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## Temperament and character in men with autism spectrum disorder: A reanalysis of scores on the Temperament and Character Inventory by individual case matching

Richard Vuijk<sup>a,\*</sup>, Pieter F.A. de Nijs<sup>b</sup>, Mathijs Deen<sup>c,d</sup>, Salvatore Vitale<sup>e,1</sup>,  
Mirjam Simons-Sprong<sup>a,2</sup>, Michiel W. Hengeveld<sup>e</sup>

<sup>a</sup> Sarr Expertise Center for Autism, Parnassia Groep, Bavo Europoort, Oudedijk 76, 3062 AG, Rotterdam, the Netherlands

<sup>b</sup> Erasmus MC, Sophia Children's Hospital, Department of Child and Adolescent Psychiatry/Psychology, Wytemaweg 80, 3015 CN, Rotterdam, the Netherlands

<sup>c</sup> Parnassia Psychiatric Institute, Kiwistraat 32, 2552 DH, The Hague, the Netherlands

<sup>d</sup> Institute of Psychology, Methodology and Statistics Unit, Leiden University, Wassenaarseweg 52, 2333 AK, Leiden, the Netherlands

<sup>e</sup> Erasmus MC, Department of Psychiatry, 's Gravendijkwal 230, 3015 CE, Rotterdam, the Netherlands

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### ABSTRACT

**Background:** Interest in autism spectrum disorders (ASD) in adulthood is increasing. Although a person may be diagnosed with ASD, the diagnosis reveals little about the individual's temperament, character, and personality. Also, relatively little is known about the personality of adults with ASD.

**Method:** A reanalysis of scores on the Temperament and Character Inventory (TCI) administered to a group of 66 normally intelligent men aged 18–63 years, diagnosed with ASD, by individual case matching to a comparison group of 66 men from the general population drawn from the TCI manual.

**Results:** Compared to the comparison group, men with ASD scored significantly higher on the scale for Harm Avoidance, and lower on Novelty Seeking, Reward Dependence, Self-Directedness, and Cooperativeness.

**Conclusions:** In this study the score pattern for temperament and character found in men with ASD by individual case matching confirms and strengthens earlier general group matching findings emerging from our 2012 study and from studies from Sweden and the Netherlands.

### 1. Introduction

There has been growing interest in the personality of individuals diagnosed with an autism spectrum disorder (ASD); this is a neurodevelopmental syndrome with a clinical presentation and characterization of persistent deficits in social communication and social interaction, as well as restricted and repetitive patterns of behavior, interests and/or activities [1]. The disorder has an estimated prevalence of 1% [2,3] and a high prevalence of comorbid psychiatric disorders [4]. Examining personality is more or less a new perspective in the 'multiplicity of autism realities' [5], alongside the already familiar ideas about ASD, such as an inability to read other people's minds [6], a disorder of executive functioning [7], a disorder of weak central coherence [8] and an excess of 'systemizing' drives at the expense of 'empathizing' drives [9], all leading to a 'spectrum of needs, services, and challenges' [10]. Dell'Osso

et al. [11] also suggested an adult autism spectrum model that encompasses ASD symptoms, behavioral traits, and personality features.

Although examining personality in persons with ASD is in its infancy, this is a growing area of research. Recently, specific personality profiles in adults with ASD have been both examined and demonstrated, revealing an interrelatedness between ASD and personality dimensions and traits, as well as associations with psychopathology [12,13]. On the Five-Factor Model of personality [14], positive correlations were found between ASD (severity) and neuroticism, and negative correlations between ASD (severity) and extraversion, openness to experience, agreeableness and conscientiousness [15–21]. In studies examining temperament (largely stable and heritable dimensions of personality) and character (the environmental dimension of personality), ASD has been linked to an introvert, rigid, passive-dependent temperament, and a poorly developed character [22–24], indicating a

\* Corresponding author.

E-mail addresses: [r.vuijk@bavo-europoort.nl](mailto:r.vuijk@bavo-europoort.nl) (R. Vuijk), [p.denijs@erasmusmc.nl](mailto:p.denijs@erasmusmc.nl) (P.F.A. de Nijs), [m.deen@parnassiagroep.nl](mailto:m.deen@parnassiagroep.nl) (M. Deen), [s.vitale@rivierduinen.nl](mailto:s.vitale@rivierduinen.nl) (S. Vitale), [Mirjam.simons-sprong@jellinek.nl](mailto:Mirjam.simons-sprong@jellinek.nl) (M. Simons-Sprong), [m.w.hengeveld@ziggo.nl](mailto:m.w.hengeveld@ziggo.nl) (M.W. Hengeveld).

<sup>1</sup> Present address: GGZ Rivierduinen, Componistenlaan 248, 2215 ST, Voorhout, the Netherlands.

<sup>2</sup> Present address: Arkin-Jellinek, Heiligenbergerweg 34, 3816 AK, Amersfoort, the Netherlands.

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risk for personality disorder. Studies examining personality disorder comorbidity in adults with ASD found high prevalence rates for especially cluster A and C personality disorders [22,25–27], ranging from 48% [27] to 62% [25]. To our knowledge, Kirchner et al. [28] were among the first to examine character strengths in adults with ASD, finding open-mindedness, authenticity, love of learning, creativity and fairness as the most frequent signature strengths.

Identifying personality traits might help to: i) explain the heterogeneity in the functioning of persons with ASD [29], ii) contribute to recognizing both the strengths and weaknesses of these individuals, and iii) may be of added value for the development of new treatment strategies and interaction styles [30]. Understanding personality can lead to a different perception of a person with ASD, i.e. by not merely seeing someone who has an ASD classification, but also seeing an individual with a distinct personality.

## 2. The present study

Based on a study we published in a Dutch journal [31] and on three earlier studies in which ASD male participants were generally group matched [22–24] we wanted to know if same results would be obtained by individual case matching. We thus hypothesized that men with ASD would score differently on the Temperament and Character Inventory (TCI [33]) compared to a comparison group: i.e. i) lower on Novelty Seeking, ii) higher on Harm Avoidance, iii) lower on Reward Dependence, iv) lower on Self-Directedness, and v) lower on Cooperativeness.

This study, a reanalysis of our 2012 data set, aimed to fill a gap in investigating self-rated temperament and character dimensions in a relatively large group of men with ASD, *individually* matched as closely as possible on age, education and marital status to a comparison group of men, and sought to confirm and strengthen previous findings from our study published in Dutch [31] as well as TCI studies from Ankarsäter et al. [22], Sizoo et al. [23], and Soderstrom et al. [24] in male adults with ASD who were *generally* matched to a norm group.

## 3. Methods

### 3.1. Participants

The ASD group consisted of 66 men aged 18–63 (mean 38) years, with an IQ of at least 85 and/or having attended primary school for at least 8 years. All were diagnosed for the first time with a DSM-IV-TR [34] pervasive developmental disorder during an ASD assessment by psychiatrists and psychologists specialized in ASD assessment (the latter supervised by RV from Sarr Expertise Center for Autism, or by SV from Erasmus MC, Department of Psychiatry).

The diagnosis of ASD was based on three in-person interview sessions, plus one or two sessions of interviewing the adult's childhood caregiver and/or partner (if applicable) exploring the symptoms in terms of the DSM criteria (for ASD, as well as for other psychiatric disorders). ASD symptoms were also observed and checked in interaction between the participant and the psychologist and the psychiatrist during the three in-person interview sessions. In a fourth session with the participant, the TCI was a standard part of the assessment to acquire an impression of temperament and character. Finally, in each case, the ASD diagnosis was assigned by one of the two authors (RV, SV), both specialized in ASD in adults, after consensus discussions with the psychiatrists and the psychologists.

Table 1 presents demographic information on the participants and the comparison group. The majority of participants were Caucasian Dutch (98.5%); 50% were single and 35% had a partner (15% unknown). Educational levels ranged from elementary school (3.0%) to university (7.8%), with the majority having followed lower secondary education (34.8%). In terms of comorbidity, five (7.6%) participants were diagnosed with personality disorder, five (7.6%) with partner-relational problems, four (6.1%) with attention-deficit/hyperactivity

**Table 1**  
Characteristics of men with autism spectrum disorder (ASD) and the matched comparison group.

	ASD group	Comparison group
Age in years: mean, range (SD)	38, 18–63 (12.5)	39, 20–63 (11.84)
Male gender, n	66	66
Ethnicity, n (%)		
- Caucasian	65 (98.5%)	66 (100%)
- Asian	1 (1.5%)	–
Marital status, n (%)		
- Married	20 (30.3%)	43 (65.0%)
- Living together	3 (4.5%)	9 (13.6%)
- No partner	33 (50.0%)	12 (18.2%)
- Unknown	10 (15.2%)	2 (3.0%)
Education, n (%)		
- Elementary school only	2 (3.0%)	2 (3.0%)
- Lower secondary education	23 (34.8%)	23 (34.8%)
- Lower vocational education	14 (21.2%)	15 (22.7%)
- Upper secondary school	9 (13.6%)	9 (13.6%)
- Higher vocational education	11 (16.7%)	11 (16.7%)
- University	5 (7.8%)	6 (9.1%)
- Unknown (IQ $\geq$ 85)	2 (3.0%)	–
ASD diagnosis, n (%)		
- Autistic Disorder	15 (22.7%)	–
- Asperger's Disorder	25 (37.9%)	–
- PDD-NOS	26 (39.4%)	–
Comorbidity, n (%)		
- Personality Disorder	5 (7.6%)	–
- Partner relational problems	5 (7.6%)	–
- ADHD	4 (6.1%)	–
- Depressive Disorder	2 (3.0%)	–
- Psychotic Disorder	1 (1.5%)	–

PDD-NOS = Pervasive Developmental Disorder-Not Otherwise Specified, ADHD = Attention-Deficit/Hyperactivity Disorder.

disorder (ADHD), two (3.0%) with depressive disorder, and one (1.5%) with psychotic disorder.

The comparison group was a well-defined group drawn from a norm group available in the Dutch manual of the TCI [35] individually matched with the ASD group. The comparison group consisted of men from the general population resident in the Netherlands and Flanders (n = 66), mean age 39 (SD 11.84, range 20–63) years, matched on age, education and marital status with the ASD group.

In comparison to our 2012 study in this study we made the two groups more similar demographically, with equal sample sizes and matched (as closely as possible) on age, marital status, and education. If more matches on age, marital status, and education were available, or if there was no unique match, a random number generator was used to select between the available matches. Although statistical methods are available to match between two groups (e.g. propensity score matching), the matched variables were not defined in exactly the same way. Therefore, we matched using a random number generator.

### 3.2. Measures

The Dutch (translated) version of the Temperament and Character Inventory (TCI [33]) is a self-report questionnaire to determine differences between individuals on seven dimensions of temperament and character, based on Cloninger's psychobiological theory of personality [33]. The TCI consists of 240 items (true/false), four temperament scales (Novelty Seeking, Harm Avoidance, Reward Dependence, and Persistence), three character scales (Self-Directedness, Cooperativeness, and Self-Transcendence), and 25 subscales.

Novelty Seeking is associated with exploratory activity in response to a novel stimulation, impulsive decision-making, extravagance and disorderliness. Harm Avoidance is characterized by excessive worrying, pessimism, shyness, being fearful and easily fatigued, with introversion at one end and extraversion at the other end of the spectrum. Reward Dependence is a tendency to respond to signals of reward of social

approval, social support and sentiment. Persistence refers to perseverance in spite of fatigue or frustration. Self-Directedness is the ability to regulate and adapt behavior to the demands of a situation in order to achieve personally chosen goals and values. Cooperativeness is the degree to which a person is generally agreeable in relationships with other persons, as opposed to aggressively self-centered and hostile. Self-Transcendence is associated with experiencing spiritual ideas, such as considering oneself an integral part of the universe.

The TCI has strong test-retest reliability. Despite the assumption that people with ASD lack insight into their own functioning so that standardized self-report measures may be unsuitable for individuals with ASD [36], studies have shown that they are able to complete self-report questionnaires producing a realistic picture of their functioning [16,19,29].

### 3.3. Procedure

Data on the ASD participants were collected during a regular ASD assessment at Sarr Expertise Center for Autism, and at Erasmus MC, Department of Psychiatry, between April 2007 and June 2010. All participants filled out the TCI by computer, with instructions provided by a psychologist specialized in ASD assessments. During this period, all patients were informed that data might be used for research purposes, and were given the possibility to refuse or withdraw.

The study procedure was reviewed and approved in an advisory statement by the Medical Ethics Committee of Erasmus MC, Rotterdam, The Netherlands (MEC-2008-221, approved on 24 July 2008). In 2016 we contacted DATEC (the provider of the TCI in the Netherlands) and they offered us the raw data of the comparison group for reanalysing our 2012 data set.

### 3.4. Statistical analysis

After assessing normality for the TCI scales for both groups using histograms, paired samples t-tests were used to compare the mean scores of the ASD group with those of the comparison group. SPSS software (version 25) was used to perform the analyses. The TCI was scored comparing the raw scores for each dimension to the scores of the comparison group drawn from the Dutch TCI manual (individually matched on age, education and marital status with the ASD group).

First, we used alpha 0.05. The correcting for multiple comparisons and to control for chance capitalization, Bonferroni corrections were applied to the TCI scores leading to an alpha level of  $0.05/7 = 0.007$ .

## 4. Results

Compared to the comparison group, men with ASD i) scored significantly lower on Novelty Seeking, Reward Dependence, Self-Directedness and Cooperativeness and ii) significantly higher on Harm Avoidance; and iii) did not score differently from the norm group on

Persistence and Self-Transcendence (Table 2).

When Bonferroni corrections were applied to the TCI temperament and character scores to control for chance capitalization (leading to an alpha level of  $0.05/7 = 0.007$ ), the same significant differences were found between the ASD group and the comparison group.

## 5. Discussion

The present study, a reanalysis of our 2012 data set, investigated temperament and character dimensions of men with ASD by individual case matching to a comparison group. The results indicate substantial associations between ASD and five of the seven personality dimensions of Cloninger's psychobiological theory of personality [33]: low Novelty Seeking, low Reward Dependence, low Self-Directedness, low Cooperativeness and high Harm Avoidance, whereas levels of Persistence and Self-Transcendence did not differ between the two groups. This study, with a strong design of *individual* case matching, confirms and strengthens the findings of previous studies employing *general* group matching [22–24,31], all showing clear differences in temperament and character of the ASD male group compared to the male norm group. For meta-analytic results of these TCI studies [22–24,31] we refer to Vuijk et al. [32].

In brief, the TCI provides a dimensional description of an individual's personality, whereby low and high TCI scores can be interpreted in terms of both negative and positive aspects of temperament and character [33].

Thus, men with ASD have a low score on Novelty Seeking; individuals with a low score on Novelty Seeking can be described as stoic, rigid, reserved and inflexible as well as being thoughtful, not taking impulsive decisions and being able to maintain routines or practices [33]. In a general population sample of adults, Romero-Martínez et al. [37] found an inverse association between experience seeking and the specific autistic traits of 'preference for routine' and 'imagination impairment'. Men with ASD have a high score on Harm Avoidance, which is characterized by excessive worrying, pessimism, and shyness; the advantages of high Harm Avoidance are paying attention to possible dangers and avoiding risks, as well as planning and preparing activities carefully [33]. Men with ASD have a low Reward Dependence, which is an indication for being practical and socially insensitive as well as being independent from sentimental considerations [33]. Izuma et al. [38] found an insensitivity to social reputation in adults with ASD, with less tendency to adapt their behavior for a better social reputation, just presenting themselves in an authentic and genuine way. Men with ASD have a low score on Self-Directedness, described as immature and in need for support in everyday life [33]; low Self-Directedness can be favorable in certain professional situations with a clear hierarchy and clear leadership, where one has to follow the orders/instructions given by the leader. Finally, men with ASD have a low score on Cooperativeness, often described as being self-centered, not always aware of other people's need for help, ignoring or neglecting the feelings of

**Table 2**  
TCI scores of men with autism spectrum disorder (ASD) compared to the comparison group.

Scale	ASD group			Comparison group			Test statistics			
	M	SD	Range	M	SD	Range	t	df	p	d
NS	16.00	6.04	2–31	20.17	5.87	7–34	–3.71	65	< .001	–0.70
HA	21.73	7.04	7–35	11.88	6.81	0–28	7.61	65	< .001	1.42
RD	11.05	4.16	3–19	14.42	3.78	6–12	–5.10	65	< .001	–0.85
PS	4.89	2.13	1–12	4.70	2.00	1–8	0.62	65	.54	0.10
SD	26.18	7.94	8–42	32.34	7.29	13–42	–4.67	65	< .001	–0.81
CO	27.09	7.12	11–39	31.00	6.52	13–40	–3.56	65	< .001	–0.57
ST	10.86	6.61	2–29	10.71	6.04	1–27	0.14	65	.89	0.02

TCI = Temperament and Character Inventory, NS = Novelty Seeking, HA = Harm Avoidance, RD = Reward Dependence, PS = Persistence, SD = Self-Directedness, CO = Cooperativeness, ST = Self-Transcendence.

others and having a possible contentment in being alone [33].

Several limitations of this study need to be addressed. First, this study included only men with ASD, which was also the case in previous studies. Therefore, and because of the ASD gender subgrouping [39–41], the results cannot necessarily be extrapolated to women. Second, the group of participants was heterogeneous in terms of age (participants' age ranged from 18 to 63 years). Our rationale for choosing this heterogeneity was to be in accordance with the heterogeneity of the comparison group. We are aware that personality scores can change with increasing age and that the differences found can be a trivial artefact of a mean age difference in the scores between the two groups. However, more or less similar TCI scores for Harm Avoidance, Reward Dependence, Self-Directedness and Cooperativeness were found in 9 and 12-year-old children with ASD [42], suggesting a stable pattern of temperament and character dimensions in persons with ASD over time. Still, the results apply to adults with ASD and cannot necessarily be applied to individuals with ASD under 18 years of age. Third, a clinical control group was lacking. Fourth, although a specific personality profile indicating personality pathology (low Self-Directedness and low Cooperativeness) was found in these participants with ASD, caution is required when interpreting such results in the context of individual psychological assessments: interpretation in terms of negative as well as positive aspects of temperament and character should be considered (as emphasized in our Discussion).

Clinical implications of this study include the formation of a comprehensive image of individuals with ASD, enriching and deepening our understanding of the person behind the disorder, and developing more effective treatment strategies. Vuijk and Arntz [43] recently started a study on the treatment of adults with ASD and personality disorder by testing a specific schema therapy program: this is a first study focusing not only on ASD but also on personality (pathology). Further research is required on the temperament and character dimensions of both men and women with ASD, covering the entire range of ages, to improve knowledge on the relationships, the overlap and the differences between these concepts, as well as our understanding of individuals with ASD and their way of functioning in daily life and experiencing the world. It remains difficult to determine whether specific temperament and character configurations increase the risk for ASD, or whether the presence of ASD influences the development of specific temperament and character configurations, or whether (from a dimensional view of psychopathology) these concepts are differently defined but the same phenomena.

## 6. Conclusion

In conclusion, this study investigating men with ASD individually matched to a comparison group, found a temperament with low Novelty Seeking, high Harm Avoidance and low Reward Dependence, and a character with low Self-Directedness and low Cooperativeness, confirming and strengthening the same findings by general group matching in earlier studies. People with ASD are of course more than merely their classification of ASD; insight into an individual's personality can lead to a different perception of a person with ASD, i.e. by not merely seeing someone who has an ASD classification, but also seeing an individual with a distinct personality.

## Conflicts of interest

The authors declare that they have no competing interests.

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## Human rights

The study was carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki).

## Authors' contributions

RV, PdN, MH designed the study. RV drafted the manuscript, with critical input from the other authors. RV collected the data. MD, MS and RV conducted the statistical analyses. All authors read and approved the final manuscript.

## Authors' information

RV, MA, is a clinical psychologist and researcher at Sarr Expertise Center for Autism.

PdN, MD, PhD, is a child and adolescent psychiatrist at Erasmus MC, Sophia Children's Hospital.

MD, MA, is a statistician at Parnassia Psychiatric Institute, Kiwistraat 32, 2552 DH, The Hague, The Netherlands, and researcher at Institute of Psychology, Methodology and Statistics Unit, Leiden University, Wassenaarseweg 52, 2333 AK Leiden, The Netherlands.

SV, PhD, is a clinical psychologist at GGZ Rivierduinen, Componistenlaan 248, 2215 ST, Voorhout, The Netherlands.

MS, PhD, is a health care psychologist at Arkin-Jellinek, Heiligenbergerweg 34, 3816 AK, Amersfoort, The Netherlands.

MH is emeritus professor of psychiatry at Erasmus MC, Department of Psychiatry, 's Gravendijkwal 230, 3015 CE, Rotterdam, The Netherlands.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.conctc.2018.09.002>.

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