

# Meta-analysis of Big Five personality traits in autism spectrum disorder

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## Abstract

The present meta-analysis synthesizes the emerging literature on the relationship of Big Five personality traits to autism spectrum disorder. Studies were included if they (1) either (a) measured autism spectrum disorder characteristics using a metric that yielded a single score quantification of the magnitude of autism spectrum disorder characteristics and/or (b) studied individuals with an autism spectrum disorder diagnosis compared to individuals without an autism spectrum disorder diagnosis and (2) measured Big Five traits in the same sample or samples. Fourteen reviewed studies include both correlational analyses and group comparisons. Eighteen effect sizes per Big Five trait were used to calculate two overall effect sizes per trait. Meta-analytic effects were calculated using random effects models. Twelve effects (per trait) from nine studies reporting correlations yielded a negative association between each Big Five personality trait and autism spectrum disorder characteristics (Fisher's  $z$  ranged from  $-.21$  (conscientiousness) to  $-.50$  (extraversion)). Six group contrasts (per trait) from six studies comparing individuals diagnosed with autism spectrum disorder to neurotypical individuals were also substantial (Hedges'  $g$  ranged from  $-.88$  (conscientiousness) to  $-1.42$  (extraversion)). The potential impact of personality on important life outcomes and new directions for future research on personality in autism spectrum disorder are discussed in light of results.

## Keywords

autism spectrum disorders, Big Five personality, meta-analysis

Personality has a variety of clinical and adaptive implications across the lifespan (Hopwood et al., 2009; Kotov et al., 2017; Ozer and Benet-Martínez, 2006; Roberts et al., 2007; Steel et al., 2008). Studying personality in the context of disorders can help enhance our understanding of “risk factors, etiology, pathophysiology, phenomenology, illness course, and treatment response” (Kotov et al., 2017: 21). Personality also has potential as an intervention target (see Roberts et al., 2017). The present review summarizes the general effects of research on personality in autism spectrum disorder (ASD), where heterogeneity exists in the literature, future directions suggested by the present findings, and gaps in the existing scholarship.

Big Five personality traits are the most commonly accepted and well-studied taxonomy for measuring personality. The five traits included in the Big Five are Openness to experience, “the breadth, depth, originality, and complexity of an individual’s mental and experiential life”; Conscientiousness, “socially prescribed impulse control that facilitates task- and goal-directed behavior such as thinking before acting, delaying gratification,

following norms and rules, and planning, organizing, and prioritizing tasks”; Extraversion, “implies an energetic approach toward the social and material world and includes traits such as sociability, activity, assertiveness, and positive emotionality”; Agreeableness, “contrasts a prosocial and communal orientation toward others with antagonism and includes traits such as altruism, tender-mindedness, trust, and modesty”; and Emotional stability/Neuroticism, “contrasts emotional stability and even-temperedness with negative emotionality, such as feeling anxious, nervous, sad, and tense” (John et al., 2008: 120). It is important to note that emotional stability and neuroticism are not synonymous terms but, rather, antonyms. In the present

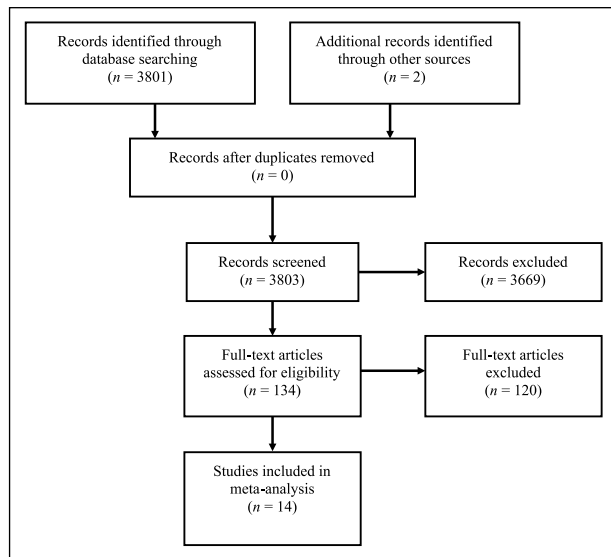
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**Figure 1.** PRISMA flow diagram.

meta-analysis, we refer to emotional stability rather than neuroticism as this allows direction of effects to be consistent across Big Five traits.

Two general classes of studies examine personality traits and their relation to ASD. Some studies have examined the correlations between Big Five personality traits and continuous measures of ASD symptoms either within diagnosed individuals or in the general population (Austin, 2005; Gallitto and Leth-Steensen, 2015; Kanai et al., 2011; Ratner and Burrow, 2017; Rodgers et al., 2018; Schriber et al., 2014; Wainer et al., 2011; Wakabayashi et al., 2006). Other studies have documented mean-level differences in personality traits by comparing individuals clinically diagnosed with ASD to “typically developing” or “neurotypical” individuals without the disorder (De Pauw et al., 2011; Fortenberry et al., 2011; Hesselmark et al., 2015; Schriber et al., 2014; Strunz et al., 2015; Suh et al., 2016). We consider each type of study in separate analyses. When referring to points that apply across analyses, we use the term *ASD*. When making study-specific points, we adhere to the language used by the study authors.

Overall, there is similarity in the direction of findings but variability in the strength of the relationship between ASD and specific personality traits. For example, all past studies report a significant association between extraversion and ASD and all but one study (Fortenberry et al., 2011) reports a significant association between emotional stability and ASD. Findings across the other Big Five traits are more variable. Thus, the first aim of the present study is to summarize and quantify the magnitude of these relationships. We anticipate that these relationships will be consistently negative and small-to-moderate in size with the effects being particularly robust for extraversion and emotional stability.

The second aim of the meta-analysis is to test the hypothesis that the relationship between personality traits and ASD characteristics increases with age. Both ASD symptoms (American Psychiatric Association (APA), 2013; Fein et al., 2013; Helt et al., 2008; Kelley et al., 2010; Robinson et al., 2011) and personality traits (Roberts et al., 2006a) change as people age. It is possible that the relationship between personality traits and ASD can also change. This review includes studies with samples from early childhood (Fortenberry et al., 2011) to midlife (Austin, 2005). One study reviewed suggests that for individuals with ASD, “personality differences persist in adulthood and even increase” (Schriber et al., 2014: 122). We, therefore, consider the extent to which age impacts meta-analytic results with the specific hypothesis that the relationship between personality traits and ASD will be larger with greater mean age of the sample. Because personality traits and ASD (APA, 2013; Schmitt et al., 2008) vary with gender, we also consider the potential for gender to moderate study effects. We also tested how the following study characteristics moderated meta-analytic results: the percentage of the sample with an ASD diagnosis, whether personality traits were measured by self-report or observer ratings, how well ASD was characterized, and risk of bias.

## Method

The present meta-analysis adhered to standards set out in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009) and the American Psychological Association (APA) Reporting Standards for Meta-Analyses (Appelbaum et al., 2018). The PRISMA checklist for this meta-analysis is available as a supplementary file and at <https://osf.io/5pfdj/>.

### Search parameters and inclusion criteria

PsychINFO, Academic Search Premier, MEDLINE, and PsycARTICLES served as the primary method of locating studies for the present meta-analysis in January 2017. Search terms were combinations of *ASD* or *autism* or *Asperger* and *personality* or *NEO-PI* or *NEO Personality Inventory* or *NEO Five Factor* or *Big Five* or *Five Factor Model* or *conscientiousness*. Conscientiousness was selected as the target trait-level keyword as it is a term exclusive to the Big Five. As shown in the PRISMA flow diagram (Moher et al., 2009) in Figure 1, this search yielded 3801 potential abstracts. A review of these abstracts yielded 132 manuscripts that were further screened for inclusion. Preprints of two manuscripts (Ratner and Burrow, 2017; Rodgers et al., 2018) were acquired after the search from the authors of those manuscripts. The literature reviews and reference sections of selected papers were also examined for additional potential studies. Electronic alerts were set

**Table 1.** Study characteristics of included effects using correlations between Big Five traits ASD characteristics.

Study	ASD metric	Trait measure	Trait rater	<i>n</i>	Mean age	% Female
Austin (2005)						
Sample 1	AQ	Mini-markers	Self	201	20.9	60.7
Sample 2	ASP	Mini-markers	Self	133	53.9	75.7
Gallitto and Leth-Steensen (2015)	AQ	Mini-markers	Self	326	20.8	74.5
Kanai et al. (2011)						
ASD sample	AQ	NEO-FFI	Self	64	32.0	20.0
Control sample	AQ	NEO-FFI	Self	65	32.0	20.0
Ratner and Burrow (2017)	AQ	Mini-IPIP	Self	252	38.6	57.4
Rodgers et al. (2018)	AQ	TIPI	Self	253	25.2	76.7
Schriber et al. (2014)						
Study 2 ASD sample	SCQ	BFI	Parent	50	12.1	60.0
Study 2 TD sample	SCQ	BFI	Parent	50	12.0	58.0
Schwartzman et al. (2016)	RAADS-R	IPIP-NEO-120	Self	828	36.0	73.0
Wainer et al. (2011)	BAP	BFI	Self	341	19.7	76.0
Wakabayashi et al. (2006)	AQ	NEO-PI-R-J	Self	320	20.5	50.6

ASD: autism spectrum disorder; AQ: Autism Spectrum Quotient (Baron-Cohen et al., 2001); ASP: Short Asperger's syndrome screening measure (Else and Baron-Cohen, 2001); SCQ: Social Communication Questionnaire (Rutter et al., 2003); RAADS-R: Ritvo Autism Asperger's Diagnostic Scale Revised (Ritvo et al., 2011); BAP: Composite of the AQ, Social Responsiveness Scale-A (Constantino and Todd, 2005), and Broad Autism Phenotype Questionnaire (Hurley et al., 2007); Mini-Markers: Personality Mini-Markers (Saucier, 1994); NEO-FFI: NEO Five-Factor Inventory (Costa and McCrae, 1992); Mini-IPIP: Mini-International Item Personality Item Pool (Donnellan et al., 2006); TIPI: Ten Item Personality Inventory (Gosling et al., 2003); BFI: Big Five Inventory (John et al., 2008); IPIP-NEO-120: International Personality Items Pool Representation of the NEO-PI-R (International Personality Item Pool, 2017); NEO-PI-R-J: NEO-PI-R Japanese version (Shimonaka et al., 1999).

for these searches after the initial search in 2017. These alerts did not generate any additional studies that warranted further screening for inclusion.

Studies were included if they (1) either (a) studied individuals with an ASD diagnosis compared to individuals without an ASD diagnosis and/or (b) measured ASD characteristics using a metric that yielded a single score quantification of the magnitude of ASD characteristics and (2) concurrently measured Big Five traits in the same sample or samples. There were no restrictions set for the time period, geographical region, culture, or language of the study. Studies published in languages other than English were considered for inclusion but none met inclusion criteria. Finally, a study with incomplete data would not have been excluded; however, all studies that met inclusion criteria provided complete data.

### Excluded studies

One study (Ingersoll et al., 2011) that met both criteria was excluded from the meta-analysis because the sample studied and measures included were identical to another study (Wainer et al., 2011). Wainer et al. (2011) was chosen for inclusion because the measures of ASD characteristics were combined to form a single composite. Two studies examining personality traits in children diagnosed with ASD were also excluded (Barger et al., 2014, 2016) because effects were reported only at the facet level rather than at the broader Big Five trait level.

### Study effects

Data from 18 samples across the 14 studies listed in Tables 1 and 2 were included in the current meta-analysis with a total of 3938 participants and 18 coded effects for each Big Five trait (for a total of 90 coded effects). Where studies reported positive associations between neuroticism and ASD, these effects were reversed to indicate negative associations between emotional stability and ASD. Rescoring neuroticism as emotional stability facilitates consistency in direction of effects across Big Five traits allowing for more streamlined tabular presentation of results, visualization of study effects, and written description of study findings. A standardized coding sheet was developed for each trait. All effects were coded by both the first and second authors. There were no discrepancies in the authors' codings and decisions about inclusion and exclusion were made through consensus discussion.

Across studies, effects were either (1) correlations of a metric of ASD characteristics with a Big Five trait or (2) group contrasts of individuals with an ASD diagnosis relative to a control sample or a normative sample. Pearson's *r* correlations took precedence in the cases where both were available. In four instances, further judgment about the effects to include was needed. In one study, the researchers divided the ASD group by low and high symptom levels (De Pauw et al., 2011). In order to avoid using the same comparison group to calculate two effects for meta-analysis, we pooled these subgroups using a weighted average for each trait. Another study (Schriber et al., 2014, Study 1)

**Table 2.** Study characteristics of included studies reporting group effects.

Study	Trait measure	Trait rater	<i>n</i> (ASD/control)	Mean age (ASD/control)	% Female (ASD/control)
De Pauw et al. (2011)	HiPIC	Parent	175/500	10.3/10.5	14.9/15.0
Fortenberry et al. (2011)	M5-PS-45	Parent	8/7	3.9/4.0	0/42.9
Hesselmark et al. (2015)	NEO-PI-R	Self	48/53	29.8/30.4	46.0/47.0
Schriber et al. (2014), Study 1	BFI	Self	37/42	22.2/23.2	22.0/20.0
Strunz et al. (2015)	NEO-PI-R	Self	59/106	32.7/30.8	54.2/47.2
Suh et al. (2016)	BFI	Student rater	27/23	13.1/13.6	7.4/8.7

ASD: autism spectrum disorder; HiPIC: Hierarchical Personality Inventory for Children (Mervielde and De Fruyt, 2002); M5-PS-45: M5-PS-45 Questionnaire (Grist et al., 2012); NEO-PI-R: Revised NEO Personality Inventory (Costa and McCrae, 1992); BFI: Big Five Inventory (John et al., 2008).

**Table 3.** Publication bias and effect size estimates.

Personality trait	Publication bias		Effect size estimate (95% CI)	Heterogeneity		
	<i>t</i>	<i>p</i>		$\tau^2$ (95% CI)	<i>Q</i>	<i>p</i>
Correlation effects						
Openness	.326	.751	−.223 (−.265, −.181)	.001 (.000, .018)	13.76	.247
Conscientiousness	1.292	.225	−.212 (−.299, −.124)	.017 (.005, .054)	47.43	<.001
Extraversion	2.579	.028	−.500 (−.596, −.404)	.022 (.008, .092)	50.40	<.001
Agreeableness	1.225	.249	−.391 (−.499, −.284)	.028 (.011, .111)	66.89	<.001
Emotional stability	2.173	.055	−.359 (−.466, −.252)	.028 (.011, .091)	109.68	<.001
Group effects						
Openness	1.241	.282	−1.03 (−1.441, −.620)	.200 (.045, 1.822)	30.74	<.001
Conscientiousness	.583	.591	−.881 (−1.405, −.358)	.345 (.098, 4.700)	35.90	<.001
Extraversion	.428	.691	−1.423 (−2.233, −.613)	.938 (.318, 5.834)	78.46	<.001
Agreeableness	.990	.378	−.906 (−1.225, −.587)	.101 (.014, .685)	20.80	.001
Emotional stability	.097	.927	−1.341 (−1.664, −1.018)	.101 (.006, 1.378)	14.31	.014

CI: confidence interval.

The *t*-test for publication bias for the correlation effects had 10 degrees of freedom. The *t*-test for publication bias for the group comparison effects had 4 degrees of freedom. Degrees of freedom for tests of heterogeneity (*Q*) were 11 for correlation effects and 5 for group effects.

reported both group contrasts and correlations within groups. However, the authors reported substantial bias due to outliers in the within-group correlations. Therefore, this sample was only included in the group contrast effects. In the second study from this same paper, both parent and child ratings of personality were available (Schriber et al., 2014, Study 2). For this study, the parent ratings of personality traits were used because the measure of ASD characteristics was based on parent report. Another study (Suh et al., 2016) compared an ASD sample and a typically developing sample with a third “optimal outcome” group (individuals with ASD diagnoses in childhood who subsequently did not meet diagnostic criteria for ASD). The optimal outcome sample was excluded from the meta-analysis as that group did not clearly meet inclusion criteria 1a.

### Publication bias

The current review included only published studies. Therefore, publication bias was assessed by examining

asymmetry of effects. This is reported in Table 3. Significant asymmetry was noted for only one effect, the correlation of extraversion and ASD characteristics. This suggests that the correlation effect for extraversion may be an overestimate; however, as significant asymmetry was not present for the four other personality traits, this may be due to the strength of the extraversion effect across studies. A trim-and-fill analysis was conducted to further assess for publication bias in this effect. This analysis did not identify a concern with missing studies from either the right ( $SE_{\text{right}}=2.143$ ) or the left ( $SE_{\text{left}}=2.276$ ) side of the distribution.

### Moderator coding

In addition to coding for the effect sizes, each study was coded for six moderators: (1) the average age of the participants in the sample, (2) the percentage of the sample who were female, (3) the percentage of the sample with an ASD diagnosis, (4) whether personality traits were

**Table 4.** Heterogeneity effects with moderators.

Personality trait	$\tau^2$	$Q_M$	$p$	$Q_E$	$p$
Openness	.009	16.26	.012	27.17	.004
Conscientiousness	.032	6.09	.413	57.57	<.001
Extraversion	.046	8.93	.178	80.93	<.001
Agreeableness	.029	3.47	.748	59.29	<.001
Emotional stability	.013	24.24	.001	35.84	<.001

Degrees of freedom for tests of heterogeneity with moderators ( $Q_M$ ) = 6. Degrees of freedom for tests of residual heterogeneity after the inclusion of moderators ( $Q_E$ ) = 11.

measured by self-report or observer ratings, (5) how well ASD was characterized as the reported alpha reliability of the scale or a score of 1 for confirmed diagnostic groups, and (6) risk of bias. We used the APA Reporting Standards (Appelbaum et al., 2018) to quantify risk of bias. The first and third author independently coded each study for the inclusion of 32 relevant points from the APA standards. Each standard was coded as being met (0), partially met (.5), or missing (1). Initial coding agreement based on what points were not met was 90.63%. Discrepancies in coding were checked by the first author to create a final, single code for each of the 32 points. These codes were summed across the 32 points to quantify risk of bias for each study. Risk of bias from these studies ranged from 2 to 9 with an average of 5.72 ( $SD=2.00$ ).

Because of the relatively small number of studies available for the present meta-analysis, moderation analyses were conducted collapsed across the correlation and group effects as the number of studies in the group effects in particular would be underpowered to accurately detect moderator effects. For the group effects, the Cohen's  $d$  effect size was computed from reported means and recalculated to  $r$  using the following equation (Borenstein et al., 2009)

$$r = \frac{d}{\sqrt{d^2 + \frac{(n_1 + n_2)^2}{n_1 n_2}}}$$

## Analyses

All analyses were conducted using random effects models in the metaphor package in R (Viechtbauer, 2010). The metaphor package uses Fisher's  $z$  as the summary measure for correlation effects and Hedges'  $g$  as the summary measure for group effects. The R script and data files used in the meta-analysis are available at <https://osf.io/5pfdj/>.

## Results

Overall, the effects reported in Table 3 demonstrate that personality traits and ASD characteristics were negatively associated with all Big Five personality traits (Fisher's  $z$  ranged from  $-.21$  (conscientiousness) to  $-.50$  (extraversion)). Mean

differences comparing individuals diagnosed with ASD to neurotypical individuals were also substantial (Hedges'  $g$  ranged from  $-.88$  (conscientiousness) to  $-1.42$  (extraversion)). All effect size estimates were significant at  $p \leq .001$ . Forest plots of each effect are available in Supplementary Figures 1 to 10 and at <https://osf.io/5pfdj/>.

There was significant variability in the effects across studies for all of the trait-ASD relationships, as illustrated in the tests for heterogeneity of effects in Table 3. Mixed effects models controlling for age, gender, percent of the sample with ASD, whether personality traits were measured by self-report or observer ratings, how well ASD was characterized, and risk of bias detected two significant moderation effects. Mean age ( $\beta = -.012$  (95% CI:  $-.020$ ,  $-.003$ ),  $p = .009$ ) and how well ASD was characterized ( $\beta = -1.290$  (95% CI:  $-2.209$ ,  $-.371$ ),  $p = .006$ ) moderated the effect for emotional stability with the effect being more robust with age and studies that tested confirmed diagnostic groups. There were no other significant moderation effects. As shown in Table 4, significant heterogeneity remained after controlling for these study-level metrics suggesting that other factors are likely driving variability in the relationship of personality traits and ASD.

## Discussion

The present meta-analysis indicates that ASD is associated with lower openness, conscientiousness, extraversion, agreeableness, and emotional stability. This descriptive relationship of personality and ASD underscores the primary purpose of many studies examining the relationship of personality traits to ASD—the facilitation of diagnosis and identification of individuals with ASD (Fortenberry et al., 2011; Kanai et al., 2011; Schriber et al., 2014; Schwartzman et al., 2016; Strunz et al., 2015). Such studies are consistent with modern dimensional conceptions of the role of personality in clinical psychology (APA, 2013; Kotov et al., 2017; Lengel et al., 2016; Tackett, 2006; Trull and Widiger, 2015; Widiger and Presnall, 2013). Personality approaches to ASD may be particularly useful as ASD has components that cut across the spectra of modern classification systems but the “neurocognitive and neurodevelopmental clusters” in which such systems place ASD “have not been examined in structural studies” (Kotov et al., 2017: 14).

At the same time, multiple studies reviewed in the present meta-analysis indicate that ASD characteristics are statistically independent from Big Five personality traits in both non-clinical (Austin, 2005; Wakabayashi et al., 2006) and clinical samples (Schriber et al., 2014). Similarly, cluster analyses suggest that not all individuals with ASD exhibit a low Big Five trait profile (Schwartzman et al., 2016). These studies indicate that low Big Five traits and ASD are not equivalent. This is in contrast to the current dimensional conceptions of the role of personality in

clinical psychology referenced in the previous paragraph and scholars studying Big Five personality in clinical samples urge “caution in treating ASD” (Schriber et al., 2014: 123) under this framework. Thus, at this point, personality trait measurement should be viewed as a potential resource to enhance rather than replace traditional diagnostic tools and future research should continue to evaluate personality and ASD in the context of dimensional models.

The inclusion of personality trait assessments as part of a portfolio of clinical assessment tools has particular potential in helping to understand the life outcomes of individuals with ASD. Where comparisons of sample variance were presented, traits were as variable or even more variable in individuals with ASD or high ASD characteristics when compared to variance in control samples (De Pauw et al., 2011; Hesselmark et al., 2015; Rodgers et al., 2018; Schriber et al., 2014). Variability in personality traits can help understand and, to some degree, account for the challenges and successes in individuals with ASD just as they do in individuals without clinical diagnoses and individuals with other disorders (Curtis et al., 2015; Hopwood et al., 2009; Kern and Friedman, 2008; Luchetti et al., 2016; Mroczek and Spiro, 2007; Ozer and Benet-Martínez, 2006; Roberts et al., 2007; Soubelet and Salthouse, 2011; Steel et al., 2008; Tackett, 2006; Ziegler et al., 2015). For example, in children with ASD, emotional stability, extraversion, and agreeableness are associated with internalizing and externalizing problems (De Pauw et al., 2011; Schriber et al., 2014). In adults with ASD or high ASD characteristics, disruptions in personality traits also appear to be influencing deficits in quality of life (Ratner and Burrow, 2017; Rodgers et al., 2018; Schwartzman et al., 2016).

The evidence emerging from the literature reviewed for this meta-analysis suggests that the overall profile of traits in ASD puts individuals at risk for challenges across the lifespan. Variability in personality within individuals with ASD can support the possibility of more optimistic trajectories. Children with higher levels of all Big Five traits were less likely to meet diagnostic criteria for ASD after having earlier received an ASD diagnosis (Suh et al., 2016). Adults with this profile reported higher education, greater satisfaction with their jobs, and greater overall satisfaction with life (Schwartzman et al., 2016). It may be that individuals with ASD with more typical personality traits are better able to accommodate the demands of society and thus are more likely to lead relatively mainstream lives. Furthermore, certain aspects of the personality profile of individuals with ASD can be strengths in some contexts, particularly academia and other specialized workplace settings (APA, 2013; Austin, 2005; Baron-Cohen et al., 2001; Strunz et al., 2015).

The existence of individuals with a more adaptive trait profile in the presence of ASD is particularly optimistic when paired with a recent meta-analysis of the impact intervention can have on personality traits in adulthood

(Roberts et al., 2017). It may be that existing interventions that target social skill development in children with ASD (e.g. Gates et al., 2017; Lopata et al., 2013; Reichow et al., 2012) are facilitating adaptive trait development with long-term consequences. Future programs of intervention should target the development of adaptive personality traits in order to potentially impact a broad range of life outcomes.

### *Limitations, future directions, and conclusion*

Research on Big Five personality traits in ASD is still an emerging field. This is most notable in the moderator analyses. The moderator effects reported in the present meta-analysis should be treated with caution given the limited number of studies available and the number of moderators tested. Consideration of these moderators should be the focus of future work. For example, future research should continue to investigate the role of age on the relationship of personality and ASD. Both personality traits (Roberts et al., 2006a) and ASD characteristics (APA, 2013; Robinson et al., 2011) are present from early in life and can and do change across the lifespan. Thus, development is an excellent area to look for sources of covariation in these phenomena. Evidence suggests that the relationship between personality and ASD increases in adulthood (Schriber et al., 2014). However, lifespan data to evaluate this hypothesis is lacking. The oldest mean age for any of the studies in the present review was 53.9 years, reflecting the dearth of research on ASD in late life. Furthermore, to date, no published studies have examined the relationship of personality and ASD longitudinally. Longitudinal research on personality and ASD throughout the lifespan will be an essential future direction for research on this topic.

In conducting developmental and longitudinal work on personality and ASD, it is important to recognize that age effects may be confounded by whether personality was measured by self-report or other-report. Future research should consider the extent to which the respondent influences the relationship between personality traits and ASD as the personality literature clearly indicates variability can exist between self-report and informant reports (Vazire, 2006; Vazire and Solomon, 2015). However, this did not moderate any results in the present meta-analysis and the one sample that collected both self- and parent reports of personality traits did not find consistent differences between the ratings (Schriber et al., 2014).

Overall, residual heterogeneity in the moderation analyses suggests additional moderators are at play in the relationship of personality and ASD. Future work should seek to identify and study these potential mechanisms. In particular, cognitive function may be an important factor. Only four studies provided a general characterization of their samples on IQ (De Pauw et al., 2011; Kanai et al., 2011; Schriber et al., 2014; Suh et al., 2016) and only one

indicated that IQ was considered as a potential control in the analyses (Schriber et al., 2014).

The particular assessment tools used may also have an important influence on study results. Study effects varied when personality traits were measured at a lower-order facet level, although this could not be included in the meta-analytic effects due to the limited number of studies that assessed facets (Hesselmark et al., 2015; Schwartzman et al., 2016; Strunz et al., 2015; Wakabayashi et al., 2006). Facet-level variability was particularly notable for the traits of openness and conscientiousness and may explain the lower effect sizes seen for these traits.

Similarly, the current moderation analyses indicate emotional stability effects were moderated by ASD characterization with effects most robust for those studies using diagnostically confirmed ASD groups compared to control samples. Within correlational studies, the ASD scale used is itself an important consideration in future research on the relationship of personality and ASD. Strength and, at times, even direction of effects also varied based on the ASD scale used (see Austin, 2005; Ingersoll et al., 2011; Wakabayashi et al., 2006). Much of the research included in the present review relied on the AQ. However, there was insufficient variability across studies to test whether using the AQ compared to a different metric of ASD characteristics moderated correlation effects. Despite its ubiquitous use, the AQ is not without flaw. Research on samples included in the present meta-analysis indicates that “the AQ provided less incremental validity” (Ingersoll et al., 2011: 1654) and demonstrated less “replicability of its theoretical factor structure” (Ingersoll et al., 2011: 1653) relative to other measures of ASD characteristics.

The field must also consider the issue of measurement invariance in conducting future research into the elaboration and precision of measurement models for both traits and ASD. Evidence in articles included in the present meta-analysis suggests that traits are not homogenous within ASD participants (De Pauw et al., 2011; Hesselmark et al., 2015; Rodgers et al., 2018; Schriber et al., 2014). Research has initially investigated the psychometric properties of personality trait assessment in ASD samples (Hesselmark et al., 2015) and the ability of individuals with ASD to self-report their personality (Hesselmark et al., 2015; Schriber et al., 2014). However, it is possible that group differences are not evidence of mean-level differences but evidence for differential scale functioning. Firm evidence of group differences in personality traits cannot be established without assessing measurement invariance and future work must address this issue.

Future work must also incorporate a broader conception of personality that extends beyond a Big Five trait approach. Modern research in personality psychology clearly indicates Big Five traits are only a component of the broader picture of personality (McAdams and Pals, 2006; Roberts et al., 2006b). While Big Five traits are

dominant, not all individual differences can be wholly reduced to the Big Five. Importantly, personality beyond the Big Five demonstrates incremental validity to Big Five traits, predicting important variance above and beyond Big Five traits (i.e. Adler et al., 2016). Future work should continue to extend the relationship of ASD with personality beyond Big Five traits. For example, there is existing literature mapping childhood temperament to ASD (Barger et al., 2014, 2016; De Pauw et al., 2011) and ASD has recently been associated with attachment styles (Gallitto and Leth-Steensen, 2015), emotion regulation (Mazefsky et al., 2013; Weiss et al., 2014), alexithymia (Liss et al., 2008), identity status (Ratner and Berman, 2015), self-concept clarity (Berna et al., 2016; Rodgers et al., 2018), self-esteem (Cooper et al., 2017; Rodgers et al., 2018), values (Kirchner et al., 2016), and autobiographical memory (Crane and Goddard, 2007; Millward et al., 2000). Continued research on personality and ASD can elucidate the extent to which these constructs overlap with and/or are incremental to Big Five traits in ASD samples.

In sum, ASD is associated with lower levels of the Big Five personality traits of openness, conscientiousness, extraversion, agreeableness, and emotional stability. This general profile may have a useful role in facilitating differential diagnosis of individuals with ASD and may inform future intervention possibilities. The studies included in this meta-analysis also suggest notable variability in personality traits within individuals with ASD. This variability is likely associated with important outcomes across the lifespan. The literature on personality and ASD is, however, still emerging with relatively few studies and those studies that do exist are cross-sectional and largely on children and young adult samples. It is our hope that this review will catalyze future work in this area in an effort to develop a better understanding of the role of personality in the lives of individuals with ASD.

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### References

References marked with an asterisk were included in the meta-analysis.

- Adler J, Lodi-Smith J, Philippe F, et al. (2016) The incremental validity of narrative identity in predicting psychological well-being: a review of the field and recommendations for the future. *Personality and Social Psychology Review* 20(2): 142–175.
- American Psychiatric Association (APA) (2013) *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*. Washington, DC: American Psychiatric Association Publishing, Inc.
- Appelbaum M, Cooper H, Kline RB, et al. (2018) Journal article reporting standards for quantitative research in psychology: the APA publications and communications board task force report. *American Psychologist* 73(1): 3–25.
- \*Austin EJ (2005) Personality correlates of the broader autism phenotype as assessed by the Autism Spectrum Quotient (AQ). *Personality and Individual Differences* 38(2): 451–460.
- Barger B, Campbell J and Simmons C (2014) measuring Five Factor Personality traits in autism during early childhood. *Journal of Developmental and Physical Disabilities* 26(6): 775–792.
- Barger B, Campbell J and Simmons C (2016) The Five Factor Personality model in children with ASD during middle childhood. *Focus on Autism and Other Developmental Disabilities* 31(3): 174–183.
- Baron-Cohen S, Wheelwright S, Skinner R, et al. (2001) The Autism-Spectrum Quotient (AQ): evidence from Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. *Journal of Autism and Developmental Disorders* 31(1): 5–17.
- Berna F, Göritz AS, Schröder J, et al. (2016) Self-disorders in individuals with autistic traits: contribution of reduced autobiographical reasoning capacities. *Journal of Autism and Developmental Disorders* 46(8): 2587–2598.
- Borenstein M, Hedges LV, Higgins JPT, et al. (2009) *Introduction to Meta-analysis*. Chichester: John Wiley & Sons.
- Constantino JN and Todd RD (2005) Intergenerational transmission of subthreshold autistic traits in the general population. *Biological Psychiatry* 57(6): 655–660.
- Cooper DK, Smith L and Russell A (2017) Social identity, self-esteem, and mental health in autism. *European Journal of Social Psychology* 47: 844–854.
- Costa PT and McCrae RR (1992) Normal personality assessment in clinical practice: the NEO personality inventory. *Psychological Assessment* 4(1): 5–13.
- Crane L and Goddard L (2007) Episodic and semantic autobiographical memory in adults with autism spectrum disorders. *Journal of Autism and Developmental Disorders* 38(3): 498–506.
- Curtis RG, Windsor TD and Soubelet A (2015) The relationship between Big-5 personality traits and cognitive ability in older adults—a review. *Aging, Neuropsychology, and Cognition* 22(1): 42–71.
- \*De Pauw SS, Mervielde I, Leeuwen KGV, et al. (2011) How temperament and personality contribute to the maladjustment of children with autism. *Journal of Autism and Developmental Disorders* 41(2): 196–212.
- Donnellan MB, Oswald FL, Baird BM, et al. (2006) The mini-IPIP scales: tiny-yet-effective measures of the Big Five factors of personality. *Psychological Assessment* 18(2): 192–203.
- Else L and Baron-Cohen S (2001) In a different world. *New Scientist* 170(2286): 42–45.
- Fein D, Barton M, Eigsti I-M, et al. (2013) Optimal outcome in individuals with a history of autism. *Journal of Child Psychology and Psychiatry* 54(2): 195–205.
- \*Fortenberry CL, Grist CL and McCord DM (2011) Personality trait differences between typically developing children and those diagnosed with autism spectrum disorder. *Individual Differences Research* 9: 73–83.
- \*Gallitto E and Leth-Steensen C (2015) Autistic traits and adult attachment styles. *Personality and Individual Differences* 79: 63–67.
- Gates JA, Kang E and Lerner MD (2017) Efficacy of group social skills interventions for youth with autism spectrum disorder: a systematic review and meta-analysis. *Clinical Psychology Review* 52: 164–181.
- Gosling SD, Rentfrow PJ and Swann WB (2003) A very brief measure of the Big-Five personality domains. *Journal of Research in Personality* 37(6): 504–528.
- Grist CL, Socha A and McCord DM (2012) The M5-PS-35: a Five-Factor personality questionnaire for preschool children. *Journal of Personality Assessment* 94(3): 287–295.
- Helt M, Kelley E, Kinsbourne M, et al. (2008) Can children with autism recover? If so, how? *Neuropsychology Review* 18(4): 339–366.
- \*Hesselmark E, Eriksson JM, Westerlund J, et al. (2015) Autism spectrum disorders and self reports: testing validity and reliability using the NEO-PI-R. *Journal of Autism and Developmental Disorders* 45(5): 1156–1166.
- Hopwood CJ, Morey LC, Ansell EB, et al. (2009) The convergent and discriminant validity of Five-Factor traits: current and prospective social, work, and recreational dysfunction. *Journal of Personality Disorders* 23(5): 466–476.
- Hurley RS, Losh M, Parlier M, et al. (2007) The broad autism phenotype questionnaire. *Journal of Autism and Developmental Disorders* 37(9): 1679–1690.
- Ingersoll B, Hopwood CJ, Wainer A, et al. (2011) A comparison of three self-report measures of the broader autism phenotype in a non-clinical sample. *Journal of Autism and Developmental Disorders* 41(12): 1646–1657.
- International Personality Item Pool (2017). Available at: <http://ipip.ori.org/>
- John OP, Naumann LP and Soto CJ (2008) Paradigm shift to the integrative Big Five trait taxonomy. In: John OP, Robins RW and Pervin LA (eds) *Handbook of Personality: Theory and Research*. New York: Guildford Press, pp.114–158.
- \*Kanai C, Iwanami A, Hashimoto R, et al. (2011) Clinical characterization of adults with Asperger's syndrome assessed by self-report questionnaires based on depression, anxiety, and personality. *Research in Autism Spectrum Disorders* 5(4): 1451–1458.
- Kelley E, Naigles L and Fein D (2010) An in-depth examination of optimal outcome children with a history of autism spectrum disorders. *Research in Autism Spectrum Disorders* 4(3): 526–538.
- Kern ML and Friedman HS (2008) Do conscientious individuals live longer? A quantitative review. *Health Psychology* 27(5): 505–512.
- Kirchner J, Ruch W and Dziobek I (2016) Brief report: Character strengths in adults with autism spectrum disorder



- without intellectual impairment. *Journal of Autism and Developmental Disorders* 46(10): 3330–3337.
- Kotov R, Krueger RF, Watson D, et al. (2017) The Hierarchical Taxonomy of Psychopathology (HiTOP): a dimensional alternative to traditional nosologies. *Journal of Abnormal Psychology* 126(4): 454–477.
- Lengel GJ, Helle AC, Deshong HL, et al. (2016) Translational applications of personality science for the conceptualization and treatment of psychopathology. *Clinical Psychology: Science and Practice* 23(3): 288–308.
- Liss M, Mailloux J and Erchull MJ (2008) The relationships between sensory processing sensitivity, alexithymia, autism, depression, and anxiety. *Personality and Individual Differences* 45(3): 255–259.
- Lopata C, Thomeer ML, Volker MA, et al. (2013) A manualized summer program for social skills in children with high-functioning ASD. In: Scarpa A, White SW and Attwood T (eds) *CBT for Children and Adolescents with High-Functioning Autism Spectrum Disorders*. New York: Guilford Press, pp.199–225.
- Luchetti M, Terracciano A, Stephan Y, et al. (2016) Personality and cognitive decline in older adults: data from a longitudinal sample and meta-analysis. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 71(4): 591–601.
- McAdams DP and Pals JL (2006) A new Big Five: fundamental principles for an integrative science of personality. *American Psychologist* 61(3): 204–217.
- Mazefsky CA, Herrington J, Siegel M, et al. (2013) The role of emotion regulation in autism spectrum disorder. *Journal of the American Academy of Child and Adolescent Psychiatry* 52(7): 679–688.
- Mervielde I and De Fruyt F (2002) Assessing children's traits with the hierarchical personality inventory for children. In: De Raad B and Perugini M (eds) *Big Five Assessment*. Göttingen, Germany: Hogrefe & Huber Publishers, pp.127–146.
- Millward C, Powell S, Messer D, et al. (2000) Recall for self and other in autism: children's memory for events experienced by themselves and their peers. *Journal of Autism and Developmental Disorders* 30(1): 15–28.
- Moher D, Liberati A, Tetzlaff J, et al. (2009) Preferred Reporting Items for Systematic Reviews and Meta-Analyses: the PRISMA Statement. *PLoS Medicine* 6(7): e100009.
- Mroczek DK and Spiro A (2007) Personality change influences mortality in older men. *Psychological Science* 18(5): 371–376.
- Ozer DJ and Benet-Martínez V (2006) Personality and the prediction of consequential outcomes. *Annual Review of Psychology* 57(1): 401–421.
- Ratner K and Berman SL (2015) The influence of autistic features on identity development in emerging adults. *Emerging Adulthood* 3(2): 136–139.
- Ratner K and Burrow AL (2017) Autistic features in the general population: implications for sensing purpose in life. *Journal of Positive Psychology*. Epub ahead of print 10 April 2017. DOI: 10.1080/17439760.2017.1315647.
- Reichow B, Steiner AM and Volkmar FR (2012) Social skills groups for people aged 6 to 21 with autism spectrum disorders (ASD). *Evidence-Based Child Health* 7: 266–315.
- Ritvo RA, Ritvo ER, Guthrie D, et al. (2011) The Ritvo Autism Asperger Diagnostic Scale-Revised (RAADS-R): a scale to assist the diagnosis of autism spectrum disorder in adults: an international validation study. *Journal of Autism and Developmental Disorders* 41(8): 1076–1089.
- Roberts BW, Harms PD, Smith JL, et al. (2006b) Methods in personality psychology. In: Eid M and Diener E (eds) *Handbook of Psychological Assessment: A Multi Method Perspective*. Washington, DC: American Psychological Association, pp.321–336.
- Roberts BW, Kuncel NR, Shiner R, et al. (2007) The power of personality: the comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science* 2(4): 313–345.
- Roberts BW, Luo J, Briley DA, et al. (2017) A systematic review of personality trait change through intervention. *Psychological Bulletin* 143(2): 117–141.
- Roberts BW, Walton KE and Viechtbauer W (2006a) Patterns of mean-level change in personality traits across the life course: a meta-analysis of longitudinal studies. *Psychological Bulletin* 132(1): 1–25.
- Robinson EB, Munir K, Munafò MR, et al. (2011) Stability of autistic traits in the general population: further evidence for a continuum of impairment. *Journal of the American Academy of Child and Adolescent Psychiatry* 50(4): 376–384.
- Rodgers JD, Lodi-Smith J, Hill PL, et al. (2018) Brief report: personality mediates the relationship between Autism Quotient and well-being: a conceptual replication using self-report. *Journal of Autism and Developmental Disorders* 48: 307–315.
- Rutter M, Le Couteur A and Lord C (2003) *Autism Diagnostic Interview-Revised*. Los Angeles, CA: Western Psychological Services.
- Saucier G (1994) Mini-markers: a brief version of Goldberg's unipolar Big-Five markers. *Journal of Personality Assessment* 63(3): 506–516.
- \*Schriber R, Robins R and Solomon M (2014) Personality and self-insight in individuals with autism spectrum disorder. *Journal of Personality and Social Psychology* 106: 112–130.
- \*Schwartzman BC, Wood JJ and Kapp SK (2016) Can the Five Factor Model of personality account for the variability of autism symptom expression? Multivariate approaches to behavioral phenotyping in adult autism spectrum disorder. *Journal of Autism and Developmental Disorders* 46(1): 253–272.
- Schmitt DP, Realo A, Voracek M, et al. (2008) Why can't a man be more like a woman? Sex differences in Big Five personality traits across 55 cultures. *Journal of Personality and Social Psychology* 94(1): 168–182.
- Shimonaka Y, Nakazato K, Gondo Y, et al. (1999) *NEO-PI-R, NEO-FFI Manual for the Japanese Version*. Tokyo, Japan: Tokyo Shinri.
- Soubelet A and Salthouse TA (2011) Personality–cognition relations across adulthood. *Developmental Psychology* 47(2): 303–310.
- Steel P, Schmidt J and Shultz J (2008) Refining the relationship between personality and subjective well-being. *Psychological Bulletin* 134(1): 138–161.

- \*Strunz S, Westphal L, Ritter K, et al. (2015) Personality pathology of adults with autism spectrum disorder without accompanying intellectual impairment in comparison to adults with personality disorders. *Journal of Autism and Developmental Disorders* 45(12): 4026–4038.
- \*Suh J, Orinstein A, Barton M, et al. (2016) Ratings of broader autism phenotype and personality traits in optimal outcomes from autism spectrum disorder. *Journal of Autism and Developmental Disorders* 46(11): 3505–3518.
- Tackett JL (2006) Evaluating models of the personality–psychopathology relationship in children and adolescents. *Clinical Psychology Review* 26(5): 584–599.
- Trull TJ and Widiger TA (2015) Personality disorders and personality. In: Mikulincer M and Shaver PR (eds) *APA Handbook of Personality and Social Psychology, Volume 4: Personality Processes and Individual Differences*. Washington, DC: American Psychological Association, pp.601–618.
- Vazire S (2006) Informant reports: a cheap, fast, and easy method for personality assessment. *Journal of Research in Personality* 40(5): 472–481.
- Vazire S and Solomon BC (2015) Self-and other-knowledge of personality. In: Mikulincer M and Shaver PR (eds) *APA Handbook of Personality and Social Psychology, Volume 4: Personality Processes and Individual Differences*. Washington, DC: American Psychological Association, pp.261–281.
- Viechtbauer W (2010) Conducting Meta-Analyses in R with the metafor Package. *Journal of Statistical Software* 36(3). DOI: 10.18637/jss.v036.i03.
- \*Wainer AL, Ingersoll BR and Hopwood CJ (2011) Structure and nature of the broader autism phenotype in a sample of undergraduate students. *Journal of Psychopathology and Behavioral Assessment* 33: 495–469.
- \*Wakabayashi A, Baron-Cohen S and Wheelwright S (2006) Are autistic traits an independent personality dimension? A study of the Autism-Spectrum Quotient (AQ) and the NEO-PI-R. *Personality and Individual Differences* 41(5): 873–883.
- Weiss JA, Thomson K and Chan L (2014) A systematic literature review of emotion regulation measurement in individuals with autism spectrum disorder. *Autism Research* 7(6): 629–648.
- Widiger TA and Presnall JR (2013) Clinical application of the five-factor model. *Journal of Personality* 81(6): 515–527.
- Ziegler M, Cengia A, Mussel P, et al. (2015) Openness as a buffer against cognitive decline: the Openness-Fluid-Crystallized-Intelligence (OFCI) model applied to late adulthood. *Psychology and Aging* 30(3): 573–588.