Selective impairment of cognitive empathy for moral judgment in adults with high functioning autism

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INTRODUCTION

Autism is considered an umbrella term for a heterogeneous spectrum of pervasive neurodevelopmental disorders with prominent difficulties in socialization (DSM-IV-TR, 2000). Individuals with high functioning forms of autism (HFA) or Asperger syndrome (AS) typically exhibit a stereotyped behavioral profile characterized by marked impairments in the use of non-verbal communicative cues leading to poor social interactions, as well as repetitive behaviors and restricted interests, motor clumsiness and linguistic oddities such as unusual word choices and inappropriate prosody. Difficulties among individuals with HFA/AS have been linked to impairments in central components of social cognition, including theory of mind (ToM) and empathy (e.g. Baron-Cohen et al., 1985, 1997, 1999; Baron-Cohen and Wheelwright, 2004).

The term ‘empathy’ has been applied to a broad spectrum of different phenomena that emerge in response to the feelings and thoughts of others (Batson, 2009). The most basic of these processes is moral empathy, in which one’s body merely mimics the posture of an observed agent (Hatfield et al., 2009). In everyday life, however, being empathic toward others involves a more complex set of processes. On the one hand, we must have cognitive empathy, or the ability to represent the internal mental state of others in order to infer their feelings, thoughts, intentions and beliefs (Blair and Blair, 2009). These processes have also been referred to as perspective taking, theory of mind (Baron-Cohen, 2005) or empathic inference (Ickes, 2009).

A major group of processes, collectively known as emotional empathy, involve the set of feelings elicited in response to the affective state of others, which can carry feelings of warmth or concern for an agent (empathic concern) or a set of self-oriented feelings generated by such agent (personal distress). Emotional empathy feeds on a phylogenetically earlier neural system of social attachment and reward, supported by circuits within the brain stem, midbrain and ventral tegmental area (Panksepp, 1998; Moll et al., 2007) as well as a broad network of structures that include the amygdala, the pars opercularis and other extended areas within the inferior frontal gyrus, the inferior parietal lobe, as well as the insula (Blair, 2008; Singer et al., 2009; Decety and Michalska, 2010; Hurlemann et al., 2010; Shamay-Tsoory, 2009, 2011). Cognitive empathy relies in a widespread cortical circuit involving the temporoparietal junction (Young et al., 2007, 2010, 2010b), several regions within the prefrontal cortex including the ventromedial prefrontal cortex and Brodmann areas 11 and 10, the medial temporal lobe and parts of the insula (Blair, 2008; Shamay-Tsoory, 2009, 2011). Accordingly, emotional empathy precedes cognitive empathy throughout human ontogeny (de Waal, 2008; Decety and Svetlova, 2012), as observed in children, who are able to emotionally respond to others yet fail at distinguishing between their own and the agent’s distress until later in life (Preston and de Waal, 2002; Singer, 2006). Cognitive and affective aspects of ToM can even be uncoupled by experimentally disrupting the aforementioned neural circuits (Kessler et al., 2009), and can be dissociated when brain networks are clinically altered (Shamay-Tsoory, 2009), as is the case with certain neurological and psychiatric patient populations (Shamay-Tsoory et al., 2005, 2007; Shamay-Tsoory and Aharon-Peretz, 2007).

Among infant (Yirmiya et al., 1992; Blair, 1999), adolescent (Shamay-Tsoory et al., 2002) and adult (Rogers et al., 2007; Dziobek et al., 2008) populations with HFA/AS, emotional empathy has been reported to be relatively spared and major difficulties seem to arise in theory of mind and the cognitive aspects of empathy. Besides the apparently unaffected emotional aspects of empathy per se, emotional disturbances in individuals with HFA/AS have been acknowledged to persist even throughout adulthood (Gray et al., 2012). Such disturbances include impairments in emotion recognition and atypical emotional responses to a wide variety stimuli, including faces (Uono et al., 2011; Yang et al., 2011), body movements (Atkinson, 2009), vocalizations (Heaton et al., 2012) and verbal information (Kuchinke et al., 2011).

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Emotion, empathy and ToM have all been strongly related to another complex aspect of social functioning: moral judgment. For years, however, traditional rationalist approaches to moral psychology had emphasized the role of reasoning in the moral judgment both of mature adults (Kohlberg, 1981) and children (Piaget, 1965). Modern trends, instead, have focused on the way affective and intuitive processes influence human morality (Haidt, 2001, 2003). According to Haidt (2003), morally good behavior is promoted by prosocial emotions such as empathy, sympathy and compassion for others. An interesting question thus arises: how is moral judgment affected in a population characterized by a preponderant impairment in cognitive empathy/ToM and atypical emotional processing?

The first studies in the moral cognition of people with autism revealed that the ability of children with autism to distinguish between conventional transgressions (e.g. playing with food, drinking soup out of a bowl at an elegant dinner party, etc.) and moral transgressions (e.g. pulling someone’s hair, kicking someone, etc.) was independent of their performance in simple ToM tasks (Blair, 1996; Leslie et al., 2006). When providing a justification to their judgment of moral transgressions, however, children with autism were usually less able to deliver appropriate or relevant arguments (Grant et al., 2005). Yet, difficulties in justifying judgments delivered to moral dilemmas have also been reported among neurotypical populations (Hauser et al., 2007), stressing the likely role of intuitive processes in driving our moral judgments (Haidt, 2001). As proposed by Cushman et al. (2006), some moral principles may indeed be available consciously while others may simply come intuitively. In this sense, one possibility is that the language and executive functioning characteristic of individuals with autism impairments may further limit their ability to access and/or deliver and share consciously available moral principles.

Among persons with HFA/AS, while compensatory mechanisms may be acquired throughout development (e.g. Frith et al., 1991; Baron-Cohen et al., 1997; Frith, 2004; Moran et al., 2011), impaired ToM and cognitive empathy, as well as disturbances in emotional processing persist onto adulthood (Grey et al., 2012). It is thus sensible to investigate moral judgment in adult populations with autism. To the best of our knowledge, only two other studies have examined moral cognition in this population. Moran et al. (2011) found that HFA/AS participants perceived accidental harms caused by innocent intentions (e.g. accidentally killing someone) as less morally permissible than neurotypical adults. In other words, faced with a negative outcome, participants perceived accidental harms caused by innocent intentions (e.g. accidentally pulling someone’s hair, kicking someone, etc.) was independent of their performance in simple ToM tasks (Blair, 1996; Leslie et al., 2006). When providing a justification to their judgment of moral transgressions, however, children with autism were usually less able to deliver appropriate or relevant arguments (Grant et al., 2005). Yet, difficulties in justifying judgments delivered to moral dilemmas have also been reported among neurotypical populations (Hauser et al., 2007), stressing the likely role of intuitive processes in driving our moral judgments (Haidt, 2001). As proposed by Cushman et al. (2006), some moral principles may indeed be available consciously while others may simply come intuitively. In this sense, one possibility is that the language and executive functioning characteristic of individuals with autism impairments may further limit their ability to access and/or deliver and share consciously available moral principles.

Faced with particular moral scenarios, however, conflict emerges between these two systems (Greene et al., 2001, 2004). For these scenarios, while the automatic emotional responses tend to favor deontological judgments (i.e. those associated with a sense of duty and righteousness), controlled cognitive processes promote utilitarian or consequentialist judgments (i.e. those that lead to the greater good). Dilemmas which merely demand the deflection of an existing threat (e.g. hitting a switch to kill one instead of many) are associated with greater activation of brain areas linked to reasoning and problem solving, such as the dorsolateral prefrontal and inferior parietal cortices (Greene et al., 2001, 2004). Faced with these ‘impersonal’, low emotionally charged dilemmas, respondents tend to more frequently deliver utilitarian judgments. Instead, moral scenarios that feature an agent causing severe direct physical harm to a particular target (e.g. pushing a man to his death to save many) yield greater activation in brain areas that have been implicated in emotion and social cognition, including the medial prefrontal cortex and posterior cingulate gyrus (Greene et al., 2001, 2004). In these so-called ‘personal’ moral scenarios, the high emotional saliency results in deontological responses being more frequently delivered than utilitarian ones. This is in contrast with a different type of moral dilemma considered ‘impersonal’, which merely demands the deflection of an existing threat. Faced with these ‘personal’, high emotionally charged dilemmas, respondents tend to more frequently deliver deontological judgments.

Research conducted in clinical populations typically characterized by emotional and social cognition disturbances—such as patients with lesions to the prefrontal cortex, behavioral variant frontotemporal demencia, and psychopaths—has revealed increased rates of utilitarian judgment to moral dilemmas (Eisinger et al., 1992; Blair, 1995; Anderson et al., 2002, 2006; Mendez et al., 2005; Mendez, 2006; Koenigs et al., 2007; Gleichgerrcht et al., 2010; Miller et al., 2010; Young et al., 2010a).

Based on these findings and given that the emotion processing and social cognition deficits typical of individuals with HFA/AS, we hypothesized that adult participants in this clinical population would also show increased utilitarian judgment relative to neurotypical controls. Moreover, considering the apparently more severe impairments in cognitive relative to emotional empathy in this population, we hypothesized that utilitarian moral judgment in HFA/AS adults would be associated particularly with impairments in cognitive aspects of empathy.

**METHOD**

The study was initially approved by the local ethics committee following the standards established by the 1964 Declaration of Helsinki.

**Participants**

Thirty-six adults [66.7% (n = 24) male; mean age = 32.6 (s.d. = 10.9); mean years of education = 14.7 (s.d. = 4.0)] with a clinical diagnosis of HFA/AS according to DSM-IV criteria (2000) were recruited from the Institute of Cognitive Neurology (INECO, Argentina) as part of a broader study on cognition in HFA/AS. Diagnosis was based on thorough clinical evaluation of participants and information gathered from their parents. Diagnostic features were further confirmed using screening questionnaires, including the Childhood Asperger Syndrome Test (CAST; Scott et al., 2002) and the Autism Spectrum Quotient for adults (AQ; Baron-Cohen et al., 2001b).

Participants had full-scale IQ scores (Wechsler, 1997) >90, with mean verbal IQ scores of 114 (s.d. = 23.5) and mean performance IQ scores of 104 (s.d. = 15.5). Mean CAST was 17.9 (s.d. = 5.6) and mean AQ score was 33.2 (s.d. = 7.5). On an average, participants exhibited mean scores of 73.9 (s.d. = 24.5) on the Systematizing Quotient—Revised (SQ; Wheelwright et al., 2006) and mean scores of 19.2 (s.d. = 12.0) on the Empathy Quotient (EQ; Baron-Cohen et al., 2001b).
and Wheelwright, 2004). All participants gave their informed consent prior to inclusion in this study.

Thirty-six neurotypical (NT) participants [63.8% (n = 23) male; mean age = 34.2 (s.d. = 8.7); mean years of education = 15.1 (s.d. = 4.2); mean verbal IQ = 110.3 (s.d. = 14.3) and mean performance IQ = 109.2 (s.d. = 12.3)] were recruited from the same demographic background as HFA/AS participants. NT participants had neither a personal nor a family history of psychiatric or neurological disease, and were comparable to HFA/AS participants in terms of age (t[70] = 0.69, P = 0.49), gender (χ² = 0.18, P = 0.89, df = 1), education (t[70] = 0.41, P = 0.68), verbal IQ (t[70] = 0.81, P = 0.42) and performance IQ (t[70] = 0.11, P = 0.24).

**EXPERIMENT 1**

**Procedure**

HFA/AS participants and NT controls were presented with two moral scenarios, in counterbalanced order: the standard trolley dilemma and the footbridge dilemma (Thomson and Parent, 1986; Greene et al., 2001, 2004). Both scenarios required participants to choose whether to harm one person to save five people but differed in the emotional saliency of the harmful act they featured (Section 1 in Supplementary Data), thus constituting one impersonal and one personal moral scenario, as follows:

(a) Impersonal scenario: The trolley dilemma required participants to decide whether to flip a switch to redirect a trolley onto a man, and away from a group of five people (utilitarian response) or whether to allow the trolley to hit the five people (deontological response).

(b) Personal scenario: The footbridge dilemma required participants to decide whether to push a man off a bridge so that his body would stop the trolley from hitting five people further down the tracks (utilitarian response) or whether to allow the trolley to hit the five people (deontological response).

A third vignette was also presented, which consisted of a non-moral dilemma which lacked emotional saliency (Greene et al., 2004), asking participants to decide whether they would take the train instead of the bus to avoid arriving late to an important meeting. In this sense, the non-moral scenario judged a morally inconsequential dilemma (Section 1 in Supplementary Data). Participants answered three questions to each scenario:

1. Would you flip the switch (moral impersonal scenario)/push the man (moral personal scenario)/take the train (non-moral scenario)? (Yes/No). This question provided a direct reflection of the participant’s moral judgment to low and high emotionally salient scenarios. As explained in the introduction, we predicted increased utilitarian judgment among HFA/AS participants.

2. How appropriate is it to flip the switch (moral impersonal scenario)/push the man (moral personal scenario)/take the train (non-moral scenario)? [on a scale of 1 (‘not appropriate at all’) to 10 (‘very appropriate’)]. This question provided a measure of whether participants’ moral judgment was related to telling morally appropriate and inappropriate actions apart. That is to say, if HFA/AS participants delivered utilitarian judgments more frequently, was it because they perceived moral transgressions as more appropriate than neurotypical controls did? Based on previous work showing that HFA/AS participants ignore the intention and focus on the outcome of morally charged actions (Moran et al., 2011), we expected reported appropriateness to be comparable to that of controls.

3. How strongly do you feel about this decision? [on a scale of 1 (‘no emotional reaction’) to 10 (‘max emotional reaction’)]. This question provided a measure of participant’s own perception of reactivity towards their moral judgment. For a person to express high emotional reactivity to killing one in order to save many, they must understand that the action being executed is a moral transgression and that the victim of said transgression has thoughts and intentions that may differ from our own. Based on previous work showing impairments among HFA/AS participants in identifying moral transgressions (Zalla et al., 2011) and showing impairments in cognitive aspects of ToM (Frith et al., 1991; Baron-Cohen et al., 1997; Frith, 2004), we hypothesized altered levels of emotional reactivity to moral scenarios.

**Statistical analysis**

Categorical variables (e.g. Yes/No answers) were compared between groups using independent χ² tests. Ordinal variables were analyzed using independent- and paired-samples t tests for inter- and intra-group comparisons, respectively. The α value for all statistical tests was set at 0.05, two-tailed.

**RESULTS**

**Moral judgment**

Non-moral scenario

A total of 35 HFA/AS participants (97.2%) and 36 NT controls (100%) stated that they would take the train instead of the bus to avoid being late for the meeting.

Moral scenarios

No significant differences were found on the proportion of HFA/AS participants (n = 8, 22.2%) and NT controls (n = 10, 27.7%) who delivered the deontological response (i.e. ‘no, I would not flip the switch’) on the impersonal scenario (χ² = 3.0, P = 0.59, df = 1) (Figure 1). On the personal scenario, however, a significant difference was found between the groups (χ² = 4.74, P = 0.03, df = 1), with 31 NT controls (86.1%) but only 23 HFA/AS participants (63.9%) delivering the deontological judgment (i.e. ‘no, I would not push the man off the footbridge’).

** Appropriateness**

As shown in Figure 2A, no significant differences were found between the groups on how appropriate they felt the utilitarian decision was on both the impersonal moral scenario (t[34] = 0.26, P = 0.69) or the personal moral scenario (t[34] = 0.21, P = 0.73). Within the HFA/AS group, the decision take the train instead of the bus on the non-moral dilemma was perceived as significantly more appropriate than the utilitarian judgment on both the impersonal (t[34] = 2.0, P = 0.05) and personal (t[34] = 8.07, P < 0.001) moral scenarios. The utilitarian judgment on the personal moral scenario was also perceived as more significantly appropriate than the utilitarian response to the personal moral dilemma (t[34] = 6.44, P < 0.001). The same pattern was observed in NT controls (all P < 0.01).

**Emotional reaction**

As shown in Figure 2B, HFA/AS participants responded more strongly than NT controls on the non-moral scenario (t[34] = 2.96, P < 0.01) and the personal moral dilemma (t[34] = 1.93, P = 0.05). On the contrary, the emotional reaction reported by HFA/AS to the personal moral dilemma was significantly lower than that of NT controls (t[34] = 2.9, P < 0.01). Participants with HFA/AS reacted
significantly more strongly on impersonal \((t_{34} = 4.29, P < 0.001)\) and personal \((t_{34} = 3.08, P < 0.01)\) moral scenarios relative to the non-moral dilemma, yet no significant difference was found on the emotional reaction between the two moral dilemmas \((t_{34} = 1.47, P = 0.15)\). NT controls, instead, showed a marked significantly stronger reaction to the personal dilemma relative to the impersonal one \((t_{34} = 7.52, P < 0.001)\).

**Correlation analyses**

In order to test whether IQ was related to moral judgment among HFA/AS participants, we sought correlations between IQ scores and reported levels of appropriateness and emotional reaction. No significant correlations were found between verbal IQ scores and appropriateness on either the impersonal \((r = 0.06, P = 0.78)\) or the personal scenario \((r = 0.24, P = 0.21)\). Similarly, no significant correlations were found between performance IQ scores and appropriateness on neither the impersonal \((r = 0.07, P = 0.72)\) nor the personal scenario \((r = 0.04, P = 0.84)\). Emotional reactivity was also unrelated to either verbal (impersonal: \(r = 0.04, P = 0.79\); personal: \(r = 0.07, P = 0.72\)) or performance IQ.

**EXPERIMENT 2**

**Procedure**

In order to further explore moral judgment in HFA/AS, participants from Experiment 1 were further assessed with the following tests:

**Theory of mind**

(a) Reading the Mind in the Eyes test (MIE; Baron-Cohen et al., 2001a). On this task, participants were presented with photographs of the ocular region of human faces and asked to choose which adjective, among four, best described what the individual in the picture was feeling. Because participants had to infer what others were feeling, this task measured affective ToM. The score for this task was percent correct. Data for the MIE test was available for 30 HFA/AS participants.

(b) Faux Pas test (Stone et al., 1998). Participants were read 20 short vignettes, 10 of which contained a social faux pas. Each vignette was also placed in front of the participant so they could refer back to the story as needed, thus decreasing working memory load. Following each vignette, participants were asked whether something inappropriate had been said by any of the characters, and if so, asked to give an explanation as to why it was inappropriate. If a faux pas was correctly identified, two follow-up questions were further asked: 'Why did the person say that?' and 'How did the other person feel?' A memory question is used as a control to confirm that the core events in the stories were retained.
Performance on this task was scored regarding the number of (i) ‘hits’, or the correct identification of stories featuring a faux pas (out of 10 points); (ii) ‘rejects’, or the appropriate rejection of those stories which did not contain a faux pas (out of 10 points); (iii) ‘total score’, which resulted from adding hits and rejects; (iv) ‘intentionality’, or the recognition that the person committing the faux pas was unaware that he/she had said something inappropriate (out of 10 points) and (v) ‘emotional attribution’, or the recognition that the person hearing the faux pas felt hurt or insulted (out of 10 points). Therefore, intentionality is a measure of cognitive ToM, while emotional attribution taps on affective ToM. Data for the Faux Pas test was available for 30 HFA/AS participants.

**RESULTS**

**Impersonal scenario**

We compared deontological (i.e. ‘no, I would not flip the switch’) and utilitarian (i.e. ‘yes, I would flip the switch’) HFA/AS responders on this low emotionally salient dilemma on several variables in order to determine whether moral judgment was associated with potentially different demographic backgrounds. No significant differences were found in regards to age ($t_{34} = 0.64, P = 0.53$), gender ($\chi^2 = 1.87, P = 0.26, df = 1$) and years of education ($t_{34} = 0.09, P = 0.93$). We also compared clinical variables related to the autistic spectrum in seeking for potential clinical markers that could influence moral cognition among HFA/AS participants. We found that although AQ ($t_{34} = 0.53, P = 0.59$), CAST ($t_{34} = 1.19, P = 0.24$) and SQ ($t_{34} = 0.97, P = 0.34$) scores were comparable between the groups, deontological responders trended toward scoring significantly higher than utilitarians on the EQ ($t_{34} = 1.94, P = 0.06$). In comparing performance on affective ToM, as measured by the MIE ($t_{28} = 1.21, P = 0.24$), as well as all subscores of the Faux Pas (hits: $t_{34} = 0.57, P = 0.57$; rejects: $t_{34} = 0.65, P = 0.52$; total: $t_{34} = 0.77, P = 0.45$; intentionality: $t_{34} = 0.94, P = 0.35$; emotional attribution: $t_{34} = 0.37, P = 0.72$) we observed comparable scores between the groups. Neither empathy (perspective taking: $t_{31} = 0.07, P = 0.95$; empathic concern: $t_{31} = 0.47, P = 0.65$; personal distress: $t_{31} = 1.75, P = 0.09$) nor moral knowledge ($t_{31} = 1.61, P = 0.14$) differed between deontological and utilitarian responders either (Table 1), stressing that utilitarian vs deontological responses to the impersonal scenario were unrelated to participant’s empathic abilities or capacity to tell good from bad apart.

**Personal scenario**

We again sought for potential demographic and clinical differences that may explain utilitarian vs deontological responses to the personal moral dilemma. No significant differences were found between deontological (i.e. ‘no, I would not push the man’) and utilitarian (i.e. ‘yes, I would push the man’) HFA/AS responders in regards to age ($t_{34} = 0.41, P = 0.41$), gender ($\chi^2 = 1.51, P = 0.22, df = 1$) and years of education ($t_{34} = 1.24, P = 0.22$). Scores obtained on the AQ ($t_{34} = 1.05, P = 0.30$), CAST ($t_{34} = 0.02, P = 0.98$), EQ ($t_{34} = 1.18, P = 0.26$) and SQ ($t_{34} = 0.78, P = 0.44$) were comparable between the groups. No significant differences were found for performance on affective ToM, as measured by the MIE ($t_{28} = 1.26, P = 0.22$). The capacity to detect an actually occurring faux pas (hits: $t_{34} = 0.83, P = 0.41$) did not differ significantly between the groups, but utilitarian responders performed significantly worse than deontological responders in recognizing that no faux pas was present (rejects: $t_{34} = 3.52, P < 0.01$) and on the task overall (total: $t_{34} = 2.07, P < 0.05$). The ability to infer other people’s intentionality on the Faux Pas test was also significantly poorer among utilitarian HFA/AS responders ($t_{34} = 2.26, P = 0.03$), despite no significant differences on the Emotional Attribution score ($t_{34} = 0.05, P = 0.88$). While empathic concern ($t_{31} = 0.64, P = 0.53$) and personal distress ($t_{31} = 1.12, P = 0.28$) were comparable between the groups, a significant difference was found for perspective taking ($t_{31} = 2.09, P = 0.04$), with utilitarian responders reporting lower tendencies to adopt the point of view of other people relative to deontological responders. Moral knowledge ($t_{31} = 1.32, P = 0.20$) did not differ the groups (Table 1).
Moral judgment patterns

Based on the criteria outlined above, 8 participants were classified as ED, 13 participants as EU and 16 participants as MR. Said classification was not predicted by age ($F_{2,34} = 2.35, P = 0.11$), gender ($\chi^2 = 2.75, P = 0.25$, df = 2), or years of education ($F_{2,34} = 2.2, P = 0.13$). Nor were the groups significantly different on the AQ ($F_{2,34} = 0.82$, $P = 0.45$), CAST ($F_{2,34} = 0.03, P = 0.97$), EQ ($F_{2,34} = 1.1, P = 0.34$), or SQ ($F_{2,34} = 2.25, P = 0.12$). The groups were comparable on their ToM performance, both on the MIE ($F_{2,28} = 1.78, P = 0.19$) and the different subscores of the Faux Pas (hits: $F_{2,28} = 1.07, P = 0.35$; rejects: $F_{2,28} = 2.3, P = 0.11$; intentionality: $F_{2,28} = 0.84, P = 0.44$; and emotional attribution: $F_{2,28} = 0.19, P = 0.83$). When considering the overall performance on the task, however, a significant difference was found between the groups ($F_{2,28} = 3.4, P < 0.05$), with EU scoring significantly lower than both ED ($P < 0.05$) and MR ($P < 0.05$). ED and MR, instead, had similar scores on the total Faux Pas ($P = 0.82$). A similar pattern was observed for empathy measures: while the groups did not differ significantly on empathic concern ($F_{2,30} = 0.68, P = 0.51$) and personal distress ($F_{2,30} = 1.46, P = 0.25$), EU participants scored significantly lower on the Perspective Taking scale ($F_{2,30} = 3.49, P = 0.04$) than ED ($P < 0.05$) and MR ($P < 0.05$) participants, but the latter groups did not differ between each other ($P = 0.78$). These results were found in the absence of significant differences on moral knowledge ($F_{2,31} = 1.43, P = 0.25$) across the groups (Table 2).

Correlation analyses

Correlations were sought between variables that significantly differed between the groups in order to better understand whether they were tapping on the exact same constructs, or whether they could be providing information of related yet distinguishable constructs. No correlations were found within HFA/AS participants between Perspective Taking and the total score on the Faux Pas ($r = 0.08, P = 0.68$) nor any of its subscores (hits: $r = 0.16, P = 0.45$; rejects: $r = 0.27, P = 0.20$; intentionality: $r = 0.12, P = 0.58$; emotional attribution: $r = 0.23, P = 0.28$). The same held true when correlations were sought independently within deontological and utilitarian responders to the impersonal and personal scenario separately, and within EU, ED and MR participants independently ($P > 0.14$).

DISCUSSION

Moral cognition constitutes a core feature of our social interactions in real life. In the present study, we investigated moral judgment among adult individuals with HFA/AS. As predicted based on this population’s well-established cognitive ToM impairments (e.g. Baron-Cohen et al., 1985, 1997, 1999; Stone et al., 1998; Baron-Cohen and Wheelwright, 2004; Moran et al., 2011; Zalla et al., 2011), we found increased utilitarian judgment to personal moral dilemmas relative to neurotypical controls. In other words, when faced with emotionally high saliency scenarios that involve a moral transgression resulting from direct physical harm to an agent, persons with HFA/AS more frequently than controls favored the utilitarian outcome. This phenomenon, however, was not observed with regards to impersonal dilemmas: when emotional saliency was low, HFA/AS and NT controls were as likely to deliver utilitarian judgments. Also importantly, these findings were unrelated to participants’ verbal or performance IQ scores.

Remarkably, increased utilitarianism among HFA/AS participants was not associated with their perception of appropriateness to inflict harm onto an agent to maximize the benefit for others. HFA/AS individuals and controls both considered that pushing a man onto the train tracks to save five lives (personal scenario) was less appropriate than flipping a switch to kill a man instead of five (impersonal...
Both groups also judged appropriateness at a similar level on each scenario, yet HFA/AS participants still delivered the utilitarian judgment more frequently on the personal dilemma. In fact, we further found that utilitarian and deontological HFA/AS respondents exhibited similar scores on a dispositional measure of moral knowledge, suggesting that their perception of what is right and wrong does not influence moral judgment. This dissociation between moral knowledge and moral judgment is consistent with reports of patients with behavioral variant frontotemporal dementia, who exhibit increased utilitarianism associated with brain degeneration of social cognition and emotional circuits (Mendez et al., 2005; Gleichgerrcht et al., 2010).

We thus sought to understand what aspects of emotion and social cognition, particularly ToM, could be associated with increased utilitarian judgment in this clinical group. It became evident from patients’ reports of emotional reactivity to each scenario that emotion deficits were relevant to moral judgment. HFA/AS participants reported significantly higher emotional reactions than neurotypical controls not only to the moral impersonal dilemma, but even to a non-moral dilemma that featured no transgressions, harm or victims. Yet, when faced with a situation charged with high emotional saliency, their emotional reaction was significantly decreased relatively to controls. Unlike the latter group who exhibit increased reactivity to personal dilemmas relative to impersonal ones, HFA/AS participants reported similar levels of emotional reactivity to both types of scenarios. This finding is consistent with previous reports highlighting, on the one hand, that individuals with HFA/AS exhibit atypical emotional processing (e.g. Gray et al., 2011), and on the other, an extensive overlap between HFA/AS and alexithymia, the inability to identify or describe emotions (Tani et al., 2004; Fitzgerald and Bellgrove, 2006). In fact, alexithymia has been found to be a better predictor than autism symptom severity of decreased brain activation in areas related to prosocial emotions (Bird et al., 2010) and reduced eye fixation when individuals with autism look at social scenes (Bird et al., 2011). Our present findings in this context call for further research exploring the relationship between measures of alexithymia and moral cognition in HFA/AS populations.

Our hypothesis that utilitarian moral judgment was associated with impairments in cognitive aspects of social cognition was also confirmed in this study. In particular, for situations posing low emotional saliency (i.e. impersonal dilemmas), moral judgment was not associated either with demographic, clinical or social cognition parameters. When faced with a dilemma bearing high emotional saliency, however, utilitarian judgment was linked to a decreased ability to deny that a faux pas had been committed (Faux Pas’ reject score) and to pick up on social appropriateness (Faux Pas’ total score), as well as a decreased ability to understand others’ intentions (Faux Pas’ intentionality sub-score), and a diminished tendency to take other’s point of view (perspective taking subscale of the IRI). Participants who delivered the utilitarian response to the personal moral scenario had poorer performance and lower self-reported scores on all four variables, relative to deontological responders with the same diagnosis. Previous studies in adult HFA/AS populations reported severe impairments particularly in these aspects of theory of mind and empathy (Rogers et al., 2007; Dziobek et al., 2008). Moreover, our results are consistent with Moran et al.’s (2011) findings showing that HFA/AS participants fail to judge the moral inappropriateness of an action based on the original intentions of the agent. Instead, they do so by focusing on the outcome of said action. This is likely because, as revealed in the present study, their ability to infer the intentions of other’s and adopt other’s point of view are impaired.

What our findings suggest is that among adults with HFA/AS, those who showed more severe impairments in cognitive ToM and empathy were more likely to deliver utilitarian judgments. These data further support previous findings showing increased utilitarianism in different patient populations with cognitive empathy impairments (Eslinger et al., 1992; Blair, 1995; Anderson et al., 2002, 2006; Mendez et al., 2005; Mendez, 2006; Koenigs et al., 2007; Gleichgerrcht et al., 2010; Miller et al., 2010; Young et al., 2010a). For this reason, it also became relevant to investigate empathy and ToM among extreme utilitarian and deontological individuals. Participants who delivered extreme utilitarian judgment (that is, utilitarian responses not only to the impersonal dilemma as do most respondents but to the personal dilemma as well), showed diminished scores particularly on cognitive ToM/empathy. Moreover, it seems as though participants with extreme utilitarian judgment deviate from the rest of the HFA/AS individuals: their cognitive ToM was significantly lower than that of extreme deontologists (those who deliver deontological judgments to both types of scenario) and the majority of participants (those who exhibit utilitarian responses to the impersonal scenarios but deontological judgment on the personal dilemma), while these two latter groups did not differ between each other.

There are certain limitations to the present study that must be taken into consideration for future work in this field. First, it is important for subsequent studies to replicate these findings using other independent moral scenarios in order to determine the generalizability of the patterns found here. Greene et al. (2001, 2004) and other authors have collected dozens of moral dilemmas that are similar in structure to the trolley and footbridge pair of dilemmas. As well, small variations in the scenarios can test for other subtle yet important aspects of moral judgment. For instance, there are dilemmas in which one person is killed to save many, including the person who commits the moral transgression (as opposed to the scenarios used in the present study, in which the person killing one to save many would not die if s/he decided to not kill the victim). Other dilemmas test a choice to commit a moral transgression for one’s own selfish benefit (rather than for the greater good). Second, more complex predictive models and statistical approaches that control for the effects of multiple comparisons will contribute to identifying the reliability of the present findings. Third, all moral cognition variables analyzed in this study resulted from structured yes/no or Likert-scale answers. Asking participants to verbalize the justifications that underlie their moral judgment can provide very useful information to better comprehend the moral psychology of individuals with HFA/AS.

Understanding the complex interaction between higher cognitive functions in autism carries important implications. First, it provides additional support to theoretical models highlighting the role of emotion in moral judgment. Among HFA/AS adults, disruption of prosocial sentiments leads to increased utilitarianism, which, as argued above, is relevant in the understanding of empathizing vs systemizing trends among persons with autism. From a clinical perspective, our findings provide useful information in the design of intervention programs aimed at training social skills among individuals with autism. These programs usually use hypothetical situations to help individuals recognize emotions, intentions and beliefs of others in order to promote more fruitful social interactions (Carter et al., 2004; Golan and Baron-Cohen, 2006). Accordingly, our study reveals that the use of moral scenarios with high emotional saliency can be useful stimuli to incorporate in attempting to work on the cognitive aspects of empathy/ToM.

Taken together, the findings from the present study reveal that impairments in cognitive aspects of empathy and theory of mind typical of individuals with HFA/AS can elicit utilitarian judgment. Greater prevalence of consequentialism when adults with HFA/AS are faced with high emotionally charged moral dilemmas appears to be associated with difficulties in social cognition.
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SUPPLEMENTARY DATA
Supplementary data are available at SCAN online.

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REFERENCES


