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Autism-spectrum traits predict humour styles in the general population

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Abstract

Previous research shows that individuals with Asperger syndrome or high-functioning autism tend to have impaired processing of humour and laugh at things that are not commonly found funny. Here the relationship between humour styles and the broader autism phenotype was investigated in a sample of the general population. The autism-spectrum quotient (AQ) and the humour styles questionnaire (HSQ) were administered to six hundred US participants recruited through an Internet-based service. On the whole, high scores on AQ were negatively related to positive humour styles and unrelated to negative humour styles. However, AQ subscales representing different autism-spectrum traits exhibited different patterns. In particular, the factor “poor mind-reading” was associated with higher scores on negative humour styles and the factor “attention to detail” was associated with higher scores on all humour styles, suggesting a more nuanced picture of the relationship between autism-spectrum traits and humour.

Keywords: humour styles; autism-spectrum; theory of mind; social skill; attention to detail

1. Introduction

The aim of this paper is to investigate the relationship between sense of humour and personality traits associated with the autism-spectrum. As discussed at length by Martin et al. (2003), sense of humour may be conceptualised in many ways, for instance as a cognitive ability to create and understand jokes, as a behavioural pattern to laugh at others' jokes, as a defence mechanism, etc. All these examples have positive connotations, and indeed many studies have found that a good sense of humour is associated with healthy psychological functioning (cf. Kuiper and McHale 2009). However, not having a good sense of humour is not necessarily the same as having no sense of humour at all; one can also have a bad sense of humour that tends to leave other people, or oneself, feeling bad. This idea lies at the core of the humour style framework

proposed by Martin et al. (2003: 52): “humor may be used to enhance the self in a way that is tolerant and non-detrimental to others (*self-enhancing humor*), or it may be done at the expense and detriment of one's relationships with others (*aggressive humor*). [...] humor may be used to enhance one's relationships with others in a way that is relatively benign and self-accepting (*affiliative humor*), or it may be done at the expense and detriment of the self (*self-defeating humor*).” This framework thus distinguishes two humour styles of a positive nature (affiliative humour and self-enhancing humour) and two humour styles that are more negatively charged (aggressive humour and self-defeating humour). Psychosocial health and well-being are positively related to the positive styles and negatively related to the negative styles (Kuiper and McHale 2009; Martin et al. 2003; Martin 2007).

Empirical studies of the four humour styles typically use the *humour styles questionnaire* (HSQ; Martin et al. 2003). To date more than two dozen papers using this questionnaire have been published. Much of this research deals with the relation between humour style and various measures of well-being (Erickson and Feldstein 2007; Greven et al. 2008; Kazarian and Martin 2004; Kazarian et al. 2010; Kuiper et al. 2004; Taher et al. 2008). These studies generally support the notion that the positive humour styles are positively linked to well-being whereas negative styles tend to be negatively associated with well-being, a finding that extends to relationship satisfaction (Cann et al. 2008, 2009). The heritability of humour styles has been estimated to range between 30 and 50 percent (Rushton et al. 2009; Vernon et al. 2008a, 2008b, 2009; Veselka et al. 2010a, 2010b).

A group of individuals strongly associated with an impaired sense of humour are those with autism and Asperger syndrome (Asperger 1944). Several studies have investigated how such impaired humour processing may be traced to cognitive deficits, in particular with respect to theory of mind (Baron-Cohen 1997; Samson and Hegenloh 2010). However, it is not the case that individuals with Asperger syndrome or high-functioning autism do not engage in humour at all. Some individuals with Asperger syndrome seem to master the cognitive processing of incongruity humour (Lyons and Fitzgerald 2004: 527). Although these cases may be somewhat exceptional, it seems generally true that individuals with Asperger syndrome or high-functioning autism are not unable to appreciate funniness but often do not find the same things funny as other people do, or at least not for the same reasons (Lyons and Fitzgerald 2004; Reddy et al. 2002; Samson and Hegenloh 2010). To see how this may relate to humour styles, consider the study of Reddy et al. (2002). They compared laughter in children with autism and children with Down's syndrome and found no group differences in overall frequencies in laughter; however, children in the two groups did not laugh at the same things, nor did they respond to laughter in the same way. In the autism group, laughter was rare in response to events normally thought of as funny. Instead, laughter was common in strange or inexplicable situations and it was often unshared. This finding suggests that the impaired sense of humour associated with autism may be particularly detrimental for positive humour styles, for which the abilities to see the point in jokes and to share laughter seem crucial. Tendencies to laugh at inappropriate times and not share laughter with others seem more compatible with the use of humour at the expense of someone else or of oneself (as in the negative humour styles). The

humour deficit associated with autism-spectrum diagnoses was therefore predicted to be particularly notable with respect to use of positive humour styles.

There is considerable evidence for the existence of a broader autism phenotype, such that clinical cases can be viewed as having extreme scores on an underlying continuous dimension involving a cluster of autism-spectrum traits (cf. Austin 2005; Steer et al. 2010). The present study used the *autism-spectrum quotient* (AQ; Baron-Cohen et al. 2001) to investigate how the broader autism phenotype relates to humour styles in a general population sample. AQ was developed as a simple self-administered instrument for assessment of autism-spectrum traits in the general population. It is well established that the total AQ score (between 0 and 50) has good screening properties for clinical autism-spectrum diagnoses (Auyeung et al. 2008; Baron-Cohen et al. 2001; Kurita et al. 2005; Samson and Hegenloh 2010; Wakabayashi et al. 2007; Woodbury-Smith et al. 2005). In a UK adult sample a threshold score of 26 was found to give optimal discrimination of patients with an autism-spectrum diagnosis (Woodbury-Smith et al. 2005). In the present study, humour styles of respondents who scored above this threshold were compared with the humour styles of respondents who scored below the threshold.

Further analysis was then made of the separate contributions of different autism-spectrum traits. The AQ was originally conceived as assessing five different areas of functioning: social skill, attention switching, communication, imagination and attention to details (Baron-Cohen et al. 2001). However, scores on the first four of these areas are highly intercorrelated and may not represent four separate factors (Hoekstra et al. 2008). A UK study identified three major factors that were interpreted as poor mind-reading, high attention to details/patterns and poor social skills (Austin 2005). The same three factors come out as the most important ones in a study of children's AQ (Auyeung et al. 2008). The present study focused on how each of these three AQ factors contributes to the various humour styles. As discussed below, some of these autism-spectrum traits may even be beneficial to humour.

Poor mind-reading refers to a deficient theory of mind, which is the ability to impute mental states to oneself and to others (Premack and Woodruff 1978). A deficiency in theory of mind is a central feature of autism in children (Baron-Cohen et al. 1985) and even high-functioning adults with autism-spectrum diagnoses do not have intact theory of mind skills (Baron-Cohen et al. 1997). This deficiency is manifested as a lack of ability to understand others' intentions and what they perceive and what they feel, which will often result in awkward communication that other people may find impolite or boring. Poor mind-reading has been associated with lack of certain kinds of humour, such as understanding false statements as jokes (Baron-Cohen 1997) or appreciating the funniness in cartoons based on the mental states of characters, e.g., conflicting intentions (Samson and Hegenloh 2010). Poor understanding of what other people perceive as funny seems obviously detrimental to successful use of affiliative humour. To see how poor mind-reading may relate to the other three humour styles, consider prior research on two related constructs: perspective-taking empathy and emotional perception. Hampes (2010) found lack of perspective-taking empathy to be negatively linked to self-enhancing humour and positively linked to aggressive humour. Yip and Martin (2006) found people low on emotional perception to score higher on both aggressive and self-defeating humour. Yip and Martin's interpretation of this finding was that people who have difficulties with accurate

emotion perception may tend to use humour in inappropriate ways, either to tease and disparage others (aggressive humour) or to excessively disparage themselves and hide their true feelings (self-defeating humour). The same reasoning seems to apply to deficiency in understanding the mental states of oneself and others. Altogether, poor mind-reading was therefore predicted to be negatively associated with positive humour styles but positively associated with negative humour styles.

Attention to details/patterns refers to the tendencies of high-functioning individuals with autism-spectrum diagnoses to have strong interests, to collect information, to focus on details rather than on the whole, and to have an unusual fascination with patterns in information (Auyeung et al. 2008; Baron-Cohen et al. 2001; Samson and Hegenloh 2010). Such tendencies may be beneficial to the individual as, for instance, they may lead to development of areas of expertise (Attwood 2006: Ch. 7). No prior research seems to have investigated the relationship between humour styles and attention to details or any obviously related construct. However, schema theories of humour suggest that schemas organizing knowledge, such as knowledge about the physical environment or routine activities, are required to produce and appreciate humorous incongruities (Martin 2007: Ch. 4). Attention to details and patterns may support the formation of schemas that can later prove useful for humour. In particular, attention to unusual aspects of words is a key to verbal humour, which seems to be the kind of humour that is most common among individuals with Asperger syndrome (Lyons and Fitzgerald 2004). As the proposed scope of the schema theory of humour is not limited to any particular humour styles, attention to details was predicted to be positively associated with all humour styles. Further support for this prediction comes from the combination of two previous findings: In a six-factor solution of the combined AQ subscales and facet scales of the big five personality dimensions it was found that while other AQ subscales formed a factor of their own, attention to details loaded on the openness-to-experience factor (Wakabayashi et al. 2006); openness-to-experience has in turn been found to be positively associated with all humour styles in at least one study (Vernon et al. 2008b).

Poor social skills refer to autism-spectrum individuals' characteristic orientation towards objects rather than people, their discomfort with social situations and their great dislike for having their own plans interrupted. This factor is closely related to other constructs (e.g., “initiating relationships” and “sociability”) that have been studied previously in the literature on humour styles (Greven et al. 2008; Vernon et al. 2009; Yip and Martin 2006). These studies have consistently found that lack of social skills in terms of initiating relationships and sociability is associated with lower scores on the positive humour styles; for the negative humour styles the association is weaker and ambiguous. Poor social skills were therefore predicted to be negatively associated with positive humour styles, whereas no particular association with negative humour styles was predicted.

These proposed relations between humour styles and autism-spectrum traits were tested in a study in the general US population using the HSQ and AQ instruments. A general population sample was obtained through an Internet-based service called the *Amazon Mechanical Turk*. This is an online labour market that, amongst other things, enables researchers to recruit respondents to web-based surveys for small fees. An advantage to the common use of student samples is that users of the Amazon Mechanical Turk exhibit a much larger range of geographical and educational backgrounds and cover the full

adult age range. Several recent studies have investigated the quality of data obtained through the Amazon Mechanical Turk and found this research method to be at least as reliable as traditional methods (Buhrmester et al. 2011; Paolacci et al. 2010).

2. Method

2.1 Participants and procedure

Six hundred US participants (217 males and 383 females) aged between 18 and 88 years ($M = 33.6$, $SD = 12.5$) were recruited via the Amazon Mechanical Turk for a compensation of 50 cents. Educational backgrounds were mixed, with 24% without any college education, 15% currently in college, and 61% with college education. Each participant filled in the humour styles questionnaire and the autism-spectrum quotient questionnaire, described below.

2.2 Measures

2.2.1 Humour styles questionnaire (HSQ; Martin et al. 2003). The 32-item humour styles questionnaire comprises four eight-item scales that assess different styles of humour: affiliative (e.g., “I laugh and joke a lot with my friends”); self-enhancing (e.g., “My humorous outlook on life keeps me from getting overly upset or depressed about things”); aggressive (e.g., “If someone makes a mistake, I will often tease them about it”); and self-defeating (e.g., “I let people laugh at me or make fun at my expense more than I should”). Respondents indicate the extent to which they agree or disagree with each item on a seven-point Likert scale. Internal consistencies of the scales ranged between .77 and .85, see Table 1.

2.2.2 Autism-spectrum quotient (AQ; Baron-Cohen et al. 2001). The 50-item autism-spectrum questionnaire comprises fifty items assessing areas associated with the autism spectrum, such as “When I talk on the phone, I'm not sure when it's my turn to speak”, “I usually notice car number plates or similar strings of information” and “I enjoy social occasions”. Only one item is directly associated with humour (“I am often the last to understand the point of a joke”). Responses are on a four-point scale: definitely disagree, slightly disagree, slightly agree, and definitely agree. Following the original paper by Baron-Cohen et al. (2001) items were scored as one for any response (i.e., either “slightly” or “definitely”) in the autistic direction and zero for any response in the non-autistic direction. The internal consistency of the AQ was .79.

3. Results

3.1 Scales

A principal components analysis was computed on the fifty AQ items. The scree plot supported a three-factor solution, accounting for 24.3% of the variance. The three-factor solution was examined using an oblique rotation; a moderate correlation of 0.2 was found between the first and third factors. The factors corresponded to the three major factors found in

prior studies: poor social skills, attention to details/patterns and poor mind-reading (Austin 2005; Auyeung et al. 2008). Corresponding scales were defined by summing the zero/one scores of items with factor pattern matrix elements greater than 0.35, see Table 1.

Table 1 about here

Mean scores, theoretical ranges and internal consistencies for all scales are presented in Table 2. Simple correlations among scales are reported in Table 3. Compared to Martin et al.'s (2003) original HSQ study among Canadian participants (mainly students), mean scores in the present study were about three points lower on the affiliative and self-enhancing humour styles and about three points higher on the self-defeating humour style. These differences are about 30-40% of a standard deviation. Similarly, compared to Baron-Cohen et al.'s (2001) original AQ study among UK students, the average AQ in the present study was 1.4 points (about 20% of a standard deviation) higher. Thus it seems that users of the Amazon Mechanical Turk tend to score a little higher than students on autism-spectrum traits while scoring lower on positive humour styles. This pattern is consistent with the predicted negative association between AQ and positive humour.

Table 2 about here

Table 3 about here

3.2 Relations between humour styles and total AQ

As reported in Table 3, AQ was negatively correlated with both positive humour styles. Further analysis was conducted to establish the generality of this finding. A threshold of 26 points has previously been found to be optimal in screening for Asperger Syndrome or high functioning autism (Woodbury-Smith et al. 2005). Participants were therefore divided into two groups, high and low AQ, based on whether their total AQ score was at least 26 points ($n=105$) or below 26 points ($n=495$). High AQ participants scored lower on affiliative humour ($M = 37.9$, $SD = 8.8$) than did low AQ participants ($M = 44.8$, $SD = 7.7$), $t(598)=8.1$, $p<.001$. Similarly, high AQ participants scored lower on self-enhancing humour ($M = 35.4$, $SD = 8.9$) than did low AQ participants ($M = 40.8$, $SD = 7.8$), $t(598)=6.4$, $p<.001$. These differences are 83% and 67% of a standard deviation, respectively. For the negative humour styles, in contrast, group differences were very small (<0.2 points) and statistically insignificant ($p>.2$). See the paper by Samson et al. (this issue) for similar results in a study of a clinical sample.

The theory of the broader autism phenotype, according to which autism-spectrum traits vary continuously in the population, suggests that AQ and positive humour styles ought to be related also within the low AQ group. This was indeed the case, both for affiliative humour ($r = -.28$, $p<.001$) and self-enhancing humour ($r = -.24$, $p<.001$).

3.3 Relations between humour styles and AQ factors

In the introduction it was predicted that the three AQ factors show different patterns as predictors of humour styles. The predicted patterns show up in the simple correlations reported in Table 3: poor social skills are associated with lower scores on positive humour styles (but unrelated to negative humour); attention to details/patterns is associated with higher scores on all humour styles; poor mind-reading is associated with lower scores on positive humour styles and higher scores on negative humour styles.

Because the AQ factor scales are intercorrelated, OLS regressions were carried out for each humour style in order to tease apart the unique contributions of each factor. The predicted patterns remain, as reported in Table 4. Note that each factor typically contributes about 4 percentage points to the proportion of variance explained.

Table 4 about here

4. Discussion

The background to this study was the fact that although autism-spectrum diagnoses are linked to impaired humour processing, individuals with such diagnoses may still find things funny and engage in use of humour. In the introduction it was argued that it may be use of positive humour styles that is particularly impeded in such individuals. In line with this expectation, high AQ was found to be linked to low scores on positive humour styles in this study. Importantly, this relation was found to hold in the general population and across the entire range of AQ values, thus supporting the theory of the broader autism phenotype (cf. Baron-Cohen et al. 2001; Austin 2005; Steer et al. 2010).

Individuals with Asperger syndrome often suffer difficulties in forming and maintaining social relationships (Attwood 2006: Chs. 3 and 13). Following recent research on mediating effects of humour styles (Kuiper and McHale 2009) it seems possible that the deficit in positive humour styles could be a mediator between the autism-spectrum traits and difficulties with interpersonal relations. If this is the case, then humour-based interventions might be useful. We suggest that this idea might be investigated in mediation studies where HSQ and measures of social relationships are administered to both clinical and non-clinical samples.

In addition to poor social skills, the cluster of traits associated with the autism-spectrum also includes poor mind-reading skills and high attention to details and patterns. Poor mind-reading skills were linked to aggressive and self-defeating humour styles. Attention to details/patterns stood out as a remarkable exception to the general AQ pattern in that it was a positive predictor of all four humour styles. This pattern supports the hypothesis that attention to details reflects a capacity to take in information that would be generally useful in humour use. Additional support for this hypothesis came from the factor analysis of the AQ items, where the item “I find making up stories easy” loaded on the attention to details factor. Taken together, the findings provide a more nuanced understanding of the specific nature of humour-related weaknesses and strengths in individuals high on autism-spectrum traits. Whereas poor social skills and poor mind-reading skills are handicaps for appropriate use of humour, high attention to details and patterns may even be an asset in generation and

appreciation of humour. An obvious prediction is that if these traits were measured in a clinical autism-spectrum sample, a less problematic relationship to humour would be found among those individuals for which attention to details is the dominating autism-spectrum trait.

The positive associations between attention to details/patterns and each of the four humour styles may also have implications for our understanding of humour more generally. Taking the schema theory of humour as a starting point there seem to be at least three different ways in which attention to details and patterns could benefit humour. First, there is the attention itself, i.e., the ability to spot things that are potentially funny. (Stand-up comedians seem to excel at this.) Second, there is the individual's accumulated knowledge from high attention to details and patterns, which could lead to the formation of schemas that are potentially useful for humour processing. Third, attention to details might over time lead to improved ability to mentally organise and access information, potentially enabling easier activation of multiple schemas. There is clearly scope for future experimental research on the exact pathways by which attention to details and patterns enable humour processing. Such research might also explore the significance of the fact that attention to details was found to load on the same factor as openness to experience (Wakabayashi et al. 2006).

To summarise, this study has contributed to a richer picture of how autism-spectrum traits are associated with both deficits and assets with respect to humour. In particular, it has pointed to the importance of attention to details for humour, regardless of humour style.

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Table 1. *Factor structure of the Autism-spectrum quotient (n = 600)*

Item	Content	Loadings			h^2
		Factor 1	Factor 2	Factor 3	
<i>Factor 1: Poor social skills (12 items):</i> eigenvalue = 6.32, % variance = 12.6					
*44	I enjoy social occasions.	.75	−.03	−.02	.57
*38	I am good at social chitchat.	.74	−.08	.06	.55
*11	I find social situations easy.	.72	−.05	.02	.53
*47	I enjoy meeting new people.	.70	−.09	.09	.51
*17	I enjoy social chitchat.	.70	−.02	−.12	.50
*15	I find myself drawn more strongly to people than to things.	.55	.03	.01	.30
*1	I prefer to do things on my own rather than with others.	.54	−.01	−.15	.32
13	I would rather go to a library than to a party.	.52	.07	−.08	.28
26	I frequently find that I don't know how to keep a conversation going.	.51	−.04	.28	.34
46	New situations make me anxious.	.46	−.01	.10	.23
22	I find it hard to make new friends.	.45	−.02	.27	.28
*34	I enjoy doing things spontaneously.	.44	−.15	−.08	.22
<i>Factor 2: Attention to detail (8 items):</i> eigenvalue = 3.11, % variance = 6.2					
23	I notice patterns in things all the time.	.08	.59	.02	.35
6	I usually notice car number plates or similar strings of information.	.08	.59	−.01	.35
12	I tend to notice details that others do not.	.11	.59	−.18	.39
41	I like to collect information about categories of things (e.g., types of cars, birds, trains, plants).	.04	.47	.21	.27
9	I am fascinated by dates.	−.12	.47	.27	.31
19	I am fascinated by numbers.	.08	.46	.20	.25
16	I tend to have very strong interests, which I get upset about if I can't pursue.	.04	.38	.25	.21
14	I find making up stories easy.	−.17	.37	−.11	.18
<i>Factor 3: Poor mind-reading (12 items):</i> eigenvalue = 2.76, % variance = 5.5					
45	I find it difficult to work out people's intentions.	.07	−.03	.55	.31
20	When I'm reading a story, I find it difficult to work out the characters'	−.09	−.04	.51	.27

	intentions.				
*27	I find it easy to 'read between the lines' when someone is talking to me.	.12	-.20	.49	.29
*36	I find it easy to work out what someone is thinking or feeling just by looking at their face.	.11	-.22	.48	.29
39	People often tell me that I keep going on and on about the same thing.	-.08	.21	.45	.25
7	Other people frequently tell me that what I've said is impolite, even though I think it is polite.	-.11	.20	.42	.23
*37	If there is an interruption, I can switch back to what I was doing very quickly.	.16	.01	.41	.20
21	I don't particularly enjoy reading fiction.	-.05	-.01	.41	.17
*31	I know how to tell if someone listening to me is getting bored.	.08	-.02	.39	.16
18	When I talk, it isn't always easy for others to get a word in edgewise.	-.19	.19	.39	.23
35	I am often the last to understand the point of a joke.	.03	-.04	.39	.15
33	When I talk on the phone, I'm not sure when it's my turn to speak.	.15	.13	.39	.19

Note. The method of principal components with direct oblimin rotation was used. Only items with loading above 0.35 on some factor are included. * designates a reverse-keyed item.

Table 2. *Mean, standard deviation, theoretical range and Cronbach's alpha for each scale*

Scale	Mean	SD	Theoretical range	α
Affiliative humour	43.6	8.3	8–56	.85
Self-enhancing humour	39.9	8.2	8–56	.83
Aggressive humour	28.0	8.6	8–56	.77
Self-defeating humour	29.0	8.9	8–56	.81
AQ	19.0	7.1	0–50	.79
Poor social skills	5.3	3.6	0–12	.85
Attention to details/patterns	4.2	2.0	0–8	.62
Poor mind-reading	2.3	2.2	0–12	.69

Table 3. *Simple correlations among scales*

Scale	1	2	3	4	5	6	7	8
1. Affiliative humour	—	.51***	.17***	.14***	-.40***	-.37***	.22***	-.30***
2. Self-enhancing humour		—	.14***	.19***	-.33***	-.27***	.17***	-.26***
3. Aggressive humour			—	.40***	.04	-.02	.18***	.17***
4. Self-defeating humour				—	.08*	-.00	.20***	.21***
5. AQ					—	.82***	.12***	.58***
6. Poor social skills						—	-.08*	.25***
7. Attention to details/patterns							—	.03
8. Poor mind-reading								—

* $p < .05$. *** $p < .001$.

Table 4. *Results of OLS regressions of humour styles on AQ factors*

Factor	Positive humour		Negative humour	
	Affiliative	Self-enhancing	Aggressive	Self-defeating
Poor social skills	-.30*** (.08)	-.20*** (.04)	-.05 (.00)	-.04 (.00)
Attention to details/patterns	.21*** (.04)	.16*** (.03)	.18*** (.03)	.20*** (.04)
Poor mind-reading	-.24*** (.05)	-.21*** (.04)	.17*** (.03)	.21*** (.04)
R ²	.23	.14	.06	.08

Note. Cells present standardised coefficients and, in parenthesis, the squared semi-partial correlation coefficients (indicating the unique contributions of each variable).

*** $p < .001$.