

RELIGIOUS COGNITION AMONG SUBJECTS WITH AUTISM SPECTRUM DISORDER (ASD): DEFECTIVE OR DIFFERENT?

Leif Ekblad, Lluís Oviedo

Abstract

Objective: To assess the empirical evidence regarding theories that link theory of mind and religious beliefs, and to test to what extent people in the autism spectrum disorder (ASD) could experience limits in their religious perceptions and ideas.

Method: Two studies have been undertaken: first, an online survey compared the answers of diagnosed autistic and neurodiverse people to neurotypical people; and second, the hypothetical 'existential theory of mind' is explored through another questionnaire in several school classes including boys on the autism spectrum.

Results: After reducing variables, those factors more related to religious or spiritual perception did not reveal an inferior sensitivity in the neurodiverse or autistic sample compared to the control group. Furthermore, a spiritual factor with items like belief in ghosts, the supernatural and the paranormal had higher prevalence in autism and neurodiversity.

Conclusions: The results call into question the theories linking autism to deficits in theory of mind with resultant religious impairment; and point to a greater role played by development and cultural environment.

Key words: religion, spirituality, autism, Theory of Mind, cognition, culture, development

Declaration of interest: none

Leif Ekblad, Independent Scholar
Lluís Oviedo, Antonianum University, Roma

Corresponding author

leif@rdos.net
loviedo@antonianum.eu

The study of autism is revealing many aspects about the human mind and behavior that have been neglected when the focus was exclusively on typically developing people. Scholars in different fields now try to learn more from the particular way autistic people learn, think, and interact with other people. These differences become a rich source of information helping to better know human specificity and its very versatile dynamics, beyond what could be considered the broadly shared 'regularities'.

Recently, psychologists learnt to test theories using autistic subjects as well as views about human cognition under special conditions, for instance when the impairment of a faculty or the over-development and intensity in some abilities furnish an excellent experimental field to assess the extent that these variables can play in mental functions.

The cognitive science of religion has developed over the last 15 years a set of theories that some scholars consider already able to provide a 'standard model'. Religion would be built upon mental abilities used for different purposes from their original design; and these forms of cognition would often have adaptive relevance, especially enhancing internal group cooperation (Smith & Sankey 2012). Such a description renders a rather synthetic view of that research field; however a more nuanced presentation should differentiate between adaptive theories and by-product theories. Indeed, the field is currently split on these two ways of understanding religious phenomena. A central tenet of this approach claims that Theory of Mind (ToM)

involves a capacity to conceive supernatural agents as being able to cause phenomena beyond the common traits attributed to ordinary subjects (Barrett 2004; Bering 2002, 2003).

The cognitive study of religion is much more than this. A clear development can be perceived after the first theories were launched two decades ago. A quick review of authors and published studies to date gives about 70 different proposals or attempts to display more scientific and naturalistic explanations of religion (Oviedo 2017). The study of subjects on the autism spectrum provides an excellent opportunity to test some new theories of religion, and particularly the ToM hypothesis as it relates to religion. Furthermore, the study of religious cognition among these subjects along the autism spectrum could reveal important features regarding their own cognitive and behavioral structure since religious experience involves different factors and variables across different individuals. Thus, we have the opportunity to offer new data to better understand religious cognitive systems.

Several choices are available to describe the autism spectrum. Most studies of autism use Autism Spectrum Disorder (ASD) as the general term. Asperger Syndrome (AS) and Pervasive Development Disorder (PDD) refer to professional diagnoses (DSM-IV, American Psychiatric Association 2000). The most recent version of the *Diagnostic and Statistical Manual of Mental Disorders (APA 2013)* provides a description of the Autism Spectrum Disorder (ASD) based on

the following traits: “Persistent deficits in social communication and social interaction”; and “restricted, repetitive patterns of behavior, interests, or activities” (APA 2013). It is classified by its severity in three levels. The term ‘Asperger’ as a way to characterize a form of less severe autism has been dropped in that manual.

High-functioning autism (HFA) is a term applied to people with autism who are deemed to be cognitively “higher functioning” than other people with autism; it is not recognized in the diagnosis of the DSM 5. In the online Aspie Quiz questionnaire (Ekblad 2013), the terms neurodiverse (ND) and neurotypical (NT) are used. The neurodiversity concept primarily relates to ASD, ADHD (Attention Deficit Hyperactivity Disorder), Dyslexia, Dyscalculia, and Dyspraxia (Armstrong 2010, Jaarsma & Welin 2012). NT is a term for typically developing people that was adopted by the autistic community and it will be used to refer to typically developing people.

Literature review

The philosopher of science Robert McCauley in his book *Why Religion is Natural and Science is Not* (2011) devotes a long paragraph to the issue of autism and religious faith. He considers claims about the difficulties that people with such a condition meet in acquiring religious beliefs due to their supposed impairments in ToM, and the possibility of overcoming such apparent difficulties through different means. Even if they were to become religious, they would do so at a higher cognitive cost than NT people, and their religion probably would have a different character (McCauley 2011, pp. 252-268).

To date, several empirical studies have been conducted to gather evidence in support of ToM’s role in religion. Catherine Caldwell-Harris and her associates published a paper reporting significant variance comparing religious beliefs between persons with High Functioning Autism (HFA) and samples of NT subjects from an internet discussion forum. A questionnaire helped to assess differences in a limited sample of subjects in both groups (61 HFA vs. 105 NT). They found that autistic people were more likely to be atheists or agnostics, or to build their own religious system (Caldwell-Harris et al. 2011). However, they suggest that some personality traits, besides the ToM condition, characteristic of these persons, could explain differences in religious faith. Following a similar pattern, Ara Norenzayan and his associates also published the results of 4 empirical studies (Norenzayan et al. 2012). In some cases, the authors report that “the autism spectrum predicted reduced belief in God, and mentalizing mediated this relationship” (p. 1). However, in some of their studies the sample size was very small (12 AS vs. 13 NT); in other cases the coefficients relating autism spectrum and belief in God were rather low. This impression was confirmed in a later study showing correlations between ‘mentalizing’ and ‘belief in God’ of just $R=0.1$, even if significant, given the large sample size ($N=492$) (Willard & Norenzayan 2013).

Other available studies put doubt on the correlation between variables of ToM and ‘religiosity’. A study published in Dutch comparing ‘images of God’ and Existential Theory of Mind (EToM) did not report significant correlations (Bouwman & Van der Maten-Abbink 2008, as accounted in Schaap-Jonker Sizoo et al. 2013, p. 6). More nuanced results are reported in an empirical study interviewing four young adults with AS,

which questioned conventional views and asked if their religious cognition reflected a “specific cognitive styles or their cultural context” (Visuri 2012). Other empirical research with Jewish children and adolescents with high-functioning autism showed that these subjects demonstrated, contrary to the hypothesis of some cognitive studies of religion, “belief in an agentive God who gives meaning to events in the world” (Brezis 2010, p. 192). This result could be accounted for based on the availability of ‘cultural scripts’. Other research based on some case studies points to creative and logically built forms of spirituality developed by people with AS (Dubin & Graetz 2009).

A more complex study did focus on the kind of God-perception held among people with ASD (Schaap-Jonker et al. 2013). This more recent and detailed research show the results of a survey of 78 cases with ASD, almost all of high religious profile in the Dutch Reformed Church (considering levels of Church attendance). Comparing with a sample of general population – but of the same religious denomination – the authors reported significant variations in their self-reported images of God as being somewhat more negative among autistic subjects. At the same time, religious saliency seems to be the factor mostly predicting positive religious feelings, while social impairment predicted more ‘anxiety towards God’. Their conclusion is that “the God-image of people with ASD has a less reciprocal nature than the God image of people without ASD, especially those without any psychiatric disorder” (Schaap-Jonker et al. 2013, p. 156). However, the authors concede that the autism-related sample (ASD) exhibits overall more positive than negative traits of God, and being much more religious than average. The described population within the broader autism spectrum, exhibiting high indicators of religiosity, projects some doubts on the views suggesting that some type of “religious disability” affects autistic people.

New additions in that research line published very recently offer interesting insights and fresh data. First, a broad study dealing with the influence that social and emotional cognition could exert on religious beliefs. The authors state that: “Using nine different measures of mentalizing, we found no evidence of a relationship between mentalizing and religious or spiritual belief” (Jack et al. 2016). Second, a study testing ToM and seven aspects of religious cognition in typical individuals and those with autism spectrum conditions, found that “deficits in mentalizing appear to have only minimal impact on the way they interact and think about gods” (Reddish et al. 2016). The third study moves in a different direction, Applying ‘latent class analysis’ to a large sample comparing believers and nonbelievers, the authors find relevant differences in sub-groups, like those of autistic tendencies. However the correlation between ‘autistic signs’ and religiosity is negative but not that high ($R=-0.15$) (Lindeman & Lipsanen 2016). The fourth and most recent study was controlling for empathy, emotional intelligence, systemizing, theory of mind, and religiosity. The authors state that “ToM was either unrelated or negatively related to religiosity (Vonk & Pitzen 2017).

The first impression after this review of recently published studies is that the issue is far from settled: it is not clear whether ToM is related to or even necessary for one to have a belief in God. A more promising approach might rather look for specific traits among individuals on the autism spectrum regarding their religious beliefs. However, the research has not yet provided outcomes in which one can trace a proper mental, religious system

or structure in ASD population, which, in principle, might be very religious.

The current state of research does not as yet allow us to draw definitive conclusions regarding different forms of autism, ToM and religious cognition. However, the collected data invite us to take more cautiously the results of quoted studies on ASD and religion, and to momentarily suspend a hasty connection between a general concept of ToM, as experienced by ASD subjects, and particular forms of religiosity. The available studies suggest the need for a more complex research, able to account for the several forms that ToM assumes and their possible implications for religious cognition: the easy and simple way is no longer the more scientifically convenient.

The main hypothesis in this paper is that ToM is not a factor that influences the religious experience of autistic people, or their final religious beliefs. The paper further claims that autistic people experience religious cognition in some specific way in their own environment, but not so different from NTs; that their specificity depends greatly on developmental, cultural and learning factors; and that this specificity is much more complex and subtle than the models exposed in recent research and theory building. To this end, two strategies have been developed: an extensive online survey devoted to providing self-identification for ND people, which included an instrument to assess religious and spiritual views; and some preliminary field work with AS children schooled in standard schools. This last approach has produced one study comparing Existential Theory of Mind (EToM) between NT and AS school children in a questionnaire.

Experiment 1

Method

We used a popular online survey (Aspie Quiz, Ekblad 2013) in this study. We exploited the high visiting rate by presenting volunteers with additional research questions.

Aspie Quiz was constructed in an iterative process with factor analysis. It defined neurodiversity as the primary factor output by factor analysis of a data set of human behaviors which contains continuously distributed traits covering all human diversity. The secondary factor was named 'neurotypicality'. The items in the final stage built on the evaluation of 1,800 items using a population of 550,000 individuals. Scores were calculated by using the factor loadings as weight factors. Factor loadings for the two factors were unrelated, but scores correlated -0.96. Because of this high dependency between the scores, the difference between the neurodiverse score and the neurotypical score was used to group the participants. A score difference above or equal to 35 was classified as ND; a score difference below or equal to -35 was classified as NT; while scores in between were classified as mixed. The cutoff to ND was originally set so that 80% of diagnosed ASD would have their diagnosis confirmed. The Aspie Quiz was validated against Baron-Cohens Autism Spectrum Quotient and scores correlated 0.83. An item's relation to neurodiversity was called 'the relevance estimate', and was calculated as the correlation between answers from the ND and NT groups. The Aspie Quiz used three answer alternatives (no, a little, yes) and had a no answer alternative that was checked by default. Unanswered items were excluded in the score calculation (Ekblad 2013).

The experiments primarily used the ND and NT group classification which a) have well-documented properties by using the Aspie Quiz scoring system, and b) do not rely on a single statement. We used the diagnosed ASD subjects mainly to check the validity of the findings. The ASD sample size was considerably smaller but still sufficient to detect large effects. If not stated otherwise the analysis was based on the Aspie Quiz score difference, hence all quiz-participants have been included.

The questionnaire was composed of 193 items, where 150 items were the standard Aspie Quiz items of which 5 were control items to check the honesty of answers. About 40 items were adapted for this particular sample to an original test designed to distinguish forms of institutional religiosity, spirituality, and moral attitudes, and previously administered to teenagers from 3 European countries, and after that standardized. 3 Items about beliefs in ghosts, paranormal experiences and sensitivity to electromagnetic fields were also added to that instrument, since these had been part of the Aspie Quiz previously and had shown interesting results. All the 193 items were presented in random order, so people could not guess the objective of the study. For the additional questions to fit into the Aspie Quiz smoothly, and to be able to present them in a random order with the basic test, the same three answer alternatives (1 = no, 2 = a little, 3 = yes) were used for the additional items, and they were presented as direct personal questions.

Data collection. The window to the questionnaire was open for several weeks during the autumn 2009, and 2138 cases were collected. Of these 128 (6%) were professionally diagnosed with AS/HFA/PDD; 678 (32%) self-identified as having autistic traits; and 1332 (62%) didn't specify their position on the autism spectrum. The average age was 31 years, with a standard deviation of 14. ASD diagnosed participants were younger on average: 25 years. Participants to the Aspie Quiz were recruited through a large number of links on blogs, forums, and autism community sites. No attempts were taken to recruit religious participants specifically.

Data analysis. To analyze the collected data, a first step was to reduce the variables in the part of questionnaire devoted to religion, spirituality and moral attitudes (43 items). To this end, a factor analysis with Varimax rotation was applied. Eight factors have been extracted from the 43 items regarding religion, spirituality, and moral attitudes, with alphas above 0.5. In the order of importance or descending discrimination, the factors have been designed as follows (see **table 1**):

- F1: Spirituality
- F2: Confessional religion
- F3: Negativity
- F4: Social Morality
- F5: Rationalism
- F6: Materialism
- F7: Altruism
- F8: Justice (Fairness).

The second step was to divide subjects between a group of NTs and another of NDs. Two procedures have been followed. The simple one used the variable based on the self-assessment of NTs / and AS/HFA/PDD, plus those who have been professionally diagnosed with AS/HFA/PDD. The more complex procedure has applied the results of the Aspie Quiz score classifications. These two approaches allow us to compare tables of means and to assess better levels of cognitive diversity in their relationship with the extracted factors.

Table 1. Factor analysis (PAF, Varimax rotation), percentage of explained variance, and reliability (Cronbach's alpha) of a sub-scale on religion, spirituality and moral attitudes (43 items; N= 2138)

Item expression	1	2	3	4	5	6	7	8
Do you believe in ghosts and / or supernatural phenomena?	.746							
Have you had paranormal experiences?	.683							
Do you think that living beings are connected in a mysterious way?	.653							
Do you think that in this world, there is more than just what can be seen and felt?	.606							
Do you think that human beings have both a material and a spiritual component?	.596							
Do you think that the soul is immortal?	.539	.460						
Do you deem yourself as a spiritual person, even if you do not attend religious services?	.526	.494						
Do you think that a mysterious force in the cosmos guides us towards the good?	.519							
Are you a praying person?		.806						
Do you attend religious services on a regular basis?		.806						
Do you try to put your religious beliefs into practice?		.756						
Are you a believer or have faith?		.736						
Do you feel more compelled to do evil than to do good things?			.678					
Do you often have a reason to do evil things?			.649					
Do you sometimes perceive the dark side of reality that leads to evil?			.538					
Do you think that this life is not but a valley of tears?			.497					
Do you feel limited in your actions only by civil law?			.486					
Is there something in you that rules you?			.448					
Do living in society limit your freedom?			.428					
Do people work just for money?			.406					
Do corruption of customs affect just the ones that corrupt?				.774				
Do moral corruption affect just the ones that corrupt?				.751				
Do economic corruption affect just the ones that corrupt?				.731				
Do you think that human beings tend at their own perfection as persons?				.417				
Do you often behave in a rational way?					.664			
Do you think that human beings know what is good and what is evil?					.637			
Do you think that if you know what 'good' is, then you can do it?					.505			
Do you think that the civil law is enough for humans to do good things?					.441			
Do you think that human beings are born to enjoy life?					.422			
Do you often have a reason to do good things?					.413			
Do you think that a human being is just a physical entity?						.691		
Do you think that emotions and feelings are just physical-chemical reactions?						.691		
Do you think there is no evil, rather only bad things?						.664		
Do you think you should sacrifice your wellbeing for the common good?							.662	
Do you not mind to strive for the benefit of others?							.637	
Do you think it is convenient to do good things regardless of whom it is for							.564	
Do you think that just behaviour is always rewarded?								.763
Do you think that unjust behaviour is always punished?								.708
Do you think that in this life each one has what one deserves?								.563
% Variance	17.4	8.32	5.44	3.70	3.53	3.08	2.52	2.73
Cronbach's alpha	.850	.852	.683	.654	.590	.603	.558	.566

Explained variance = 48,6%; F1: Spirituality; F2: Confessional religion; F3: Negativity; F4: Social Morality; F5: Rationalism; F6: Materialism; F7: Altruism; F8: Justice (Fairness)

The third step was to calculate a cross-tabulation table for each procedure of discrimination allowing for diversity.

Results

Table three shows the means of each factor for each sub-sample. The contrast of means for each factor between NT, and ND is quite revealing. The first result shows how the second table – one that can be considered as more reliable in assessing neurodiversity – confirms and even accentuates the results of the first table, based on self and professional assessment. The analysis of each factor shows other remarkable results.

The first factor, called “Spirituality”, clusters 8 items (table 1). The 6 with higher correlations are:

- Do you believe in ghosts and / or supernatural phenomena?
- Have you had paranormal experiences?
- Do you think that living beings are connected in a mysterious way?
- Do you think that in this world, there is more than just what can be seen and felt?
- Human beings have both a material and a spiritual component
- The soul is immortal

The term used to design this first factor “Spirituality” reflects a tendency in the current study of religion to distinguish between institutional and informal or subjective religious forms. Several attempts have tried to better characterize such distinction and to avoid overlaps, with not certain conclusion. The items clustered in this factor come close to what several scholars have described as ‘spirituality’ as distinct from ‘religion’. The point can be seen in the following description: “... religiousness and spirituality, with the former representing an institutional, formal, outward, doctrinal, authoritarian, inhibiting expression and the latter representing an individual, subjective, emotional, inward, unsystematic, freeing expression (Hill & Pargament 2003, 64).

The results show that people who do not suspect that they are on the autism spectrum get a mean of 1.56 (on a scale from 1 to 3) while people that suspect they

are on the autism spectrum get 1.69; and professionally diagnosed AS/HFA get 1.59. The variance between these three cohorts is rather scarce but significant (ANOVA $p \leq 0.001$), and people on the autism spectrum appear as having a little more “spiritual sensitivity” than others. This result is more evident in the second table: the contrast between NTs (M= 1.52) and NDs (M= 1.68) is still bigger (all the results are significant).

A test with just the first two items of this factor is quite revealing. The items wording is: “Do you believe in ghosts and / or supernatural phenomena?”, “Have you had paranormal experiences?”. [The cross-tabulation can be seen in table 4] Beliefs in ghosts and supernatural phenomena are significantly more prominent among NDs than NTs (M= 1.64 vs. 1.45); this tendency is even more evident regarding paranormal experiences (M= 1.50 vs. 1.24). These outcomes point to a greater sensitivity on the part of ND subjects towards the broad spectrum of spiritual and supernatural experiences.

The second factor clusters indicators of religious practice, like religious service attendance, personal prayer, and self-assessment as a religious person. Here again, the means are similar, and the variance is small, but again significant and points to higher figures for people on the autism spectrum, who appear as ‘more religious’ following the indicators of institutional religiosity. In table 2, these results are clearly confirmed (M= 1.50 vs. 1.39).

The third factor is the one with the greater variance between these sub-samples; it is defined as ‘Negativity’ and clusters 8 items. The main ones are:

- Do you feel more compelled to do evil than to do good things?
- Do you often have a reason to do evil things?
- Do you sometimes perceive the dark side of reality that leads to evil?
- Do you think that this life is nothing but a valley of tears?

In this case people on the autism spectrum clearly rank higher than others (Suspect = 1.51; Professionally diagnosed = 1.66; Don’t suspect = 1.32; second table: ND = 1.59; NT = 1.28). This data might reveal a greater sensitivity within that sample towards forms of evil and negativity; or perhaps this sensitivity could be the consequence of their perception about their own

Table 2. Cross-tabulation of means of 8 extracted factors and 3 sub-samples based on self-assessment of perceived and diagnosed AS/HFA degree; N= 2138

Asp		Spirituality**	Conf. religion**	Negativity**	Social Moral	Rationalism**	Materialism	Altruism	Justice
NI	M	1.56	1.40	1.35	0.99	1.90	1.57	1.74	1.22
	N	1332	1332	1332	1332	1332	1332	1332	1332
	SD	0.62	0.62	0.43	0.53	0.55	0.70	0.63	0.47
SI	M	1.69	1.52	1.51	0.96	1.79	1.57	1.69	1.24
	N	678	678	678	678	678	678	678	678
	SD	0.66	0.64	0.47	0.54	0.53	0.76	0.66	0.49
PD	M	1.59	1.48	1.66	0.99	1.77	1.73	1.67	1.27
	N	128	128	128	128	128	128	128	128
	SD	0.65	0.62	0.55	0.55	0.51	0.74	0.58	0.49

Note. NI stands for “no identification”; SI stands for “self-identified as on the autism spectrum”; and PD stands for “professional diagnosed AS/HFA”; Scoring: 0 = no answer, 1 = no, 2 = sometimes, 3 = yes ANOVA sign. ** $p \leq 0.001$

Table 3. Cross-tabulation of means of 8 extracted factors and 3 sub-samples based on Aspie Quiz classifications; N= 2138

Status		Spirituality**	Conf. religion*	Negativity**	Social Moral	Rationalism**	Materialism	Altruism	Justice
NT	M	1.53	1.39	1.28	1.01	1.97	1.55	1.75	1.24
	N	879	879	879	879	879	879	879	879
	SD	0.60	0.62	0.38	0.51	0.53	0.68	0.62	0.45
Mixed	M	1.63	1.45	1.42	0.97	1.79	1.54	1.73	1.22
	N	528	528	528	528	528	528	528	528
	SD	0.66	0.64	0.45	0.56	0.56	0.73	0.65	0.49
ND	M	1.68	1.50	1.59	0.95	1.77	1.63	1.67	1.23
	N	731	731	731	731	731	731	731	731
	SD	0.67	0.63	0.50	0.55	0.52	0.77	0.65	0.49

Note. NT stands for “neurotypical”, and ND stands for “neurodiverse” ANOVA sign. * p< 0.005; ** p<0.001

diversity; or, alternatively, of being victims of bullying attitudes.

The fourth factor measured attitudes towards social morality and corruption; the variance is not significant. The fifth factor is designed as ‘Rationalism’. From 6 clustered items, the main three are:

- Do you often behave in a rational way?
- Do you think that human beings know what is good and what is evil?
- Do you think that if you know what ‘good’ is, then you can do it?

It is interesting that even if the variance is small but significant, this factor reveals that people on the autism spectrum score a little lower than others (Suspect= 1.78; Professionally diagnosed= 1.76; Don’t suspect= 1.90). This result could be understood as a difficulty by that sub-sample to recognize in an intuitive way the differences between good and evil and even to behave in a way that is not considered ‘rational’.

The factor 6, named ‘Materialism’ clusters 3 items describing human beings and their emotions just in physical terms. Here a contrast emerges between professionally diagnosed and the other two groups (Suspect= 1.56; Professionally diagnosed= 1.72;

Don’t suspect= 1.56). This variance is nevertheless non-significant; it could point to a small increase of materialism among ASD people in the way in which they understand human nature, but again the result is not conclusive.

The two last extracted factors, ‘Altruism’ and ‘Fairness’ do not offer substantial variation between the three sub-samples, and their reliability coefficient is lower and their ANOVA not-significant.

In later version of Aspie Quiz, participants were asked “Do you prefer to construct your own set of spiritual beliefs rather than following existing religions / belief-systems?”, and this generated higher scores from NDs than from NTs (N = 1850, p < 0.0001), supporting previous studies on this topic. However, this is a personal preference, and not an inability to acquire religious beliefs.

Since some doubts could be raised to what extent such results can be understood as evidence against a connection between ToM and religious aptitude, some additional tests were performed trying to focus more on that aspect. As formerly described, the main Aspie Quiz instrument contains 150 items. Many of them can be viewed as ‘indicators of mentalizing activity’ or describing difficulties to adapt to majority patterns of social cognition and interaction. A list of such items includes the following:

- Do you find it easier to understand and communicate with odd & unusual people than with ordinary people?
- Do you tend to express your feelings in ways that may baffle others?
- Do others often misunderstand you?
- Do you forget you are in a social situation when something gets your attention?
- Do people sometimes think you are smiling at the wrong occasion?
- Do you tend to interpret things literally?
- Do people often tell you that you keep going on and on about the same thing?
- Are you often surprised what people’s motives are?
- In a conversation, do you tend to focus on your own thoughts rather than on what your listener might be thinking?
- Is it hard for you to see why some things upset

Table 4. Cross-tabulation of means of 2 items and 3 sub-samples based on Aspie Quiz classifications

Status		Ghosts**	Paranormal**
NT	M	1.45	1.24
	N	879	879
	SD	0.78	0.66
Mixed	M	1.56	1.37
	N	528	528
	SD	0.86	0.82
ND	M	1.64	1.50
	N	731	731
	SD	0.91	0.84

ANOVA sign. ** p<0.001

- Are you good at interpreting facial expressions?

Clustering this set of 11 items, its reliability coefficient has been calculated ($\alpha=0.808$); that figure reveals a close relatedness among them. The mean in such cluster has been calculated, to allow for simple correlations with the two main factors formerly described: 'spirituality' and 'confessional religion'. The results show low and significant positive correlations regarding both variables. Since the described set can be associated with standard mentalizing difficulties, the evidence points to an absence of negative effects on spiritual or religious scores, or even to a moderate positive effect, specially regarding spiritual perception ('mentalizing activity' with spirituality, current $R=0.264$, $p \leq 0.001$; with religiosity, $R=0.181$, $p \leq 0.001$). Additional correlation tests have been performed with every item on that set and the two selected factors: in all cases, the correlations were low and positive; the only exception regards the item "Are you good at interpreting facial expressions?", which is positively related too but goes in an opposite direction to the rest (see **table 5**).

Concerning the issue on the possible relationship between ASD and schizophrenic traits, in the Aspie Quiz study, the diagnosed ASD group was only 6%, and the answers for the spiritual questions were not significantly different between the ASD group and those that didn't believe they had an ASD. In the evaluation of Aspie Quiz (Ekblad 2013), the Schizotypal Personality Questionnaire (SPQ-A), which has several spiritual aspects, had a high correlation to the Aspie Quiz score (.66). This is consistent with the present study. The slightly lower scores in the ASD group compared to the ND group might be caused by some people with both autistic and schizotypal traits receiving Schizophrenia-related diagnoses rather than ASD diagnoses. Still, the Aspie Quiz score had a .83 correlation to the Autism Spectrum Quotient (Ekblad 2013), which means the score is more relevant for ASD than for Schizophrenia.

Experiment 2

Method

Following a suggestion of Jesse Bering about EToM (Bering 2002, 2003) and its proposed central

role in religious cognition, an empirical study was devised to test this hypothesis. Bering describes EToM as "an independent system that, although built on the foundations of the ToM, serves not to explain or predict behavior but, rather, to allow individuals to attribute meaning to certain classes of autobiographical experiences" (2002: 4). This move devolves religion to one of its most specific realms: a system of meaning. If Bering is right, and ToM is the basis of this more sophisticated system, then deficits in that basic domain could affect the function of religion as a provider of meaning.

The first step was to compose an ad hoc questionnaire to check levels or areas involved in EToM. This questionnaire included 30 specific items, two items inquiring about levels of religious practice (church attendance and personal prayer); and the demographics of gender and age. This specifically designed questionnaire poses questions regarding perceptions of divine providence, the voice of conscience, or the ability to experience a transcendent meaning in life. The questionnaire did not intend to distinguish EToM as an independent variable regarding religious/spiritual beliefs, since this would become extremely difficult as, in principle, religious beliefs are in themselves part of that system of meaning. The scale of responses was reduced to three levels: 'yes', 'more or less', 'no', to simplify them and to adapt them to the capacity of a population of pre-adolescents and adolescents, allowing for the presence of some subjects with AS.

Data collection. The questionnaire was administered at the end of 2010 to three different schools in Spain in three different regions, two of them Catholic, and the other public. This is a sample of convenience, based on direct knowledge after looking for schools with the presence of at least one student in AS condition. The group's ages were distributed as follows:

- School 1a; 1 ESO; N= 30; age M= 11.9
- School 1b; 4 ESO; N= 30; age M= 15.3
- School 2; 1 ESO; N= 22; age M= 11.6
- School 3; 6 Prim; N= 52; age M= 10.9

The total number of children enrolled in this study was 134.

The first three groups of students had a boy in each class professionally diagnosed with AS.

Table 5. Correlation (Pearson's *r*) of Variables 'Spirituality' and 'Confessional religion' ('Dependent variables') among 'Theory of mind set' and selected items

	Spirituality	Conf. Rel.
ToM 11 items set	.264**	.181*
Do you tend to express your feelings in ways that may baffle others?	.173**	.117**
Do others often misunderstand you?	.177**	.131**
Do you tend to interpret things literally?	.145**	.133**
Are you often surprised what people's motives are ?	.177**	.133**
In a conversation, do you tend to focus on your own thoughts rather than on what your listener might be thinking?	.114**	.107**
Is it hard for you to see why some things upset people so much?	.087**	.051*
Are you good at interpreting facial expressions?	.171**	.123**

All correlations are significant at $p < .00$ level (**) or $p < .05$ level (*).

Results

A factor analysis with Varimax rotation from the total of data was performed, and five factors have been extracted (alpha coefficients greater than or close to 0.5):

- God knows us, helps and protects
- God guides our conscience
- God neglects; is absent
- Religious practice
- Sense of providence despite the odds.

The comparative table of averages for the first factor shows that the perception of a God, who positively exerts its protective action, is quite high among members of these samples, and either declines significantly in the older segment or becomes negatively correlated with age (the students 15 years old perceive less of a sense of positive providence). No significant variations are recorded in this and other factors between boys and girls.

The most surprising result of this survey corresponds to the comparison between three cases of pupils with AS in two surveyed participating schools. In all the above-described factors the AS boys reflect clearly the average in their perception of an EToM, or even above average regarding the NT control group. This outcome contrasts with the idea that their difficulties in mentalizing or reading the minds of other people, renders them less sensitive from a religious point of view. An explanation for this could be that having received and internalized a strong religious background they have learned and memorized ideas like “God loves us, cares for us and protects us”, especially for individuals who may be in a more precarious condition due to their relational impairments. In fact, the three cases involve children raised in religious or Christian families, and in two cases in Christian schools. Only one item with the expression: “There is an inner voice that tells me what is right and what is wrong” appears clearly in contrast with the average answers. The outcome could show a difficulty of AS school boys regarding such ‘inner voices’

The questionnaire should still be validated in a more extensive way so as to verify its ability to reflect the EToM in different settings. It should also be distributed to populations of adolescents and young people of different ages to see to what extent some predictions or hypotheses in the minds of the researchers are met. It appears that EToM works more vividly until a certain age, in around 12-13 years, in which individuals rather naturally attribute some abilities to influence life events, especially in a positive way, to the incorporeal and transcendent agency. In fact, the negative experiences in this questionnaire are often not attributed to a supernatural agency. It is pertinent to conclude that the ability or tendency to attribute agency to supernatural beings decreases as individuals grow and develop other faculties that recognize the causality of a more imminent or rational agency.

Discussion

The thesis of religion in autistic subjects as mainly derived from social learning could mean that they would hardly generate religious ideas or experiences on their own. This sort of ‘kick-off’ would be rather a patrimony of NTs or very creative minds. However, once in place, when religion becomes a trait of a human community, people with supposed impairments in their ToM, would just ‘adapt’ to the rest of the social group.

This view is compatible with the hypothesis formulated privately by Justin Barrett: religion needs an initial ToM to be started, and once on the move, it can assume forms which lack the contribution of that ToM, and even the emotional dimension. However, this is a very theoretical and difficult to assess hypothesis.

The problem with the former explanations is that secularized societies exert a rather low pressure regarding religious socialization. On the other hand, NT children would proceed in a similar way as everybody else learning and losing their religious beliefs and practices at a more mature age, or they would just keep them because of social pressure or environmental adaptation. The available literature on the sociology of conversion points to such a pattern of acquisition and loss of religious beliefs and behaviors. Studies or data on possible conversions by autistic subjects are missing, and therefore, any comparison at the moment is not possible.

The issue related to the ‘behavioristic explanation’ raises some questions. The questionnaires used in the described two studies included several items on religious sensitivity and views, which are harder to fake from a purely behavioristic or learned position, as some kind of ‘interiorization’ and reflection are required to consciously answer to them. It is difficult to settle these questions. Perhaps more interviews with autistic adults with religious beliefs and practices, able to reconstruct their own experience from infancy on, may help more when knowing how they managed to overcome the expected difficulties.

The discussion of this issue reflects a much broader question: the role of external versus internal configuration of religious beliefs. Religious experience has been valued more as a form of internal conviction and feeling, and less as something external, conventional, formal or just learned by as an environmental adaptation. However, this trend does not mean that the ‘ideal form’ of internal religion, corresponding to a strong intimate experience and feeling – within a Reformed and Enlightened tradition – is the only or the most genuine religious form, or that it could be claimed, in a kind of normative move, as being the best or the ‘authentic’ religious way. The idea of a pluralism of religious forms and developments emerges as very convenient in this context to avoid simplifications and reductions.

The present study suffers from several methodological limitations that is fair to recognize. Even if the sample size is big enough in the first study, the recruitment method for individuals that look into the Aspie Quiz could raise some suspicions, since most voluntary people are trying to test or ascertain their own autistic symptoms. Then possibly some of the symptoms could be mixed with other psychological problems, rendering the results fuzzier. However Aspie Quiz has reached great popularity and has become an accurate method to assess autistic traits after the many iterations and standardization.

Conclusion

The Aspie Quiz survey indicated that mature subjects on the autism spectrum do not reflect relevant differences in the field of religion and spirituality compared to their NT counterparts. Some nuances can be perceived, especially regarding the issue of negativity, which shows a higher sensitivity on the side of autistic subjects; and a little more of a materialistic view of human nature. Furthermore, the data analysis reveals that items associated with communication difficulties

and to some extent with ToM, correlate moderately and positively with a scale describing spiritual perceptions, contrary to the expectation that such problems could entail a diminished spiritual aptitude. ND people indicated having more spiritual beliefs and more often preferred private religious beliefs while NT people preferred to follow existing religious scripts.

Thus, this study reveals a more nuanced religious structure in the minds of subjects on the autism spectrum and does not allow simplifications serving some theoretical programs. The general impression is that many autistic subjects suffer difficulties in adapting to the standard religious socialization characteristic of most children of their age. However these difficulties are overcome through specific ways, perhaps building some particular religious structure or code; and at the end what counts most is the social or cultural environment, which becomes the decisive factor leading to more or less religious attitudes and ideas. Therefore, developmental and social-cultural variables become more important than just innate cognitive features when predicting religious outcomes in these cases. This conclusion finds some empirical evidence in the neurologic research of Bastiaansen and his associates (2011), which reaches the following conclusions: “Inferior frontal gyrus activity during the observation of facial expressions increased with age in subjects with autism, but not in control subjects. The age-related increase in activity was associated with changes in gaze behavior and improvements in social functioning” (...) The results of this cross-sectional study suggest that mirror neuron system activity augments with age in autism and that this is accompanied by changes in gaze behavior and improved social functioning” (Bastiaansen et al. 2011, p. 832).

All in all, there is still a long way to go until scholars can resolve several issues arising from the new scientific study of religion. The accumulated experience shows that reducing the variables too much does not help to gain a better scientific approach. The case about studying autistic people should be less one of testing pre-existing theories, but rather one that could help to explore the richness and varieties of religious experience and cognition, as William James claimed. These varieties do not challenge scientific views but rather enrich our insights into this important dimension of the human condition.

Future research

Several issues remain unanswered. For example, the following would need future consideration:

- From a neurological and cognitive point of view, it is difficult to assess the sorts of impairments and enhanced abilities on the autism spectrum and their own mental structure. Indeed, a big problem arises when dealing with subjects positioned at different points on that spectrum since those more severely affected suffer other cognitive impairments beneath problems of ToM. These aspects might add weight to their respective difficulties with religion. Therefore religious experience would depend on other cognitive faculties as well, which often remain affected in more severe forms of autism.
- From a cognitive developmental point of view, it seems that autistic subjects and NTs thread different paths towards their cognitive maturity, in integrating different skills, and balancing

emotional and sheer cognitive aspects of their lives. That distinction applies to religious development too, and it would be important to track the specific path followed by ASD people, provided that there might be a unique path, which is rather less probable, knowing the many varieties and expressions that condition assumes.

- From the point of view of a cognitive-cultural relationship, the case study of AS subjects provides interesting insights, but at the same time, it appears as quite intriguing. It is clear from the evidence accumulated to date that those persons manage to adapt on average to their own environment, but it is hard to assess the way in which the cognitive structure and cultural context interact to achieve that outcome. The impression is that these are – not only in this case – very entrenched dimensions and that it becomes very hard to disentangle them to ascertain the specific contribution of innate cognitive traits. The most that can be expected is that NTs and autistics work out the integration of mind and culture, not only regarding religion, in specific ways.
- More promising ways to explore the specific structure of religious cognition by autistic people would be a study of their ‘religious grammars’ and the meaning they project into religious ideas and actions. In the first case, it would be insightful to assess whether they build on a different ‘religious grammar’ or apply a specific ‘set of codes’ that allow them to elaborate information susceptible to becoming ‘religious’ in its output. The evidence until now is very weak for a ‘universal religious grammar’ (Oviedo and Canteras 2013). In the case that autistic people might apply similar or specific clues, they could help shed more light on this thorny issue. In the second case, the meaning ASD people project onto their own religious beliefs and actions could be revealing when compared with other forms of meaning-building of religious concepts, if religion is assumed as a “meaning system” (Emons & Paloutzian 2003, Silberman 2005)

List of abbreviations and acronyms used throughout the text

ADHD: Attention Deficit Hyperactivity Disorder
AS: Asperger Syndrome
ASD: Autism Spectrum Disorder
DSM: Statistical Manual of Mental Disorders
EToM: Existential Theory of Mind
HFA: High-functioning autism
ND: Neurodiverse
NT: Neurotypical
PDD: Pervasive Development Disorder
SPQ-A: Schizotypal Personality Questionnaire
ToM: Theory of Mind

References

- American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing, Washington, DC.
- Armstrong T (2010). *Neurodiversity: Discovering the extraordinary gifts of autism, ADHD, dyslexia, and other brain differences*. Da Capo Lifelong Books, Cambridge, MA.

- Barrett J (2004). *Why Would Anyone Believe in God?* Alta Mira Press, Walnut Creek.
- Bastiaansen JA, Thioux M, Nanetti L, van der Gaag Ch, Ketelaars C, Minderaa R, Keysers C (2011). Age-related increase in inferior frontal gyrus activity and social functioning in autism spectrum disorder. *Biological Psychiatry* 69, 9, 832-838. doi: 10.1016/j.biopsych.2010.11.007
- Bering JM (2002). The Existential Theory of Mind. *Review of General Psychology* 6, 1, 13-24.
- Bering JM (2003). Towards a cognitive theory of existential meaning. *New Ideas in Psychology* 21, 1, 101-120.
- Brezis RS (2012). Autism as a case for neuroanthropology: Delineating the role of Theory of Mind in religious development. In Lende DH, Downey G (eds) *The Encultured brain: An introduction to neuroanthropology*. MIT Press, Cambridge, MA, 291-314.
- Caldwell-Harris C, Murphy CF, Velazquez T, McNamara P (2011). Religious belief systems of persons with high functioning autism. Retrieved from <http://csjarchive.cogsci.rpi.edu/proceedings/2011/papers/0782/paper0782.pdf>
- Dubin N, Graetz JE (2009). Through a different lens: Spirituality in the lives of individuals with Asperger's syndrome. *Journal of Religion, Disability and Health* 13, 1, 77-82. doi: 10.1080/15228960802505213.
- Ekblad L (2013). Autism, personality, and human diversity: Defining neurodiversity in an iterative process using Aspie quiz, *SAGE Open* July-September 1-14. Doi: 10.1177/2158244013497722.
- Emmons R A, Paloutzian RF (2003). The Psychology of religion. *Annual Review of Psychology* 54, 377-402.
- Hill PC, Pargament KI (2003). Advances in the conceptualization and measurement of religion and spirituality: Implications for physical and mental health research. *American Psychologist* 58, 64-74.
- Jack A, Friedman JP, Boyatzis RE, Taylor SN (2016). Why Do You Believe in God? Relationships between Religious Belief, Analytic Thinking, Mentalizing and Moral Concern. *PLoS ONE* 11, 3: e0149989. doi:10.1371/journal.pone.0149989
- Jaarsma P, Welin S (2012). Autism as a natural human variation: Reflections on the claims of the neurodiversity movement. *Health Care Analysis* 20, 20-30.
- Lindeman M, Lipsanen J (2016). Diverse Cognitive Profiles of Religious Believers and Nonbelievers. *The International Journal for the Psychology of Religion* 26, 3, 185-192, doi: 10.1080/10508619.2015.1091695.
- McCauley RN (2011). *Why religion is natural and science is not*. Oxford University Press, Oxford, New York.
- Norenzayan A, Gervais WM, Trzesniewski H (2012). Mentalizing deficits constrain belief in a personal God, *PLoS ONE* 7-5, e36880. doi: 10.1371/journal.pone.0036880.
- Oviedo LI, Canteras M (2013). Steps Towards a "Universal Religious Grammar". *Antoniano* 88, 3, 531-553.
- Oviedo LI (2017). Recent scientific explanations of religious beliefs: A systematic account. In Angel HF, Runehov A, et al. *Creditions: The Process of Believing*. Springer, Dordrecht, Heidelberg, pp. 289-318.
- Reddish P, Tok P, Kundt R (2016). Religious Cognition and Behaviour in Autism: The Role of Mentalizing. *The International Journal for the Psychology of Religion* 26, 2, 95-112, doi: 10.1080/10508619.2014.1003518.
- Schaap-Jonker H, Sizoo B, van Schothorst-van Roekel J, Corveleyn J. (2013). Autism spectrum disorders and the image of God as a core aspect of religiousness. *The International Journal for the Psychology of Religion* 23, 2, 145-160. doi: 10.1080/10508619.2012.688005.
- Silberman I (2005). Religion as a meaning system. Implications for the New Millennium. *Journal of Social Issues* 61, 4, 641-663. doi: 10.1111/j.1540-4560.2005.00425.x.
- Smith A, Sankey H (2012). Thinking about religion: Examining progress in religious cognition. In Dawes GW, Maclaurin J (eds) *A New Science of Religion*. Routledge, London, New York, 111-132.
- Visuri I (2012). Could everyone talk to God? A case study on Asperger's syndrome, religion, and spirituality. *Journal of Religion, Disability & Health* 16, 4, 352-378. doi: 10.1080/15228967.2012.731888.
- Vonk J, Pitzten J (2017). Believing in other minds: Accurate mentalizing does not predict religiosity. *Personality and Individual Differences* 115, 70-76. doi: 10.1016/j.paid.2016.06.008
- Willard AK, Norenzayan A (2013). Cognitive biases explain religious belief, paranormal belief, and belief in life's purpose. *Cognition* 129, 2, 379-391. doi:10.1016/j.cognition.2013.07.016.