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Are autistic traits an independent personality dimension? A study of the Autism-Spectrum Quotient (AQ) and the NEO-PI-R

Akio Wakabayashi [a,b,*], Simon Baron-Cohen [b], Sally Wheelwright [b]

[a] *Department of Psychology, Chiba University, 1-33 Yayoi-cho, Inage, Chiba 263-8522, Japan*
[b] *Autism Research Centre, Department of Psychiatry, University of Cambridge, Douglas House, 18b Trumpington Road, Cambridge CB2 2AH, UK*

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Abstract

This study examines the relation between autistic traits and the personality dimensions of the Big Five model in a sample of 320 university students. We administered the Autism-Spectrum Questionnaire (AQ) and the NEO-PI-R. Results showed the AQ correlated with Extraversion and Conscientiousness negatively, and Neuroticism positively. Results of multiple regression analyses suggested the NEO-PI-R did not predict AQ score. Joint factor analyses also suggested autistic traits are independent of the big five personality dimensions. High AQ scorers, who are an analogue model of autism spectrum conditions, showed a profile of high Neuroticism, low Extraversion and low Conscientiousness. Results are discussed in terms of autistic traits representing a sixth factor of personality.

Keywords: Autism-Spectrum Quotient; Big Five model; The NEO-PI-R; Autistic traits

* Corresponding author. Address: Department of Psychology, Chiba University, 1-33 Yayoi-cho, Inage, Chiba 263-8522, Japan.
E-mail address: akiowcam@mac.com (A. Wakabayashi).

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1. Introduction

Autism spectrum conditions are defined in terms of abnormalities in social and communication development, in the presence of marked repetitive behaviour and narrow interests (American Psychiatric Association, 1994).[1] An assumption of the autism-spectrum model is that autism conditions lie on a continuum of social-communication skills (Baron-Cohen, 1995; Frith, 1991; Wing, 1981, 1988). The continuum view shifts us away from categorical diagnosis and towards a quantitative approach, and suggests the possibility of an 'analogue' study of autism.

To test the continuum view, Baron-Cohen, Wheelwright, Skinner, Martin, and Clubley (2001) constructed the Autism-Spectrum Quotient (AQ), which comprises a 50 item self-administered questionnaire, comprising five sub-scales: social skill, attention switching, attention to detail, communication, and imagination. The AQ clearly distinguishes people with Autistic Spectrum Conditions (ASC), particularly those with Asperger Syndrome (AS) or high functioning autism (HFA) (both of whom by definition have an IQ in the average or above average range) from those without either of these diagnoses, and this result from a British sample has been replicated in the very different cultural context of Japan (Wakabayashi, Baron-Cohen, Wheelwright, & Tojo, in press). The AQ not only discriminated people with ASC from a control population but revealed a normal distribution in the adult population, in both cultures. These results suggest that the AQ measures individual differences in the degree or the number of autistic traits in adults.[2] This raises the question that the number of autistic traits, as measured by the AQ, constitutes a personality dimension of individual differences, akin to 'Introversion' or 'Neuroticism', and one that might be independent of the known personality dimensions.

Some studies investigating the relationship between autism and personality have been conducted in clinical settings (Alvarez & Reid, 1999) and in families (Murphy et al., 2000). Recently, Austin (2005) studied the relationship between the AQ and the 'Big Five' dimensions of personality in university students. The results showed that the AQ correlated with Extraversion and Agreeableness (both in a negative direction), and Neuroticism. Austin concluded however that, based on the results from multiple regression analyses, the AQ captures variance in individual differences that is not fully accounted for by the five-factor model. This suggestion is of interest because it may mean that autistic traits, as measured by the AQ, are a different dimension of individual difference from the major personality dimensions.

Austin (2005) used the Personality Mini-Markers as indices of the Big Five dimensions in her study. This instrument is constructed from a 40-item scale of trait-descriptive adjectives (Saucier, 1994). Although useful as a brief measure of individual differences on the Big Five dimensions, it might not be sensitive enough as a test of whether the AQ is independent of the Big Five dimensions, especially their facets. For this reason, we carried out a more comprehensive examination of the relationship between autistic traits and personality. If there is a relationship between these in

[1] In this paper we use the term 'autism spectrum conditions'. This term is used interchangeably for the term 'autism spectrum disorders' in related literatures lately. Since this acknowledges these as medical conditions with a biological basis in altered neuronal function and structure, and with a genetic basis, but avoids the negative overtones of the word 'disorder', instead acknowledging that autism involves both deficits (e.g., in empathy) and strengths (e.g., in attention to detail, deep interests, and in 'systemizing').

[2] 'The number of autistic traits' means simply the degree of the responses to the AQ here.

typical adults, it may mean that the AQ simply measures individual differences in personality. However, if the number of autistic traits is *independent* of the major personality dimensions, this would be important in suggesting that those with a diagnosis of an ASC are just an extreme of the variance seen among typical adults, and it opens the way for analogue research of ASC. In order to investigate these questions, we tested the relationship between the AQ and the big five personality dimensions in detail, by using the NEO-PI-R.

2. The relation between the AQ and the Big Five model

2.1. Participants

The participants were 320 students (158 males and 162 females) of introductory psychology from Chiba University. The ages of the participants ranged between 18 and 23 (Mean = 20.5, SD = 2.25).

2.2. Instruments

The Autism-Spectrum Quotient (AQ) Japanese version (Wakabayashi, Tojo, Baron-Cohen, & Wheelwright, 2004). This questionnaire was confirmed as equivalent to the original UK version of the AQ (Wakabayashi et al., in press), and standardized by the authors to apply in Japan.

NEO-PI-R Japanese version (NEO-PI-R, Costa & McCrae, 1992, Japanese version; Shimonaka, Nakazato, Gondo, & Takayama, 1999): This questionnaire has the same format (240 items) as the original version, and measures the Big Five domains (Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness) and each of their six facets.

2.3. Procedure

The questionnaires were administered mainly in group settings. About half the participants took the AQ first, and after one or two months they took the NEO-PI-R. The remaining half of the participants took the tests in reverse order. All the questionnaires that had items with no response or more than one response to the same item were rejected. The number of participants described above is the number who completed all items.

2.4. Results

2.4.1. Psychometric properties of the AQ in this study

The mean AQ score of the participants was 20.9 (SD = 6.73). This result was identical with former large standardized data (Mean = 20.7, SD = 6.38, $N = 1050$). The skewness was 0.181 and kurtosis was −0.788, and they were almost identical with standardized data too. These results suggest that the participants in this study were representatives of the general population in Japan, and the distribution of the AQ score is not skewed, but the kurtosis shows that the distributions are slightly *platykurtic*. The internal consistency of the AQ full-scale was 0.81, and those of the subscales ranged between 0.6 and 0.8.

Table 1
Correlations between the AQ and the Big Five domains in NEO-PI-R

	AQ total	Social skill	Attention switching	Attention to details	Communication	Imagination
Neuroticism	0.289**	0.079	0.284**	0.092	0.343**	−0.013
Extraversion	−0.434**	−0.549**	−0.260**	0.140*	−0.339**	−0.254**
Openness	−0.109	−0.068	−0.139*	0.160**	−0.124*	−0.229**
Agreeableness	−0.096	−0.153*	0.123*	−0.052	0.018	−0.232**
Conscientiousness	−0.288**	−0.255**	−0.119*	0.214**	−0.432**	−0.285**

* $p < 0.05$.
** $p < 0.01$.

2.4.2. The correlation between the AQ and the NEO-PI-R

The Pearson's product moment correlation coefficients between total AQ score, and sub-scale scores of the AQ, and five domains in the NEO-PI-R are shown in Table 1. Total AQ score was negatively correlated with Extraversion and Conscientiousness, but positively correlated with Neuroticism. However, there were no correlations between the AQ and Openness to Experiences and Agreeableness. Each sub-scale of the AQ also showed the correlation with some of the big five domains, but there were certain differences among the sub-scales in the relation with the big five domains.

The correlations between total AQ score and sub-scales in the AQ and each facet of five personality domains in the NEO-PI-R are shown in Table 2. Total AQ score is negatively correlated with all facets in Extraversion and five facets in Conscientiousness, but positively correlated with four facets in Neuroticism. However, there were no certain correlations between the AQ and Openness to Experiences and Agreeableness, except only a few facets such as Actions, Altruism and Modesty.

On the sub-scales of the AQ, Social skill correlated with all facets in Extraversion. Attention switching correlated with four facets in Neuroticism positively and five facets in Extraversion negatively. Communication correlated with all facets in Conscientiousness and four facets in Extraversion negatively and all facets in Neuroticism positively. Imagination correlated with all facets in Conscientiousness, five facets in Extraversion and Openness and three facets in Agreeableness negatively. Attention to details did not correlate with most of the facets.

2.4.3. Multiple regression analysis of the NEO-PI-R

In order to examine whether AQ score can be predicted by the Big Five personality dimensions, we applied a regression analysis to our data. A standard multiple regression analysis was performed with AQ score as the predicted variable and the five personality dimensions from the NEO-PI-R (Neuroticism, Extraversion, Openness to Experiences, Agreeableness, and Conscientiousness) as predictor variables. The NEO-PI-R scales predicted 24.1% of the variability in the number of autistic traits. Similarly, standard multiple regression analyses were performed with the five sub-scales of the AQ as the predicted variables and five scales of the NEO-PI-R as predictor variables. The results also showed small R^2 values (Social Skill = 34.2%, Attention Switching = 15.0%, Attention to Details = 9.3%, Communication = 26.8%, and Imagination = 18.6%).

2.4.4. Exploratory factor analyses on the combined AQ and NEO-PI-R

From the results obtained on the AQ and the NEO-PI-R, it is difficult to argue that autistic traits are just a part of the major personality dimensions. In order to assess the degree of independence of

Table 2
Intercorrelations between the AQ and 30 facets in NEO-PI-R

	AQ total	Social skill	Attention switching	Attention to details	Communication	Imagination
Anxiety	0.229**	0.073	0.257**	0.100	0.234**	−0.027
Angry Hostility	0.106	0.008	0.063	0.107	0.122*	0.008
Depression	0.280**	0.108	0.327**	0.093	0.291**	−0.038
Self-Consciousness	0.333**	0.205**	0.347**	0.020	0.353**	0.016
Impulsiveness	0.073	0.014	0.029	−0.010	0.208**	−0.044
Vulnerability	0.305**	0.060	0.399**	0.005	0.394**	0.018
Warmth	−0.397**	−0.523**	−0.162**	0.084	−0.291**	−0.254**
Gregariousness	−0.426**	−0.563**	−0.224**	0.075	−0.270**	−0.246**
Assertiveness	−0.350**	−0.341**	−0.319**	0.167**	−0.407**	−0.107
Activity	−0.326**	−0.409**	−0.250**	0.136*	−0.278**	−0.138*
Excitement-Seeking	−0.224**	−0.298**	−0.136*	0.010	−0.074	−0.152**
Positive Emotion	−0.202**	−0.274**	−0.074	0.062	−0.102	−0.215**
Fantasy	0.064	0.117*	0.054	0.096	0.036	−0.168*
Aesthetics	−0.116*	−0.099	−0.090	0.026	−0.038	−0.158*
Feelings	−0.099	−0.175**	0.060	0.084	−0.046	−0.242**
Actions	−0.230**	−0.219**	−0.291**	0.077	−0.143*	−0.095
Ideas	0.016	0.062	−0.030	0.226**	−0.120*	−0.142*
Values	0.065	0.145**	−0.088	−0.050	0.048	0.146**
Trust	−0.124*	−0.177*	−0.011	0.018	−0.026	−0.181**
Straightforwardness	−0.009	0.020	0.165**	−0.133*	0.023	−0.043
Altruism	−0.239**	−0.277**	−0.030	0.090	−0.151**	−0.369**
Compliance	−0.015	−0.043	0.096	−0.055	0.035	−0.080
Modesty	0.208**	0.198**	0.230**	0.004	0.163**	0.015
Tender-Mindedness	−0.045	−0.143*	0.102	0.010	0.047	−0.161**
Competent	−0.259**	−0.152**	−0.186*	0.090	−0.388**	−0.119*
Order	−0.100	−0.121*	−0.038	0.288**	−0.310**	−0.140*
Dutifulness	−0.162**	−0.129*	0.012	0.169	−0.322**	−0.234**
Achievement Striving	−0.261**	−0.323**	−0.095	0.155**	−0.328**	−0.172**
Self-Discipline	−0.261**	−0.267**	−0.130*	0.127*	−0.344**	−0.145**
Deliberation	−0.114*	−0.039	0.015	0.096	−0.224**	−0.214**

* $p < 0.05$.
** $p < 0.01$.

the AQ from the big five personality dimensions, a joint factor analysis was carried out on the combined sub-scale set of the AQ and the facets of the NEO-PI-R. If five factors emerge from this joint factor analysis, it means that the autism-spectrum is likely to be classified into one of the five personality domains or their facets. However, if the autism spectrum is independent of these five personality domains, the sub-scales of the AQ would not load on any factors of the NEO-PI-R.

A principal factor analysis was carried out on the inter sub-scale correlation matrix obtained from 320 students who had responded to the AQ and NEO-PI-R. The result of the initial principal factor analysis revealed that five factors had Eigenvalues greater than one (Fig. 1). The result of the Varimax rotated five factor solution is shown in Table 3. As can be seen, four of the five factors in

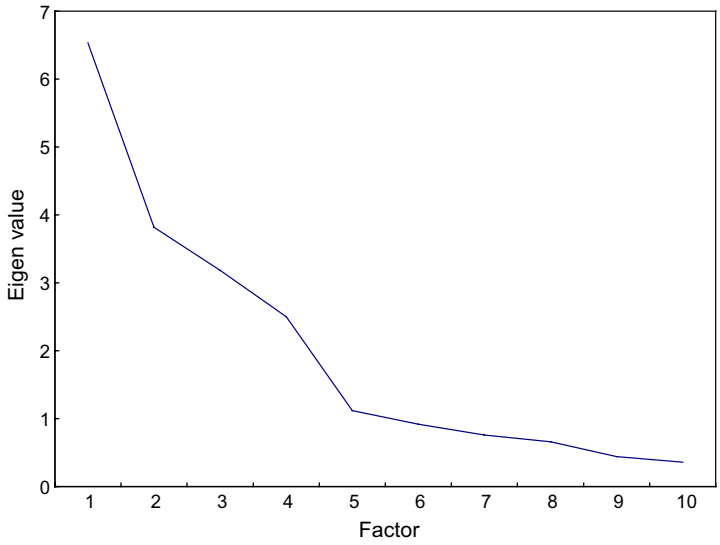

Fig. 1. Scree plot of the AQ and NEO-PI-R joint factor analysis.

the Big Five personality domains emerged as factors, corresponding to Neuroticism (Factor I), Conscientiousness (Factor II), Extraversion (Factor III), and Agreeableness (Factor IV). The fifth factor could be regarded as a factor of the autism-spectrum, though the factor loading on Imagination was low and Attention to details did not load on this factor either. To make sure, we also carried out the factor analysis by a six factor solution (Table 4). The result of the six factor solution showed that six factors consisting of the AQ and the Big Five personality domains emerged clearly, although some sub-scales (Attention to detail on the AQ, and the facets of Actions and Values in Openness to Experience, and Modesty in Agreeableness) did not load on the appropriate factors.

2.4.5. The profile of high AQ scorers on the NEO-PI-R

In order to examine whether there are any distinctive features in high AQ scorers, as an analogue model of autism-spectrum conditions, we examined the characteristics of the high AQ scorers in terms of the big five personality dimensions.

We extracted the participants who scored 32 and above as high AQ scorers, because this score was confirmed as a cut-off point between people with ASC and typical controls both in the UK and Japan. Therefore, these participants correspond to an analogue model of ASC on the AQ. The number of participants who fitted this standard was 10 (3.1%). The total AQ score of this group was $M = 32.4$ (SD = 0.52), and mean sub-scale scores were as follows: Social skill = 5.4, Attention switching = 8.6, Attention to detail = 5.4, Communication = 7.6, and Imagination = 5.4.

The mean scores (Z-scores) of high AQ scorers on each of the Big Five domains and their facets were as follows. On the five domains, the high AQ scorers showed high Neuroticism (60.8) and low Extraversion (41.7) and Conscientiousness (42.8), but Openness (49.4) and Agreeableness (51.4) were average. On the scales of the facets in the NEO-PI-R, the high AQ scorers showed high Depression (62.5) and Self-consciousness (59.1) (both in Neuroticism), and low Assertiveness (39.6; Extraversion), low Actions (39.3; Openness), low Deliberation (39.2; Conscientiousness).

Table 3
Varimax rotated five factor solution for the combined sub-scales of the AQ and facet scales of NEO-PI-R

Variables	Factor I	Factor II	Factor III	Factor IV	Factor V
Social Skill (AQ1)	0.021	−0.161	−0.119	−0.082	**0.767**
Attention Switching (AQ2)	0.335	0.003	0.058	0.160	**0.507**
Attention to Details (AQ3)	0.096	0.299	0.113	−0.077	−0.060
Communication (AQ4)	0.250	−0.385	0.070	0.032	**0.495**
Imagination (AQ5)	−0.126	−0.273	−0.182	−0.184	0.301
N1 anxiety	**0.790**	0.058	0.051	−0.127	0.093
N2 Angry Hostility	**0.431**	−0.071	0.233	**−0.556**	0.004
N3 Depression	**0.843**	−0.053	0.116	−0.102	0.107
N4 Self-Consciousness	**0.724**	−0.034	0.053	0.006	0.281
N5 Impulsiveness	0.346	−0.381	**0.543**	−0.325	−0.057
N6 Vulnerability	**0.792**	−0.242	0.067	−0.016	0.054
E1 Warmth	−0.137	0.097	**0.454**	0.391	**−0.526**
E2 Gregariousness	−0.081	0.044	0.323	0.154	**−0.635**
E3 Assertiveness	−0.350	0.307	0.314	−0.379	−0.374
E4 Activity	−0.289	0.297	**0.473**	−0.230	−0.358
E5 Excitement-Seeking	−0.021	−0.052	**0.561**	−0.158	−0.388
E6 Positive Emotions	−0.172	0.004	**0.708**	0.272	−0.218
O1 Fantasy	0.028	−0.138	**0.457**	−0.048	0.133
O2 Aesthetics	0.043	0.083	0.349	0.075	−0.073
O3 Feelings	0.257	0.133	**0.573**	0.058	−0.139
O4 Actions	−0.343	0.008	0.211	−0.030	−0.275
O5 Ideas	−0.107	0.273	0.169	−0.111	0.161
O6 Values	−0.290	−0.147	0.001	0.007	0.141
A1 Trust	−0.081	−0.035	0.373	**0.593**	−0.129
A2 Straightforwardness	−0.016	−0.031	−0.096	**0.614**	0.125
A3 Altruism	0.029	0.196	0.234	**0.701**	−0.193
A4 Compliance	−0.097	−0.043	−0.192	**0.710**	−0.043
A5 Modesty	**0.487**	−0.135	−0.350	0.269	0.107
A6 Tender-Mindedness	0.179	0.081	0.304	**0.509**	−0.028
C1 Competent	**−0.584**	**0.564**	0.030	0.073	−0.046
C2 Order	0.097	**0.589**	−0.049	−0.104	−0.101
C3 Dutifulness	−0.051	**0.741**	−0.123	0.282	−0.003
C4 Achievement Strivings	−0.241	**0.665**	0.257	0.053	−0.226
C5 Self-Discipline	−0.324	**0.686**	0.010	0.107	−0.174
C6 Deliberation	0.083	**0.603**	−0.384	0.112	−0.018
Variance (%)	12.4	9.9	9.5	9.1	7.9

Items with loadings above |0.40| are shown in thick figures.

3. Discussion

In this paper we have examined the relationship between the Autism-Spectrum Quotient (AQ) and the NEO-PI-R. The results obtained from correlations between the AQ and the NEO-PI-R suggested that there is some relation between the AQ and some major personality dimensions,

Table 4
Varimax rotated six factor solution for the combined sub-scales of the AQ and facet scales of NEO-PI-R

Variables	Factor I	Factor II	Factor III	Factor IV	Factor V	Factor VI
Social Skill (AQ1)	−0.016	−0.160	−0.176	−0.243	**0.716**	0.101
Attention Switching (AQ2)	0.329	−0.002	0.170	−0.058	**0.543**	−0.029
Attention to Details (AQ3)	0.100	0.258	−0.053	0.059	−0.093	0.247
Communication (AQ4)	0.251	−0.389	0.055	−0.029	**0.530**	−0.101
Imagination (AQ5)	−0.110	−0.232	−0.210	0.010	0.352	−0.324
N1 Anxiety	**0.793**	0.036	−0.089	−0.049	0.091	0.081
N2 Angry Hostility	**0.504**	−0.138	**−0.409**	0.364	0.046	0.037
N3 Depression	**0.837**	−0.088	−0.058	−0.079	0.084	0.172
N4 Self-Consciousness	**0.712**	−0.050	0.022	−0.121	0.277	0.081
N5 Impulsiveness	**0.422**	**−0.489**	−0.100	**0.466**	−0.016	0.178
N6 Vulnerability	**0.798**	−0.245	0.041	−0.042	0.086	−0.083
E1 Warmth	−0.099	0.044	**0.554**	0.349	**−0.465**	0.099
E2 Gregariousness	−0.043	0.003	0.288	0.303	**−0.599**	0.070
E3 Assertiveness	−0.268	0.229	−0.227	**0.535**	−0.339	0.147
E4 Activity	−0.180	0.209	−0.001	**0.704**	−0.252	0.036
E5 Excitement-Seeking	0.064	−0.154	0.075	**0.573**	−0.329	0.170
E6 Positive Emotions	−0.114	−0.111	**0.501**	**0.505**	−0.166	0.306
O1 Fantasy	0.026	−0.251	0.038	0.111	0.044	**0.580**
O2 Aesthetics	0.045	0.004	0.151	0.115	−0.121	**0.406**
O3 Feelings	0.302	0.021	0.246	0.363	−0.124	0.379
O4 Actions	−0.320	−0.035	0.035	0.209	−0.287	0.155
O5 Ideas	−0.121	0.204	−0.115	0.005	0.071	**0.470**
O6 Values	−0.300	−0.149	−0.018	−0.028	0.119	0.041
A1 Trust	−0.080	−0.068	**0.689**	0.127	−0.084	0.091
A2 Straightforwardness	−0.058	0.028	**0.555**	−0.229	0.165	−0.201
A3 Altruism	0.001	0.186	**0.734**	−0.050	−0.179	0.137
A4 Compliance	−0.176	0.030	**0.585**	**−0.417**	−0.066	−0.091
A5 Modesty	**0.413**	−0.058	0.125	**−0.511**	0.063	−0.121
A6 Tender-Mindedness	0.183	0.056	**0.598**	0.094	0.027	0.050
C1 Competent	**−0.564**	**0.553**	0.074	0.187	−0.023	0.052
C2 Order	0.109	**0.580**	−0.108	0.061	−0.101	0.090
C3 Dutifulness	−0.066	**0.766**	0.227	−0.069	0.015	0.011
C4 Achievement Striving	−0.167	**0.625**	0.190	**0.481**	−0.116	−0.043
C5 Self-Discipline	−0.284	**0.692**	0.145	0.261	−0.091	−0.128
C6 Deliberation	0.032	**0.662**	−0.041	−0.329	−0.064	0.005
Variance (%)	12.1	9.9	9.3	9.1	7.0	4.1

Items with loadings above |0.40| are shown in thick figures.

in particular Neuroticism, Extraversion, and Conscientiousness. The results in the two former domains (N and E) were consistent with the results obtained from the Personality Mini-Markers (Austin, 2005), although the relationship was only moderate even for Extraversion, which showed the highest correlation with the AQ. The relationship between AQ and Extraversion (negative) may be no surprise, since people with ASC tend to report avoiding social contact as they find

it stressful. However, one result obtained here differed from the earlier research, that is, while Agreeableness related negatively with AQ in the report by Austin (2005), Conscientiousness related negatively with AQ in this study. It is unclear if this inconsistency might result from the intercultural difference between the UK and Japan, or from the difference between the instruments used, the personality mini-marker and the NEO-PI-R.

There were some differences among the relation between AQ sub-scales and the NEO-PI-R. For example, Social skill was negatively correlated with Extraversion, but was not correlated with Neuroticism. Communication was correlated with Neuroticism and was negatively correlated with Extraversion and Conscientiousness. Imagination was negatively correlated with four domains of the NEO-PI-R except Neuroticism. These results suggest a need to investigate the relation between the AQ, especially its sub-scales, and personality in more detail.

The results of multiple regression analyses were consistent with the results reported by Austin (2005). The results showed the NEO-PI-R scales predicted only 24% of the variability on the AQ, suggesting that the individual differences on the AQ cannot be predicted sufficiently by the Big Five personality domains.

The results of joint factor analyses of the AQ and NEO-PI-R also supported the above conclusion. The result of the five factors solution suggest that those factors correspond with Neuroticism, Extraversion, Agreeableness, Conscientiousness, and the AQ, but a factor corresponding with Openness could not be found. This result suggests that the number of autistic traits is independent of the Big Five personality domains except Openness. This result might reflect that Openness is the least stable factor in the Five Factor Model (Pervin, 1994). However, the result of the six factors solution revealed that each factor was shown to correspond to the AQ and the Big Five personality domains separately. These results mean that there is a probability of independence between number of autistic traits and the Big Five personality domains, although the scree plot did not show whether the numbers of factors (five or six) were adequate or not. The factor structure showed that AQ did not link with any personality domains in the NEO-PI-R, but emerged as an independent factor.

The profile of high AQ scorers, who can be regarded as an analogue model of ASC, showed certain patterns of high Neuroticism, low Extraversion (i.e., Introversion) and low Conscientiousness on the five personality domains. These results are consistent with the results obtained from the correlation analyses. On the facets, they showed certain characteristics such as high depression, low assertiveness and low activities, which corresponded with clinical observations of people with ASC (Alvarez & Reid, 1999). But they did not show differences on all facets of Neuroticism, Extraversion and Conscientiousness. For example, although high AQ scorers showed low scores on the domain of Extraversion, in its facets they did not show relatively lower scores on Warmth, Excitement-seeking and Positive Emotion. These trends were seen for Conscientiousness as well. However, it is not clear whether this profile of the high AQ scorers represents characteristics of personality in people with ASC, because the number of participants who fitted in this 'analogue' condition was very small, and they were not diagnosed as ASC. The most marked features on the AQ of this analogue group were high Attention switching (difficulty) and high Communication (difficulty). These features are almost identical to people with an actual diagnosis of ASC (Baron-Cohen et al., 2001), but the mean scores of Social skill and Imagination were not as high as to correspond with a clinical group. These results suggested that there are some differences between analogue and clinical groups on the AQ. There is a need to investigate the similarity and

differences between high AQ scorers in people with and without a formal diagnosis of ASC in more detail, as well as to examine the personality profile of analogue models of ASC in a large sample, to compare it with a clinical sample.

Some problems remain in this study: First, the data reported in this paper is exclusively from university students, and it is possible that different profiles may emerge if people who are not students are included. Our earlier studies showed no differences in AQ scores in a student and a non-student general population sample (Baron-Cohen et al., 2001). One fundamental issue is whether autistic traits in the general population and those with a diagnosis on the autistic spectrum have the same meaning. We think the AQ may well measure autistic traits similarly both in people with and without autistic symptoms. Although results from earlier studies in the UK and Japan support this view (Baron-Cohen et al., 2001; Wakabayashi et al., in press), this question needs further investigation. Secondly, there is the issue of whether a quantitative measure of autistic traits is identical to a quantitative measure of autistic 'symptoms'. Further studies to investigate this issue are required. But we conclude that the present results suggest that individual differences in the degrees of autistic tendencies are independent of major personality dimensions in the general population.

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