patients without ASD). Patients with ASD scored higher on detachment and stress susceptibility and had a median of four PD compared to two in the control group. More than 40% of the ASD group reached the cut-off score for avoidant, borderline and obsessive–compulsive PD, more than a third had depressive, schizotypal, schizoid and narcissistic PD and at least 25% reached the cut-off for paranoid and passive-aggressive PD. Females with ASD scored significantly higher than males on borderline and passive-aggressive traits.

In a pilot study on adults with mild ASD, Ketelaars et al[43] found partial or complete PD, assessed by the IPDE[37], in more than half of the sample. Schizoid and avoidance were the most frequent PD. There were no significant differences in the pattern of Axis II comorbidity between the ASD and the non-ASD patients.

Instead, in a retrospective chart study[44] on adults screened for ASD, only 15% of ASD patients had a lifetime PD diagnosis. This lower comorbidity is probably due to the fact that one third of the patient group had an intellectual disability. People with autism and an intellectual disability were less likely to receive a diagnosis of PD[45, 46].

In a study on Temperament Character Inventory (TCI) profiles in ASD and ADHD[47], the presence of PD was assessed with the SCID-II in a subgroup of patients with childhood onset of a neuropsychiatric disorder: 75% of the sample met the criteria for at least one PD. Specific PD prevalences are presented in Table 3.
### Table 3: Specific personality disorders (Structured clinical interview for DSM-IV axis II diagnosis) prevalence in autism spectrum disorder samples

| PD              | Lugnegård et al[38], 2012 | Hofvander et al[14], 2009 | Anckarsäter et al[47], 2006 | Strunz et al[26], 2015 |
|-----------------|---------------------------|---------------------------|----------------------------|------------------------|
| Paranoid        | 0%                        | 19%                       | 25.5% ASD; 25.9% ASD + ADHD | 2%                     |
| Schizoid        | 26%                       | 13%                       | 31.9% ASD; 22.2% ASD + ADHD | 36%                    |
| Schizotypal     | 2%                        | 21%                       | 23.4% ASD; 11.1% ASD + ADHD | 0%                     |
| Antisocial      | 0%                        | 3%                        | 0% ASD; 18.5% ASD + ADHD    | 0%                     |
| Histrionic      | 0%                        | 0%                        | 0%                         | 0%                     |
| Borderline      | 0%                        | 9%                        | 10.6% ASD; 14.8% ASD + ADHD | 0%                     |
| Narcissistic    | 0%                        | 3%                        | 6.4% ASD; 3.7% ASD + ADHD   | 0%                     |
| Avoidant        | 13%                       | 25%                       | 34% ASD; 11.1% ASD + ADHD   | 2%                     |
| Obsessive-compulsive | 19%              | 32%                       | 42.6% ASD; 29.6% ASD + ADHD | 17%                    |
| Dependent       | 0%                        | 5%                        | 8.5% ASD; 22.2% ASD + ADHD  | 0%                     |

PD: Personality disorders; ASD: Autism spectrum disorder; ADHD: Attention deficit hyperactivity disorder.

---

### Figure 1: Preferred reporting items for systematic reviews and meta-analyses flow diagram of the systematic research process.

**Temperament and character inventory**

Studies using the temperament and character inventory (TCI) to evaluate personality in patients with ASD are presented in Table 4[48]. Four TCI studies on adults with ASD[47,49-51] found low scores on the character dimensions of self-directedness and cooperativeness. Moreover, ASD was associated with high harm avoidance, low reward dependence, low novelty seeking and high self-transcendence. The high level of rare answer scores also reflects the oddity and social insensitivity inherent in the self-descriptions of subjects with ASD[50,52]. Cluster A and cluster C PD were more common in patients with ASD assessed with the TCI and confirmed with the SCID-II.
In the sample of AS patients included in another TCI study [50], the obsessional type of PD was the most frequent, followed by the passive-dependent, explosive and passive-aggressive types.

The TCI profiles differed somewhat when ASD was combined with a comorbid disorder such as ADHD [47] or substance abuse [49]. When ASD was comorbid with ADHD this was associated with higher levels of novelty seeking, whereas when ASD was comorbid with substance abuse this was associated with a higher degree of persistence and a lower degree of self-directedness compared to ASD patients without the comorbidity.

There was also some evidence indicating an association between temperament and character dimensions and long-term ASD diagnostic stability and psychiatric comorbidity. In a longitudinal cohort study by Helles et al. [52], the TCI was used to assess 40 males who were diagnosed with AS in childhood and followed prospectively over almost two decades. Three distinct temperament and character profiles emerged. Those no longer meeting the criteria for ASD had high reward dependence. It is also interesting to note that in another study [50] 35.5% of the sample had reward dependence scores above the general population mean, suggesting that a subgroup of individuals with AS desire closer social interaction than they are able to establish. The participants with a stable ASD diagnosis and no current psychiatric comorbidity (‘ASD pure group’) were characterized by lower novelty seeking and higher harm avoidance compared with normative data; however, compared to the other groups harm avoidance was lower than for the ‘ASD plus group’ (those with a stable ASD diagnosis and psychiatric comorbidity), which showed elevated harm avoidance and low self-directedness and cooperativeness. In the ASD plus group, comorbidity disorders were depression, anxiety disorder and/or ADHD.

Vuijk et al. [51] performed a re-analysis of scores on the TCI administered to a sample of 66 ASD men by individual case matching. Compared to the general population, patients with ASD scored significantly higher on the scale for harm avoidance, and lower on novelty seeking, reward dependence, self-directedness, and cooperativeness. These findings confirmed the results emerging from their previous research published in Dutch [53].

### Big five personality traits

In Table 5 a summary of studies measuring the Big Five personality traits [54] in ASD patients is presented.

Schriber et al. [55] investigated personality differences between ASD adults and neurotypical control adults using self-reports of the Big Five personality traits. Individuals with ASD were more neurotic, and less extraverted, agreeable, conscientious and open to experience, than neurotypical controls. The same

| Ref. | Participants | Comparison group | Measures | Personality measures | Results |
|------|--------------|------------------|----------|----------------------|---------|
| Anckarsäter et al. [47], 2006 | *n = 113 (6 autistic disorder, 46 AS, 66 Atypical Autism); 47ASD+ADHD 66 ASD* | Age and sex matched group | SCID-I; ASID; Y-BOCS; ASHFAQ; TCI | TCI; SCID-II | Lower NS, RD, SD, C; Higher HA; Cluster A and Cluster C PD were common |
| Soderstrom et al. [50], 2002 | *n = 31 AS* | Age and sex matched group | WAIS-III | TCI | Higher HA ST; Lower NS, RD, SD, C |
| Sizoo et al. [49], 2009 | *n = 75 (53 without SUD, 8 with past SUD, 14 with current SUD)* | *n = 657 NC* | ADI-R; ADOS; DSM-IV criteria checklists; WAIS-III | VTCI | Higher HA, ST; Lower RD, SD, C; Lower NS and RD for ASD without SUD; Higher P for subgroups with current or past SUD |
| Vuijk et al. [51], 2018 | *n = 66 (15 ASD, 25 AS, 26 PDD-NOS)* | Matched comparison group (age, education, marital status) | GAFWAIS-III;ASDI; BDI; ASRS | TCI | Higher HA, lower NS, RD, SD, C |
| Helles et al. [52], 2016 | *n = 40 AS* | Within comparison group (no longer ASD/ASD pure/ASD plus) | GAFWAIS-III;ASDI; BDI; ASRS | TCI | Higher RD in no longer ASD; Higher HA; lower NS in ASD pure; Higher HA, lower C, SD in ASD plus |

C: Cooperativeness; HA: Harm avoidance; NC: Neurotypical controls; NS: Novelty Seeking; P: Persistence; RD: Reward dependence; SD: Self-directedness; ST: Self-transcendence; SUD: Substance use disorder; SUD: No history of SUD; VTCI: Short version of temperament character inventory.
personality differences were confirmed when controlling for age, gender and self- and parent reports. The findings indicated that the personality profile distinguished between ASD and neurotypical controls but did not significantly distinguish severity symptoms between individuals with ASD.

In another study, Schwartzman et al.[56] compared adults with and without ASD using the International Personality Item Pool Representation of the NEO-PI-R (IPiP-NEO-120) as a trait measure. The IPiP-NEO-120, following the full-length version of the NEO[57,58], consists of 24 items per factor and 4 items per facet for a total of 120 items. The Big Five facets accounted for 70% of the variance in autism trait scores measured with the Ritvo Autism Asperger’s Diagnostic Scale Revised (RAADS-R)[59]. Neuroticism correlated positively with autism symptom severity, whereas extraversion, openness to experience, agreeableness and conscientiousness correlated negatively with autism symptom severity.

The clinical characteristics of AS adults, including depression, anxiety and personality (NEO Five-Factor Inventory, NEO-FFI)[57], were examined by Kanai et al.[59]. The AQ[39], Hospital Anxiety and Depression Scale (HADS)[60], Liebowitz Social Anxiety Scale (L-SAS)[61] and neuroticism scores were significantly higher in adults with AS than in controls, whereas the extraversion, agreeableness and conscientiousness scores were significantly lower. The total score of the AQ correlated with the anxiety subscale score of the HADS and the extraversion, openness and conscien-

---

**Table 5 Summary of studies measuring big five personality traits in adults with autism spectrum disorder**

| Ref. | Participants | Comparison group | Measures | Personality trait measures | Results |
|------|--------------|-----------------|----------|---------------------------|---------|
| Schwartzman et al[56], 2016 | n = 364 adults with elevated ASD traits | n = 464 adults with lower ASD traits | RAADS-R | IPiP-NEO-120 | Neuroticism was positively correlated with ASD symptomatology; Extraversion, openness to experience, conscientiousness, and agreeableness were negatively correlated with ASD; About 70% of the variance in RAADS-R scores accounted for by the IPiP-NEO-120 facets. A great variability in personality traits emerged in the elevated ASD traits group with four distinct clusters of FFM personality types. |
| Schriber et al [55], 2014 | n = 37 ASD (29% HFA, 57% AS, 14% PDD-NOS) | n = 42 NC | WAIS; ADOS G | BFI | Higher Neuroticism Lower Openness to experience, Conscientiousness, Extraversion, Agreeableness |
| Kanai et al[67], 2011 | n = 64 AS | n = 65 NC | AQ; HADS; L-SAS | NEO-FFI | AQ, HADS, and L-SAS were significantly higher in AS than in control. Higher Neuroticism, Lower Extraversion, Agreeableness, Conscientiousness AQ correlated with the subscale scores of HADS and NEO-FFI in AS |
| Strunz et al[26], 2015 | n = 59 ASD(83% AS, 17% HFA) | n = 62 NPD, 80 BPD, 106 NC | SCID-I/MINI | NEO-PI-R; DAPP BQ; SCID-II | On the NEO-PI-R: Conscientiousness: NCC = ASD < BPD and NPD Neuroticism: NCC < ASD < NPD < BPD; Extraversion: ASD < BPD, NPD, NCC; Openness for experience: ASD < NCC, BPD, NPD Agreeableness: ASD > BPD and NPD > NCC; the DAPP-BQ: Inhibitedness: ASD > BPD > NCC and NPD Dissocial Behaviour: NCC > ASD < BPD and NPD; Emotional dysregulation: NCC < ASD = NPD < BPD Compulsivity: ASD > BPD, NPD, NCC |
| Hesselmark et al [62], 2015 | n = 48 AS | n = 53 NC | MINI | NEOPI-R | Satisfactory internal consistency of the NEOPI-R. Neuroticism correlated with psychiatric comorbidity in ASD group |

BFI: Big five inventory; L-SAS: Liebowitz social anxiety scale; HADS: Hospital anxiety and depression scale; IPiP-NEO-120: International personality item pool representation of the NEO-PI-R; NEO-PI-R: Neo personality inventory revised.
tiousness subscale scores of the NEO-FFI in adults with AS, but not in the controls.

Strunz et al.[66] assessed personality traits using the NEO-PI-R[62] and personality pathology using the Dimensional Assessment of Personality Pathology (DAPP-BQ)[63, 64] in four samples of adults: ASD, narcissistic PD, borderline PD and non-clinical controls. Personality traits and personality pathology specific to ASD could be identified: ASD individuals, when compared to non-clinical controls, showed significantly higher scores on the NEO-PI-R neuroticism and DAPP-BQ emotional dysregulation dimensions and lower agreeableness scores; ASD individuals had significantly lower scores on the NEO-PI-R extraversion and openness to experience scales and significantly higher scores on the DAPP-BQ inhibitedness and compulsivity scales, relative to all other groups.

Moreover, individuals with ASD scored significantly higher than all other groups on the NEO-PI-R straightforwardness (frankness in expression) subscale. The results of the comparison with PD will be described later as differential diagnosis features.

**Minnesota multiphasic personality inventory**

Table 6 shows a summary of studies using other assessment measures to evaluate personality in ASD.

Only one study[65] explored personality in HFA by administering the minnesota multiphasic personality inventory (MMPI-2)[66]. The ASD sample had higher scores on the L (Liar) validity scale, Clinical Scale Depression (D) and Social Introversion (S), Content Scale Social Discomfort (SOD), Supplementary Scale Depression (R) and Personality Psychopathology Five (PSY-5) Introversion (INTR) scales than a matched sample of college students.

In ASD, sample comorbidity conditions were major depression, anxiety disorder and ADHD. The MMPI-2 profile reflected social isolation, interpersonal difficulties, depressed mood and coping deficits. This study also found medium-sized group differences from the control sample and elevations in 30%-40% of the ASD group on Scale 8 (Schizophrenia). These results could be related to psychotic symptoms but also to social alienation and general maladjustment. A high rate of elevation (30%) on the L scale reflects a desire to present a favourable impression and is quite unusual in this sample of patients.

**Eysenck personality questionnaire**

Kanai et al.[67] examined 112 adults with AS using the eysenck personality questionnaire (EPQ)[68] and the Schizotypal Personality Questionnaire (SPQ)[69]. Patients scored higher than controls on the SPQ, higher on the neuroticism and psychotism scores of the EPQ and lower on the extraversion and lie scores of the EPQ. The SPQ subscale scores (unusual perceptual experiences, odd behaviour and suspiciousness) were correlated with the total scores of the AQ in AS.

**Personality disorders as differential diagnosis**

In the literature investigating the relationship between PD and ASD, differential diagnosis is less explored than comorbidity. Studies comparing individuals with ASD or PD on different assessment measures are shown in Table 7, and each PD cluster is described in terms of differential diagnosis with ASD.

**Cluster A personality disorders**

Autism and schizophrenia spectrum disorders are classified separately in the DSM-5, but empirical findings suggest that these two disorders share overlapping features[70-72]. In clinical practice the most common difficulties are in the differential diagnosis of adults with ASD from those suffering from schizoid or schizotypal PD[29,73]. It is suggested that attention should be paid to the developmental history of the person, the prodrome and onset of the condition, its course and the absence of positive symptoms[74].

Social cognition (SC) deficits are points of overlap between ASD and schizophrenia spectrum disorders. SC includes cognitive mechanisms involved in the processing and interpretation of the social world[75-79]. Most studies on this topic directly examined patients with autism and schizophrenia[80-83] rather than schizoid or schizotypal patients. Only two studies meeting the inclusion criteria were found.

Booules-Katri et al.[84] investigated differences in Theory of Mind (ToM), a main component of SC, which refers to the ability to understand the emotional and mental states of other people[75,78,79,85,86]. They used three advanced ToM tests in 35 patients with HFA, 30 patients with schizotypal-schizoid PD (SSPD) and 36 healthy controls: individuals with HFA showed worse performance and no dissociation
Table 6 Summary of studies using different assessment measures to evaluate personality in adults with autism spectrum disorder

| Ref.          | Participants | Comparison group                                           | Measures       | Personality measures | Results                                                                 |
|---------------|--------------|------------------------------------------------------------|----------------|----------------------|-------------------------------------------------------------------------|
| Ozonoff et al [65], 2005 | n = 20 HFA 24 NC (age, intelligence and gender matched college students) | WAIS-R          | MMPI-2         | Higher Depression, Social Introversion, Social Discomfort, Repression and PSY-5 scale Introversion |
| Kanai et al [59], 2011  | n = 55 AS 57 NC | WAIS-R          | SPQ, EPQ       | SPQ: AS>NC; SPQ subscale scores (unusual perceptual experiences, odd behaviour, and suspiciousness) were correlated with total scores of the AQ in the AS group; Higher ‘Neuroticism’ and ‘Psychoticism’; Lower ‘Extraversion’ and ‘Lie’ |

EPQ: Eysenck personality questionnaire; MMPI-2: Minnesota multiphasic personality inventory; SPQ: Schizotypal personality questionnaire.

between affective and cognitive ToM components when compared with the SSPD patients; and the SSPD individuals scored significantly lower on cognitive than affective ToM tasks.

Stanfield et al [87] compared SC in ASD and schizotypal PD (SPD) using functional magnetic resonance imaging (fMRI). In the Ekman 60-Faces Test and the social judgement task there were no significant differences between the ASD, the SPD and the comorbid groups on any measure. All groups had similar patterns of impairment in the SC tests and few differences in clinical symptoms, but clear differences were seen between the ASD and SPD groups using fMRI during the social judgement task. Hyperactivation in SPD compared to ASD was found in the amygdala and the cerebellum. The fMRI findings for the comorbid group showed differences compared to the ASD group and similarities with the SPD group. The findings supported the hypo- and hyper-mentalizing theory of ASD and schizophrenia, highlighting the difficulty and importance of considering SPD as a differential diagnosis for ASD.

Cluster B personality disorders

In recent years there has been a growing interest in investigating deficits in SC, given the symptomatic overlap between autistic spectrum conditions and borderline PD (BPD) [88-91].

An investigation [92] into the difference and overlap between ASD and BPD was performed by evaluating autistic traits and empathizing and systemizing abilities in four samples: ASD, BPD, comorbid ASD+BPD and controls.

Similar to BPD, ASD patients scored higher than controls on the AQ [39] and the Systemizing Quotient-Revised (SQ-R) [93] but had lower empathizing abilities measured with the Empathy Quotient (EQ) [94]. The major limitations of this study were that diagnosis was based on the patients’ self-reports, and that there was a preponderance of females in the BPD and control samples. The results support the view that some females with BPD have undiagnosed ASD.

In another study [95], 30 BPD, 30 AS and 60 matched control participants were compared on interpersonal emotion regulation strategies. Both patients with AS and those with BPD engaged less than the controls in interpersonal affect improvement. No differences were found for affect worsening. Individuals with AS did not differ in affect improvement and worsening, tending to generally engage less in interpersonal emotion regulation. Instead, individuals with AS reported using less adaptive (attention deployment, cognitive change) and more maladaptive (expressive suppression) interpersonal emotion regulation strategies compared to individuals with BPD and controls.

Differential diagnosis between ASD and narcissistic PD (NPD) may also be difficult. NPD was found to be one of the most prevalent PD in a help-seeking population of adults with suspicion of autism without intellectual disability in whom autism could be excluded [96]. Attwood [97] suggested that individuals with ASD, especially those with superior intellectual abilities, may overcompensate for feelings of inadequacy in social situations by becoming arrogant and egocentric.

Strunz et al [26] compared BPD, NPD and ASD on personality traits (NEO-PI-R) and personality pathology (DAPP-BQ), reporting different profiles. Adults with ASD had significantly higher scores on the NEO-PI-R conscientiousness dimension and significantly lower scores on the DAPP-BQ dissocial behaviour dimension than BPD and NPD patients. On the corresponding DAPP-BQ compulsivity scale, adults with ASD had significantly higher scores than all other groups.
Table 7 Studies comparing autism spectrum disorder patients with personality disorders patients on different assessment measures

| Ref. | Participants | Comparison group | Measures | Results |
|------|--------------|------------------|----------|---------|
| Strunz et al [26], 2015 | 59 ASD (83% AS, 17% HFA) | 62 NPD, 80 BPD, 106 NC | NEO-PI-R; DAPP-BQ; SCID-I/MIINI; SCID-II | On the NEO-PI-R: Conscientiousness: NCC = ASD > BPD and NPD; Neuroticism: NCC < ASD = NPD < BPD; Extraversion: ASD < BPD, NPD, NCC; Openness for experience: ASD < NCC, BPD, NPD; Agreeableness: ASD = BPD and NPD > NCC; on the DAPP-BQ: Inhibitedness: ASD = BPD > NCC and NPD; Dissocial Behaviour: NCC = ASD < BPD and NPD; Emotional dysregulation: NCC < ASD = NPD < BPD; Compulsivity: ASD > BPD, NPD, NCC |
| López-Pérez et al [95], 2017 | 30 AS | 30 BPD matched NC | SCID-I/SCID-II | SCID-I/SCID-II emotion regulation of others and self (two scales: extrinsic affect improvement, extrinsic affect worsening)Interpersonal emotion management |
| Dudas et al [92], 2017 | 624 ASD | 23 BPD; 16 ASD+ BPD; 2081 NC | AQ; EQ; SQR; SCID-II | AQ: NC < BPD = ASC < ASC+BPD; EQ:NC < BPD = ASC = ASC+BPD; SQR NC < BPD = ASC = ASC+BPD |
| Murphy [10], 2006 | 39 AS; Male forensic patients detained in high security psychiatric care | 39 PD (antisocial and/or borderline)39 SC with positive symptoms detained in high security psychiatric care | WAIS-R; ToM measures | WAIS-R; ToM measures |
| Stanfield et al [87], 2017 | 28 ASD | 21 SPD; 10 CM; 33 NC | ADOS-G; SCID-II; PANSS; WAISSocial judgment task; Ekman 60 facies task; IRMI task of social judgement | ADOS-G; SCID-II; PANSS; WAISSocial judgment task; Ekman 60 facies task; IRMI task of social judgement |
| Boroules-Katri et al [84], 2019 | 35 HFA | SSPD (n = 30) and a NC (n = 36) | O-LIFE questionnaire; SCID-I; SCID-II; ADI-R; ADOS; WAIS-III; ToM test | O-LIFE questionnaire; SCID-I; SCID-II; ADI-R; ADOS; WAIS-III; ToM test |

BPD: Borderline personality disorder; CM: Comorbid group (SPD+ASD); EQ: Empathy quotient; NPD: Narcissistic personality disorder; O-LIFE questionnaire: Short version of the Oxford-Liverpool Inventory of Feelings and Experiences questionnaire; PANSS: Positive and negative syndrome scale; NC: Non clinical control group; SQR: Systemizing quotient revised; SSPD: Schizotypal-schizoid personality disorder; ToM: Theory of mind.

In BPD, higher levels of neuroticism, extraversion and openness for experience but less conscientiousness and the same level of agreeableness were found on the NEO-PI-R scores. The study also found, using the DAPP-BQ, more emotional dysregulation and dissipative damage and less inhibition and compulsivity in BPD patients compared with ASD patients. On the three inhibitedness subscales, no differences were reported. Even if the underlying causes social avoidance differed between BPD and ASD (social skill deficit in ASD versus fear of rejection in BPD), ASD individuals scored lower on the NEO-PI-R openness to experience dimension but significantly higher on the ideas (intellectual curiosity) subscale than BPD patients.

In relation to the difference between autism and narcissism, ASD patients’ scores on the NEO-PI-R modesty and compliance subscales were comparable to non-clinical control subjects. Moreover, patients with ASD and non-clinical controls had similar scores on the DAPP-BQ narcissism subscale.
With regard to differential diagnosis with antisocial PD, different empathic dysfunctions in psychopathy and autism have been found\cite{98,99}. Only one study\cite{100} compared the ToM performances of forensic AS, schizophrenia and PD patients. In the PD group there were individuals with dissocial PD and/or BPD, diagnosed by expert clinicians. Patients were male and detained in high security psychiatric care. The results suggested that the AS and SC groups performed worse than the PD patients on the revised eyes task\cite{101} and the second-order mental representation stories. The AS and PD groups did not differ on the Wechsler Adult Intelligence Scale full-scale IQ but both scored more highly than the SC group.

**Cluster C personality disorders**

It is well known that the phenomenology of obsessive–compulsive PD shows similarities to that of ASD\cite{102}, so misdiagnosis of ASD as anankastic PD is possible. It is suggested to consider first whether an individual has an underlying autism spectrum condition before诊断ing obsessive-compulsive PD\cite{103}. In ASD, repetitive patterns of behaviour, in particular the pursuit of circumscribed interests, are often associated with pleasure and mastery rather than egodystonicity. Gadelkarim et al\cite{104} suggested that in obsessive–compulsive patients the presence of obsessive–compulsive PD should alert one to the possible recognition of ASD.

No studies comparing ASD patients with cluster C PD patients met the inclusion criteria.

**DISCUSSION**

Examining personality in adults with ASD has only become the focus of research in recent years. The current review provides a literature summary of how personality and PD have been studied in high-functioning adults with ASD, focusing on two clinical issues.

The first issue for clinicians evaluating personality in ASD adult patients is to determine whether personality traits are part of the same autistic phenomenology or rather represent different categorical factors (comorbidity). The findings of studies focused on PD comorbidity suggested that approximately 50% of individuals with ASD fulfilled the diagnostic criteria for at least one PD.

The prevalence of PD comorbidity seemed to vary, increasing in samples of patients with other Axis I disorders, especially ADHD, and decreasing in mixed samples with intellectual disabilities. The most common comorbid PD belong to cluster A or cluster C (schizoid, schizotypal, obsessive–compulsive and avoidance PD). High rates of patients with more than one PD were found using the SCID-II. This suggests the utility of completing an assessment with other instruments to answer the question: ‘True comorbidity or overlapping features?’\cite{5}. Phenotypic similarities between high-functioning ASD and both schizoid/schizotypal and obsessive–compulsive PD have been noted, but the available data are sparse, so this could be a diagnostic challenge for clinicians\cite{105,106}. An additional PD to an ASD diagnosis could be considered ‘true comorbidity’ if it gives relevant information for understanding patient functioning and for developing more specific treatments.

In most of the studies reviewed, the personality of adults with ASD was assessed in order to identify a specific profile differing from that of neurotypical controls. Big Five personality traits and the TCI dimensions are the most commonly used taxonomy for measuring personality in adults with ASD. The findings of these studies support the hypothesis that ASD in adults is associated with a distinct personality profile that is not equivalent to an ASD diagnosis or to a specific PD.

Regarding the Big Five traits, these patients have been shown in all the studies reviewed to be higher in neuroticism and lower in extraversion and agreeableness, and also in most of the studies to be lower in openness to experience and conscientiousness. At the same time, ASD characteristics are statistically independent of the Big Five personality traits in clinical samples.

Adults with ASD have repeatedly been shown to have a distinct temperament and character compared to neurotypical controls. Concerning the TCI dimensions, lower scores on the character dimensions of self-directedness and cooperativeness indicated a possible personality psychopathology\cite{107,108}. Moreover, ASD was associated with high harm avoidance, low reward dependence, low novelty seeking and high self-transcendence. High harm avoidance reflects pessimism and shyness, and also state-dependent anxiety. Low reward dependence indicates impairments in social sensitivity, attachment capacity and adaptability. In individuals with an immature
character structure, high self-transcendence may lead to disregard for the basic realities of human interaction and social responsibilities.

As regards other personality measures, such as the EPQ and MMPI-2, the emerging profile reflected social isolation, interpersonal difficulties and psychotic-like symptoms.

In summary, the overall profile of personality traits and dimensions in ASD puts individuals at risk for other psychiatric disorders and lower functioning, even if variability exists.

Individuals with autism that are not diagnosed in childhood may have a high level of stress in trying to find a lifestyle to survive in a world that is difficult to understand; thus, building their personality with this level of chronic stress could be a trigger for creating a PD. Nevertheless, the neuropsychiatric dysfunctions associated with ASD permit considerable variation in personality. It has been suggested that personality mediates the relationship between autistic symptoms and well-being[109,110]. Exploring personality could provide a more comprehensive picture of adults with ASD, characterizing them through their individual strengths and weaknesses. It could advance the understanding of heterogeneity within patients and help in the development of more specific interventions. Treatment of PD comorbidity in adults with ASD is still in its infancy, but specific programmes have started to be developed [111].

The second critical issue is differentiating ASD patients from PD patients in clinical samples when searching for an ASD diagnosis. High-functioning ASD patients are frequently misdiagnosed with PD, and few studies were found on differential diagnosis between ASD and PD.

SC deficits could be useful for distinguishing ASD from PD, especially borderline and antisocial PD[112]. Gender could cause specific patterns of PD comorbidity and increase the risk of misdiagnosis, especially in women[14,113]; it has been suggested that some women with BPD have undiagnosed ASD.

Concerning the difference between autism and narcissism, individuals with ASD may appear egocentric because of a limited awareness of when it is appropriate to compliment oneself and when it is not. Nevertheless, ASD patients were found to be comparable to non-clinical controls on scales measuring narcissism in the only available investigation on this topic[26].

Differences in ToM abilities between ASD and cluster A PD have also been found, but functional neuroimaging may be better than SC testing for discriminating between autism and schizophrenia spectrum disorders[87].

Findings on differential diagnosis should be replicated and investigations should be extended to compare ASD patients with cluster C PD patients too.

Differential diagnosis should be based on clinical examination and a very careful history investigation of the first years of development, the first social relationships with other children and adolescents, changes of lifestyle during development and clinical symptoms of ASD in the first years of life.

Interviews such as the Autism Diagnostic Interview–Revised (ADI-R)[114] could help the clinician to collect the first symptoms of ASD. Personality assessment could help in confirming the diagnosis, but has to be used carefully by an expert clinician who knows the ASD cognitive style in order to avoid misunderstandings.

The findings of all the studies included in this review were based on self-reporting questionnaires or structured interviews that collected information only from the patients. This raises concerns about how a person with autism can read and understand the complex questions in a self-report test: individuals with autism could have difficulties in understanding the real meaning because of their literal way of reading a text. Nevertheless, studies have supported the validity of self-report in adults with ASD without intellectual disability[55,62].

CONCLUSION

This review provides a summary of the main findings in the literature regarding PD in adults with high-functioning ASD without intellectual disability. The aim of the review is to improve knowledge of the complex relationship between ASD and PD. Among the limitations of this review is the exclusion of studies looking for autistic traits in patients with PD or in non-clinical populations, which may be informative for giving a better understanding of overlapping features, as the question of commonality as opposed to comorbidity is not yet resolved. Furthermore, our research was conducted extensively on PubMed only. Future works should be conducted by
optimizing retrieval strategies and also including studies concerning adolescents. Another area little examined is the role of age in modulating the relationship between PD and ASD\cite{115,116}. Longitudinal research on personality and ASD may clarify whether the relationship between personality and ASD increases in adulthood, as has been suggested\cite{55}.

**ARTICLE HIGHLIGHTS**

**Research background**
Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by persistent deficits in social communication and social interaction, as well as restricted, repetitive and stereotyped patterns of behaviour. Individuals with high-functioning ASD are more likely to be diagnosed in adulthood, probably due to the development of learnt or camouflaging strategies that make it much harder to identify the underlying difficulties. Late-diagnosed individuals report higher levels of co-occurring psychiatric disorders or misdiagnosis, because some features of ASD can overlap with symptoms of other psychiatric conditions as well as personality disorders (PD). In recent years there has been a growing interest in exploring the complex relationship between ASD and PD, especially for features that overlap with cluster A and cluster C PD.

**Research motivation**
Consideration of the relationship between PD and ASD, with a focus on differential diagnosis and comorbidity, can lead to a better understanding of this complex topic and can improve the diagnostic process as well as supporting the creation of targeted interventions.

**Research objectives**
To summarize the research findings on ASD and PD in adulthood, focusing on comorbidity and differential diagnosis.

**Research methods**
The guidelines of the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) were followed in the present review. A comprehensive literature search was performed through PubMed, including only studies published in the English language and performed on adults without intellectual disability. The research included studies published up to April 2020.

**Research results**
The current review provides a literature summary of how personality and PD have been studied in high-functioning adults with ASD. The findings show that approximately 50% of individuals with ASD fulfilled the diagnostic criteria for at least one PD. The most common comorbid PD belong to cluster A or cluster C (schizoid, schizotypal, obsessive–compulsive and avoidance PD). High-functioning ASD patients are frequently misdiagnosed with PD, but only a few studies have been conducted on differential diagnosis. Furthermore, there were significant differences in methodological approaches, including ASD diagnostic instruments and personality measures.

**Research conclusions**
ASD in high-functioning adults is associated with a distinct personality profile even if variability exists. Cluster A and cluster C PD are the most frequent co-occurring PD, but overlapping features should be considered. Exploring personality could provide greater understanding of adults with ASD by identifying strengths and weaknesses, and could give relevant information for the development of specific and individual treatments.

**Research perspectives**
Further studies are needed to explore the relationship between ASD and PD, especially on differential diagnosis. It would be useful to explore the relationship between PD and ASD from a longitudinal perspective, take in account individual’s life and development history.
REFERENCES

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®). Arlington, VA, 2013 [DOI: 10.1176/appi.books.9780890425596.x00diasnosticclassification]

2. Howlin P, Moss P. Adults with autism spectrum disorders. Can J Psychiatry 2012; 57: 275-283 [PMID: 22546059 DOI: 10.1177/070674371205700502]

3. Marriage S, Wolverton A, Marriage K. Autism spectrum disorder grown up: a chart review of adult functioning. J Can Acad Child Adolesc Psychiatry 2009; 18: 322-328 [PMID: 19881941]

4. Seltzer MM, Shattuck P, Abbeduto L, Greenberg JS. Trajectory of development in adolescents and adults with autism. Ment Retard Dev Disabil Res Rev 2004; 10: 234-247 [PMID: 15666341 DOI: 10.1002/mrdd.20038]

5. Lai MC, Baron-Cohen S. Identifying the lost generation of adults with autism spectrum conditions. Lancet Psychiatry 2015; 2: 1013-1027 [PMID: 26544750 DOI: 10.1016/S2215-0366(15)00277-1]

6. Luciano CC, Keller R, Politi P, Aguglia E, Magnano F, Burti L, Muraro F, Aresi A, Dananni S, Berardi D. Misdiagnosis of high function autism spectrum disorders in adults: an Italian case series. Autism 2014; 18; 11: 131 [DOI: 10.1177/2165-7890.1000131]

7. Mattila ML, Hurtig T, Haapassalo H, Jussila K, Kuusikko-Gauffin S, Kielenen M, Linna SL, Ebeling H, Bloigu R, Joskot L, Pauls DL, Moilanen I. Comorbid psychiatric disorders associated with Asperger syndrome/high-functioning autism: a community- and clinic-based study. J Autism Dev Disord 2010; 40: 1080-1093 [PMID: 20177765 DOI: 10.1007/s10803-010-0958-2]

8. Antshel KM, Russo N. Autism Spectrum Disorders and ADHD: Overlapping Phenomenology, Diagnostic Issues, and Treatment Considerations. Curr Psychiatry Rep 2019; 21: 34 [PMID: 30903299 DOI: 10.1002/aur.1920-1020-5]

9. Postorino V, Kems CM, Vivanti G, Bradshaw J, Siracusano M, Mazzzone L. Anxiety Disorders and Obsessive-Compulsive Disorder in Individuals with Autism Spectrum Disorder. Curr Psychiatry Rep 2017; 19: 92 [PMID: 29082826 DOI: 10.1007/s11920-017-0846-y]

10. Russell AJ, Mataix-Cols D, Anson M, Murphy DG. Obsessions and compulsions in Asperger syndrome and high-functioning autism. Br J Psychiatry 2005; 186: 525-528 [PMID: 15928364 DOI: 10.1192/bjp.bp.104.0568] 2011; 180: 94-98

11. Bertelli MO, Piva Merli M, Bradley E, Keller R, Varucciu N, Del Furia C, Panocchia N. The diagnostic boundary between autism spectrum disorder, intellectual developmental disorder and schizophrenia spectrum disorders. Advances in Mental Health and Intellectual Disabilities 2015; 9: 243-264 [DOI: 10.1108/ahmld-05-2015-0024]

12. Cauda F, Costa T, Nani A, Fava L, Palermo S, Bianco F, Duca S, Tatu K, Keller R. Are schizophrenia, autistic, and obsessive spectrum disorders dissociable on the basis of neuroimaging morphological findings? Autism Res 2017; 10: 1079-1095 [PMID: 28339164 DOI: 10.1002/aur.1759]

13. Cochran DM, Dvir Y, Frazier JA. "Autism-plus" spectrum disorders: intersection with psychosis and the schizophrenia spectrum. Child Adolesc Psychiatr Clin N Am 2013; 22: 609-627 [PMID: 24012076 DOI: 10.1016/j.chc.2013.04.005]

14. Hofvander B, Delorme R, Chaste P, Nydén A, Wentz E, Ståhlberg O, Herbretch E, Stoopin A, Ebeling H, Bloigu R, Joskot L, Pauls DL, Moilanen I. Comorbid psychiatric disorders associated with Asperger syndrome/high-functioning autism: a community- and clinic-based study. J Autism Dev Disord 2010; 40: 1080-1093 [PMID: 20177765 DOI: 10.1007/s10803-010-0958-2]

15. Lai MC, Kasse C, Besney R, Bonato S, Hull L, Mandy W, Sztamari P, Ameis SH. Prevalence of co-occurring mental health diagnoses in the autism population: a systematic review and meta-analysis. Lancet Psychiatry 2019; 6: 819-829 [PMID: 31447415 DOI: 10.1016/S2215-0366(19)30289-5]

16. Lever AG, Geurts HM. Psychiatric Co-occurring Symptoms and Disorders in Young, Middle-Aged, and Older Adults with Autism Spectrum Disorder. J Autism Dev Disord 2016; 46: 1916-1930 [PMID: 26861713 DOI: 10.1007/s10803-016-2722-8]

17. Roy M. Prox-Vagedes V, Ohlmeier MD, Dillo W. Beyond childhood: psychiatric comorbidities and social background of adults with Asperger syndrome. Psychiatr Danub 2015; 27: 50-59 [PMID: 25751341]

18. Hedley D, Ujarević M, Foley KR, Richdale A, Trollor J. Risk and protective factors underlying depression and suicidal ideation in Autism Spectrum Disorder. Depress Anxiety 2018; 35: 648-657 [PMID: 29659141 DOI: 10.1002/da.22759]

19. Cassidy S, Bradley L, Shaw R, Baron-Cohen S. Risk markers for suicidality in autistic adults. Mol Autism 2018; 9: 42 [PMID: 30833306 DOI: 10.1186/s13229-018-0226-4]

20. Hull L, Petrides KV, Allison C, Smith P, Baron-Cohen S, Lai MC, Mandy W. “Putting on My Best Normal”: Social Camouflaging in Adults with Autism Spectrum Conditions. J Autism Dev Disord 2017; 47: 2519-2534 [PMID: 28527095 DOI: 10.1007/s10803-017-3166-5]

21. Baron-Cohen S. Empathizing, systemizing, and the extreme male brain theory of autism. Prog Brain Res 2010; 186: 167-175 [PMID: 21094892 DOI: 10.1016/B978-0-444-53630-3.00011-7]

22. Rynkiewicz A, Janas-Kozik M, Slopieś A. Girls and women with autism. Psychiatr Pol 2019; 53: 737-752 [PMID: 31760407 DOI: 10.12740/PP/OnlineFirst/95098]

23. Matson JL, Williams L.W. Differential diagnosis and comorbidity: distinguishing autism from other mental health issues. Neuropsychiatr 2013; 3: 233-243 [DOI: 10.2217/npy.13.1]

24. Keller R, Chiareggato S, Bari S, Castaldo R, Rutto F, Chiocchetti A, Dianzani U. Autism in
Abnormalities in Personality in Autism Spectrum Disorder: A Systematic Review and Meta-Analysis.

Rinaldi C et al. Autism spectrum disorder and personality disorders

Volume 11
December 19, 2021
Issue 12
1382

10.1038/s41561-021-00912-7

Adulthood: Clinical and Demographic Characteristics of a Cohort of Five Hundred Persons with Autism Analyzed by a Novel Multistep Network Model. Brain Sci 2020; 10 [PMID: 32630229 DOI: 10.3390/brainsci10070616]

25. Moher D, Liberati A, Tetzlaff J, Altman DG; PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med 2009; 6: e1000097 [PMID: 1921072 DOI: 10.1371/journal.pmed.1000097]

26. Stranz S, Westphal L, Ritter K, Heuser I, Drieseb I, Roepke S. Personality Pathology of Adults With Autism Spectrum Disorder Without Accompanying Intellectual Impairment in Comparison to Adults With Personality Disorders. J Autism Dev Disord 2015; 45: 4026-4038 [PMID: 25022250 DOI: 10.1007/s10803-014-2183-x]

27. Gillberg C, Billstedt E. Autism and Asperger syndrome: co-existence with other clinical disorders. Acta Psychiatr Scand 2000; 102: 321-330 [PMID: 11098802 DOI: 10.1034/j.1600-0447.2000.102005321.x]

28. Lehnhardt FG, Gawronski A, Pfeiffer K, Kockler H, Schilbach L, Vogele K. The investigation and differential diagnosis of Asperger syndrome in adults. Dtsch Arztebl Int 2013; 110: 755-763 [PMID: 24290364 DOI: 10.3238/arztebl.2013.0755]

29. Roy M, Dillo W, Emrich HM, Ohlmeier MD. Asperger’s syndrome in adulthood. Dtsch Arztebl Int 2009; 106: 59-64 [PMID: 19562011 DOI: 10.3238/arztebl.2009.0059]

30. Shaltout E, Al-Dewik N, Samara M, Morsi H, Khattab A. Psychological comorbidities in autism spectrum disorders. In: Essa MM, Qoronfleh MW. Personalized food intervention and therapy for autism spectrum disorder management. Switzerland AG: Springer Nature 2020; 24: 163-191 [PMID: 32008360 DOI: 10.1007/978-3-030-30440-7_6]

31. Vannucci G, Masi G, Toni C, Dell’Oso I, Marazziti D, Perugi G. Clinical features, developmental course, and psychiatric comorbidity of adult autism spectrum disorders. CNS Spectr 2014; 19: 157-164 [PMID: 24352005 DOI: 10.1017/S1082592913000941]

32. Woodbury-Smith MR, Volkmar FR. Asperger syndrome. Eur Child Adolesc Psychiatry 2009; 18: 2-11 [PMID: 18563474 DOI: 10.1007/s00787-008-0701-0]

33. Lodi-Smith J, Rodgers JD, Cunningham SA, Lopata C, Thomeer ML. Meta-analysis of Big Five personality traits in autism spectrum disorder. Autism 2019; 23: 556-565 [PMID: 29676605 DOI: 10.1177/1362361318765671]

34. Vujk R, Deen M, Sizoo B, Arntz A. Temperament, character and personality disorders in adults with autism spectrum disorder: a systematic literature review and meta-analysis. Rev J Autism Dev Disord 2018; 5: 176-197 [DOI: 10.1007/s40489-018-0131-y]

35. First MB, Gibbon M, Spitzer RL, Williams JBW, Benjamin LS. Structured clinical interview for DSM-IV Axis I disorders—clinician version (SCID-CV). Washington DC: American Psychiatric Association, 1997 [DOI: 10.1002/brb3.1894v1.decision1]

36. First MB, Gibbon M, Spitzer RL, Williams JBW, Benjamin LS. Structured clinical interview for DSM-IV axis II personality disorders (SCID-II). Washington DC: American Psychiatric Association, 1997 [DOI: 10.1521/pedi.1995.9.2.83]

37. Loranger AW, Sartorious N, Andreoli A, Berger P, Buchheim P, Chambabasavanna SM, Coid B, Dahl A, Diekstra RF, Ferguson B. The International Personality Disorder Examination. The World Health Organization/Alcohol, Drug Abuse, and Mental Health Administration international pilot study of personality disorders. Arch Gen Psychiatry 1994; 51: 215-224 [PMID: 8122958 DOI: 10.1001/archpsyc.1994.03950030050005]

38. Lugnegård T, Hallerbäck MU, Gillberg C. Personality disorders and autism spectrum disorders: what are the connections? Compr Psychiatry 2012; 53: 333-340 [PMID: 21821235 DOI: 10.1016/j.comppsych.2011.05.014]

39. Baron-Cohen S, Wheelwright S, Skinner R, Martin J, Chabery E. The autism-spectrum quotient (AQ): evidence from Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. J Autism Dev Disord 2001; 31: 5-17 [PMID: 11439754 DOI: 10.1023/a:1005653411471]

40. Rydén E, Bejerot S. Autism spectrum disorders in an adult psychiatric population. A naturalistic cross-sectional controlled study. Clin Neuropsychiatry 2008; 5: 1-21 [DOI: 10.1186/2040-2392-4-49]

41. Ekslieus L, Lindström E, von Knorring L, Bodlund O, Kullgren G. SCID II interviews and the SCID Screen questionnaire as diagnostic tools for personality disorders in DSM-III-R. Acta Psychiatr Scand 1994; 90: 120-123 [PMID: 7976457 DOI: 10.1111.j.1600-0447.1994.tb01566.x]

42. Gustavsson JP, Bergman H, Edman G, Ekselius L, von Knorring L, Linder J. Swedish universities mathematicians. (AQ): evidence from Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. J Autism Dev Disord 2001; 31: 5-17 [PMID: 11439754 DOI: 10.1023/a:1005653411471]

43. Ekselius L, Lindström E, von Knorring L, Bodlund O, Kullgren G. SCID II interviews and the SCID Screen questionnaire as diagnostic tools for personality disorders in DSM-III-R. Acta Psychiatr Scand 1994; 90: 120-123 [PMID: 7976457 DOI: 10.1111.j.1600-0447.1994.tb01566.x]

44. Gustavsson JP, Bergman H, Edman G, Ekselius L, von Knorring L, Linder J. Swedish universities mathematicians. (AQ): evidence from Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. J Autism Dev Disord 2001; 31: 5-17 [PMID: 11439754 DOI: 10.1023/a:1005653411471]

45. Ghazinoudin M. Mental health aspects of autism and Asperger syndrome. Philadelphia PA: Jessica Kingsley Publishers, 2005 [DOI: 10.7748/mhp.9.3.35.s30]

WJP | https://www.wjgnet.com
46 Tsakanikos E, Costello H, Holt G, Bouras N, Sturme P, Newton T. Psychopathology in adults with autism and intellectual disability. J Autism Dev Disord 2006; 36: 1123-1129 [PMID: 16855878 DOI: 10.1007/s10803-006-0149-3]

47 Anckarsäter H, Stahlberg Ö, Larson T, Hakansson C, Jutblad SB, Niklasson L, Nydén A, Wentz E, Westergren S, Cloninger CR, Gillberg C, Rastam M. The impact of ADHD and autism spectrum disorders on temperament, character, and personality development. Am J Psychiatry 2006; 163: 1239-1244 [PMID: 16816230 DOI: 10.1176/appi.ajp.163.7.1239]

48 Cloninger CR, Przybeck T, Svrakic DM, Wetzel RD. The Temperament and Character Inventory (TCI): A Guide to its Development and Use. Washington University: Center for Psychobiology of Personality, 1997 [DOI: 10.1037/03902-000]

49 Sizzo B, van den Brink W, Gorissen van Eenie M, van der Gaag RJ. Personality characteristics of adults with autism spectrum disorders or attention deficit hyperactivity disorder with and without substance use disorders. J Nerv Ment Dis 2009; 197: 450-454 [PMID: 19525746 DOI: 10.1097/NMD.0b013e3181a6dd0]

50 Soderstrom H, Rastam M, Gillberg C. Temperament and character in adults with Asperger syndrome. Autism 2002; 6: 287-297 [PMID: 12212919 DOI: 10.1080/1362361029006003006]

51 Vujik R, de Nijs FPA, Deen M, Vitale S, Simons-Spong M, Hengeveld MW. Temperament and character in men with autism spectrum disorder: A reanalysis of scores on the Temperament and Character Inventory by individual case matching. Contemp Clin Trials Commun 2018; 12: 55-59 [PMID: 30259003 DOI: 10.1016/j.cctc.2018.09.002]

52 Helles A, Wallinius M, Gillberg IC, Gillberg C, Billstedt E. Asperger syndrome in childhood - personality dimensions in adult life: temperament, character and outcome trajectories. BJPsych Open 2016; 2: 210-216 [PMID: 27703779 DOI: 10.1192/bjpo.bp.116.002741]

53 Vujik R, de Nijs PF, Vitale SG, Simons-Spong M, Hengeveld MW. Personality traits in adults with autism spectrum disorders measured by means of the Temperament and Character Inventory. Tijdschr Psychiatr 2012; 54: 699-707 [PMID: 22893535]

54 John OP, Naumann LP, Soto CJ. Paradigm shift to the integrative Big Five trait taxonomy. In: John OP, Robins RW, Pervin LA. Handbook of Personality: Theory and Research. New York: Guildford Press, 2008: pp.114-158. [DOI: 10.1080/10478401003648732]

55 Schriber RA, Robins RW, Solomon M. Personality and self-insight in individuals with autism spectrum disorder. J Pers Soc Psychol 2014; 106: 112-130 [PMID: 24377361 DOI: 10.1037/a0034950]

56 Schwartzman BC, Wood JJ, Kapp SK. Can the Five Factor Model of Personality Account for the Variability of Autism Symptom Expression? J Autism Dev Disord 2016; 46: 253-272 [PMID: 26319256 DOI: 10.1007/s10803-015-2571-x]

57 Costa PT, McCrae RR. Revised NEO personality inventory (NEO-PI-R) and NEO five-factor Inventory (NEO-FFI) professional manual. Odessa: Psychological Assessment Resources, 1992 [DOI: 10.4135/9781894920049.n9]

58 Ritvo RA, Ritvo ER, Guthrie D, Ritvo MJ, Hufnagel DH, McMahon W, Tonge B, Mataix-Cols D, Wood JJ, Kapp SK. Can the Five Factor Model of Personality Account for the Variability of Autism Symptom Expression? J Autism Dev Disord 2016; 46: 253-272 [PMID: 26319256 DOI: 10.1007/s10803-015-2571-x]

59 Kanai C, Iwanami A, Hashimoto R, Ohta H, Tani M, Yamada T, Kato N. Clinical characterization of adults with Asperger’s syndrome assessed by self-report questionnaires based on depression, anxiety, and personality. Res Autism Spectr Disord 2011; 5: 1451-1458 [DOI: 10.1016/j.rasd.2011.02.005]

60 Zigmond AS, Snith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand 1983; 67: 361-370 [PMID: 6880820 DOI: 10.1111/j.1600-0447.1983.tb09716.x]

61 Liebowitz MR. Social phobia. Mod Probl Pharmacopsychiatry 1987; 22: 141-173 [PMID: 2885745 DOI: 10.1159/000414022]

62 Hesselmark E, Eriksson JM, Weilerlund J, Bejerot S. Autism Spectrum Disorders and Self-reports: Testing Validity and Reliability Using the NEO-PI-R. J Autism Dev Disord 2015; 45: 1156-1166 [PMID: 25326256 DOI: 10.1007/s10803-014-2275-7]

63 Livesley WJ. Trait and behavioral prototypes of personality disorder. Am J Psychiatry 1986; 143: 728-732 [PMID: 3717394 DOI: 10.1176/appi.ajp.143.6.728]

64 Livesley WJ. A systematic approach to the delineation of personality disorders. Am J Psychiatry 1987; 144: 772-777 [PMID: 3591999 DOI: 10.1176/ajp.144.7.772]

65 Ozonoff S, Garcia N, Clark E, Lainhart JE. MMPI-2 personality profiles of high-functioning adults with autism spectrum disorders. Assessment 2005; 12: 86-95 [PMID: 15695746 DOI: 10.1177/1073191104273132]

66 Butcher JN, Graham JR, Ben-Porath YS, Tellegen A, Dahlstrom WG, Kraner EM. Minnesota Multiphasic Personality Inventory-2 (MMPI-2): Manual for administration, scoring, and interpretation (Rev. ed.). Minneapolis: University of Minnesota Press, 2001 [DOI: 10.1037/t15120-000]

67 Kanai C, Iwanami A, Ohta H, Yamasue H, Matsuhashima E, Yokoi H, Shinohara K, Kato N. Clinical characteristics of adults with Asperger’s syndrome assessed with self-report questionnaires. Res Autism Spectr Disord 2011; 5: 185-190 [DOI: 10.1016/j.rasd.2010.03.008]

68 Eyseck HJ, Eyseck SBG. Manual of the Eysenck Personality Questionnaire. London: Hodder and Stoughton, 1975 [DOI: 10.1037/t05462-000]
69 Raine A. The SQP: a scale for the assessment of schizotypal personality based on DSM-III-R criteria. *Schizophr Bull* 1991; 17: 555-564 [PMID: 1805349 DOI: 10.1093/schbul/17.4.555]

70 Biasumo E, Di Gregorio E, Belligni EF, Keller R, Riberi E, Gandione M, Calcuta A, Mancini C, Giorgio E, Cavaleri L, Puppi P, Talarico F, Foa AM, De Rubeis S, Cirillo Silengo M, Ferrero GB, Brusco A. A novel 3q29 deletion associated with autism, intellectual disability, psychiatric disorders, and obesity. *Am J Med Genet B Neuropsychiatr Genet* 2016; 171B: 290-299 [PMID: 26620927 DOI: 10.1002/ajmg.b.32406]

71 Cauda F, Nani A, Costa T, Palermo S, Tatu K, Manuello I, Duca S, Fox PT, Keller R. The morphometric co-atrophy networking of schizophrenia, autistic and obsessive spectrum disorders. *Hum Brain Mapp* 2018; 39: 1898-1928 [PMID: 29349864 DOI: 10.1002/hbm.23952]

72 Naito K, Matsui Y, Maeda K, Tanaka K. Evaluation of the validity of the Autism Spectrum Quotient (AQ) in differentiating high-functioning autistic spectrum disorder from schizophrenia. *Kobe J Med Sci* 2010; 56: E116-E124 [PMID: 21063152]

73 Wolff S. Schizoid personality in childhood: The links with Asperger syndrome, schizophrenia spectrum disorders, and elective mutism. In: Schopler E, Mesibov GB, Kunce LJ. Autism spectrum disorder and high-functioning autism? New York: Plenum, 1998: 123-142 [DOI: 10.1007/978-1-4615-5369-4_7]

74 Keller R, Piedimonte A, Bianco F, Bari S, Cauda F. Diagnostic Characteristics of Psychosis and Autism Spectrum Disorder in Adolescence and Adulthood. A Case Series. *Autism Open Access* 2015; 6: 159 [DOI: 10.4172/2165-7890.1000159]

75 Mazza M, Lucci G, Pacitti F, Pino MC, Mariano M, Casacchia M, Roncone R. Could schizophrenic subjects improve their social cognition abilities only with observation and imitation of social situations? *Neuropsychol Rehabil* 2010; 20: 675-703 [PMID: 20714969 DOI: 10.1080/090602011.2010.486284]

76 Bishop-Fitzpatrick L, Mazęsky CA, Eack SM, Minshew NJ. Correlates of Social Functioning in Autism Spectrum Disorder: The Role of Social Cognition. *Res Autism Spectr Disord* 2017; 35: 25-34 [PMID: 28839456 DOI: 10.1016/j.rasd.2016.11.013]

77 Pino MC, Mazza M, Mariano M, Peretti S, Dimitriou D, Masedu F, Valenti M, Franco F. Simple Mindreading Abilities Predict Complex Theory of Mind: Developmental Delay in Autism Spectrum Disorders. *J Autism Dev Disord* 2017; 47: 2743-2756 [PMID: 28597142 DOI: 10.1007/s10803-017-3194-1]

78 Pino MC, Masedu F, Vagnetti R, Attanasio M, Di Giovanni C, Valenti M, Mazza M. Validity of Social Cognition Measures in the Clinical Services for Autism Spectrum Disorder. *Front Psychol* 2020; 11: 4 [PMID: 32116882 DOI: 10.3389/fpsyg.2020.00004]

79 Pino MC, Vagnetti R, Masedu F, Attanasio M, Tiberti S, Valenti M, Mazza M. Mapping the Network of Social Cognition Domains in Children With Autism Spectrum Disorder Through Graph Analysis. *Front Psychiatry* 2020; 11: 579339 [PMID: 33192721 DOI: 10.3389/fpsych.2020.579339]

80 Bölte S, Poustka F. The recognition of facial affect in autistic and schizophrenic subjects and their first-degree relatives. *Psychol Med* 2003; 33: 907-915 [PMID: 12877405 DOI: 10.1017/s0033291703007438]

81 Ozgven HD, Oner O, Baskak B, Oktenc F, Olmez S, Munir K. Theory of Mind in Schizophrenia and Asperger's Syndrome: Relationship with Negative Symptoms. *Klinik Psikofarmakov Bulenti* 2010; 20: 5-13 [PMID: 25584026 DOI: 10.1080/10177833.2010.11706028]

82 Tin LNW, Lui SSY, Ho KKY, Hung KSY, Wang Y, Yeung HKH, Wong TY, Lam SM, Chan RCK, Cheung EFC. High-functioning autism patients share similar but more severe impairments in verbal theory of mind than schizophrenia patients. *Psychol Med* 2018; 48: 1264-1273 [PMID: 28920569 DOI: 10.1017/s0033291717002690]

83 Pinkham AE, Morrison KE, Penn DL, Harvey PD, Kelvens S, Ludwig K, Sasson NJ. Comprehensive comparison of social cognitive performance in autism spectrum disorder and schizophrenia. *Psychol Med* 2020; 50: 2557-2565 [PMID: 31576783 DOI: 10.1017/s0033291719002708]

84 Boules-Katri TM, Pedreño C, Navarro JB, Parnias M, Obiols JE. Theory of Mind (ToM) Performance in High Functioning Autism (HFA) and Schizotypal-Schizophrenia Personality Disorders (SSPD) Patients. *J Autism Dev Disord* 2019; 49: 3376-3386 [PMID: 31104261 DOI: 10.1007/s10803-019-04058-1]

85 Mazza M, Pino MC, Mariano M, Tempesta D, Ferrara M, De Berardis D, Masedu F, Valenti M. Affective and cognitive empathy in adolescents with autism spectrum disorder. *Front Hum Neurosci* 2014; 8: 791 [PMID: 25339889 DOI: 10.3389/fnhum.2014.00791]

86 Mazza M, Mariano M, Peretti S, Masedu F, Pino MC, Valenti M. The Role of Theory of Mind on Social Information Processing in Children With Autism Spectrum Disorders: A Mediation Analysis. *J Autism Dev Disord* 2017; 47: 1369-1379 [PMID: 28213839 DOI: 10.1007/s10803-017-3069-5]

87 Stanfield AC, Philip RCM, Whalley H, Romaniuk L, Hall J, Johnstone EC, Lawrie SM. Dissociation of Brain Activation in Autism and Schizotypal Personality Disorder During Social Judgments. *Schizophr Bull* 2017; 43: 1220-1228 [PMID: 29088456 DOI: 10.1093/schbul/sbx083]

88 Colla L, Gabbarone I, Riberi E, Borroz E, Bosco FM, Keller R. Mindreading abilities and borderline personality disorder: A comprehensive assessment using the Theory of Mind Assessment Scale. *Psychiatry Res* 2019; 272: 609-617 [PMID: 30616131 DOI: 10.1016/j.psychres.2018.12.102]

89 Dziobek I, Preissler S, Grozdanovic Z, Heuser I, Heekeren HR, Roepke S. Neuronal correlates of altered empathy and social cognition in borderline personality disorder. *Neuroimage* 2011; 57: 539-
Rinaldi C et al. Autism spectrum disorder and personality disorders

548 [PMID: 21586330 DOI: 10.1016/j.neuroimage.2011.05.005]

Preißler S, Dziobek I, Ritter K, Heekeren HR, Roepeke S. Social Cognition in Borderline Personality Disorder: Evidence for Disturbed Recognition of the Emotions, Thoughts, and Intentions of others. Front Behav Neurosci 2010; 4: 182 [PMID: 21151817 DOI: 10.3839/fbnheh.2010.0182]

Roepeke S, Vater A, Preißler S, Heekeren HR, Dziobek I. Social cognition in borderline personality disorder. Front Neurosci 2012; 6: 195 [PMID: 23335877 DOI: 10.3389/fnins.2012.00195]

Dudas RB, Lovejoy C, Cassidy S, Allison C, Smith P, Baron-Cohen S. The overlap between autistic spectrum conditions and borderline personality disorder. PLoS One 2017; 12: e0184447 [PMID: 28886113 DOI: 10.1371/journal.pone.0184447]

Baron-Cohen S, Richter J, Bisarya D, Gurunathan N, Wheelwright S. The systemizing quotient: an investigation of adults with Asperger syndrome or high-functioning autism, and normal sex differences. Philos Trans R Soc Lond B Biol Sci 2003; 358: 361-374 [PMID: 12639333 DOI: 10.1098/rstb.2002.1206]

Baron-Cohen S, Wheelwright S. The empathy quotient: an investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences. J Autism Dev Disord 2004; 34: 163-175 [PMID: 15162935 DOI: 10.1023/b:jadd.0000022607.19833.00]

López-Pérez B, Ambrona T, Gummerum M. Interpersonal emotion regulation in Asperger's syndrome and borderline personality disorder. Br J Clin Psychol 2017; 56: 103-113 [PMID: 27990657 DOI: 10.1111/bjc.12124]

Strunz S, Dziobek I, Roepeke S. [Comorbid psychiatric disorders and differential diagnosis of patients with autism spectrum disorder without intellectual disability]. Psychother Psychiatromed Psychol 2014; 64: 206-213 [PMID: 24234289 DOI: 10.1055/s-0033-1357808]

Attwood T. The Complete Guide to Asperger’s Syndrome. London: Jessica Kingsley Publishers, 2007 [DOI: 10.1177/13591045080130021008]

Blair RJ. Fine cuts of empathy and the amygdala: dissociable deficits in psychopathy and autism. Q J Exp Psychol (Hove) 2008; 61: 157-170 [PMID: 18033416 DOI: 10.1080/17470210701508855]

Hansman-Wijnands MA, Hummelen JW. Differential diagnosis of psychopathy and autism spectrum disorders in adults. Empathic deficit as a core symptom. Tijdschr Psychiatr 2006; 48: 627-636 [PMID: 16958304]

Murphy D. Theory of mind in Asperger's syndrome, schizophrenia and personality disordered forensic patients. Cogn Neuropsychiatry 2006; 11: 99-111 [PMID: 16537236 DOI: 10.1080/1354680044400182]

Baron-Cohen S, Wheelwright S, Hill J, Raste Y, Plumb I. The "Reading the Mind in the Eyes" Test revised version: a study with normal adults, and adults with Asperger syndrome or high-functioning autism. J Child Psychol Psychiatry 2001; 42: 241-251 [PMID: 11280420]

Cath DC, Ran N, Smit JH, van Balkom AJ, Conijn HC. Symptom overlap between autism spectrum disorder, generalized social anxiety disorder and obsessive-compulsive disorder in adults: a preliminary case-controlled study. Psychopathology 2008; 41: 101-110 [PMID: 18033980 DOI: 10.1159/000115555]

Fitzgerald M. Misdiagnosis of Asperger syndrome as anankastic personality disorder. Autism 2002; 6: 435 [PMID: 12540134 DOI: 10.1177/1362361302006004010]

Gadelkarim W, Shalper S, Reid J, Wikramanayake M, Kaur S, Kolli S, Osman S, Fineberg NA. Overlap of obsessive-compulsive personality disorder and autism spectrum disorder traits among OCD outpatients: an exploratory study. Int J Psychiatry Clin Pract 2019; 23: 297-306 [PMID: 31375037 DOI: 10.1080/13651501.2019.1638939]

Arduini GM, Keller R. Il ritiro sociale nei disturbi dello spettro autistico. Modelli clinici e trattamento. In: Procacci M, Semerari A. Ritiro sociale: psicologia e clinica. Trento: Erickson, 2019: 207-230 [DOI: 10.3280/qpc47-2020oa11213]

Keller R, Bari S. Psychosis and ASD. In: Keller R. Psychopathology in Adolescents and Adults with Autism Spectrum Disorders. Springer, 2019: 51-65 [DOI: 10.1007/978-3-030-26276-1_4]

Cloninger CR. A practical way to diagnosis personality disorder: a proposal. J Pers Disord 2000; 14: 99-108 [PMID: 10897461 DOI: 10.1521/pedi.2000.14.2.99]

Svrakic DM, Whitehead C, Przybeck TR, Cloninger CR. Differential diagnosis of personality disorders by the seven-factor model of temperament and character. J Pers Disord 2000; 14: 285-306 [PMID: 10897465 DOI: 10.1521/pedi.2000.14.2.99]

Rogers JD, Lodi-Smith J, Hill PL, Spain SM, Lopata C, Thomeer ML. Brief Report: Personality Mediates the Relationship between Autism Quotient and Well-Being: A Conceptual Replication using Self-Report. J Autism Dev Disord 2018; 48: 307-315 [PMID: 28918443 DOI: 10.1007/s10803-017-3290-2]

Suh J, Orinstein A, Barton M, Chen CM, Eigište JM, Ramirez-Esparza N, Fein D. Ratings of Broader Autism Phenotype and Personality Traits in Optimal Outcomes from Autism Spectrum Disorder. J Autism Dev Disord 2016; 46: 3505-3518 [PMID: 27538964 DOI: 10.1007/s10803-016-2868-4]

Vuijik R, Amtrz A. Schema therapy as treatment for adults with autism spectrum disorder and comorbid personality disorder: Protocol of a multiple-baseline case series study testing cognitive-behavioral and experiential interventions. Contemp Clin Trials Commun 2017; 5: 80-85 [PMID: 29740624 DOI: 10.1016/j.conctc.2017.01.001]

Baron-Cohen S. The science of evil: on empathy and the origins of cruelty. Old Saybrook CT: Tantor Media Inc, 2011 [DOI: 10.12775/pch.2014.019]

Rydén G, Rydén E, Hetta J. Borderline personality disorder and Autism Spectrum Disorder in
females. A cross-sectional study. Clin Neuropsychiatry 2008; 5: 22-30 [DOI: 10.1097/yco.0000000000000318]

114 Lord C, Rutter M, Le Couteur A. Autism Diagnostic Interview-Revised: a revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. J Autism Dev Disord 1994; 24: 659-685 [PMID: 7814313 DOI: 10.1007/BF02172145]

115 Supek K, Iyer T, Menon V. The influence of sex and age on prevalence rates of comorbid conditions in autism. Autism Res 2017; 10: 778-789 [PMID: 28188687 DOI: 10.1002/aur.1741]

116 Wise EA, Smith MD, Rabins PV. Aging and Autism Spectrum Disorder: A Naturalistic, Longitudinal Study of the Comorbidities and Behavioral and Neuropsychiatric Symptoms in Adults with ASD. J Autism Dev Disord 2017; 47: 1708-1715 [PMID: 28303420 DOI: 10.1007/s10803-017-3095-3]
