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Dissociation of Cognitive and Emotional Empathy in Adults with Asperger Syndrome Using the Multifaceted Empathy Test (MET)

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Abstract Empathy is a multidimensional construct consisting of cognitive (inferring mental states) and emotional (empathic concern) components. Despite a paucity of research, individuals on the autism spectrum are generally believed to lack empathy. In the current study we used a new, photo-based measure, the Multifaceted Empathy Test (MET), to assess empathy multidimensionally in a group of 17 individuals with Asperger syndrome (AS) and 18 well-matched controls. Results suggested that while individuals with AS are impaired in cognitive empathy, they do not differ from controls in emotional empathy. Level of general emotional arousability and socially desirable answer tendencies did not differ between groups. Internal consistency of the MET's scales ranged from .71 to .92, and convergent and divergent validity were highly satisfactory.

Keywords Asperger syndrome · Autism · Empathy · Social cognition · Theory of mind · Sympathy

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Introduction

Empathy, the ability to share another person's inner life, is fundamental for the success of human relationships and societies. Previous research has taken two main approaches to the study of empathy. The first approach focuses on cognitive empathy (Kohler 1929; Baron-Cohen and Wheelwright 2004), or the capacity to take the perspective of another person and to infer their mental states. The second approach emphasizes emotional or affective empathy (Eisenberg and Miller 1987; Mehrabian and Epstein 1972), defined as an observer's emotional response to another person's emotional state. Other researchers have suggested a more multi-dimensional approach that views cognitive and emotional components of empathy as two separate, but related constructs (Davis 1980, 1983).

Autism spectrum conditions, along with other conditions such as psychopathy, have been described as "empathy disorders" (Gillberg 1992). Interestingly, few studies have formally assessed empathy in individuals with autistic conditions and those studies have generally focused on either the cognitive or emotional component alone or have not attempted to differentiate between the two components. For example, Baron-Cohen and colleagues (2004) report reduced empathy in individuals with autism using the

Empathy Quotient (EQ), a questionnaire that largely focuses on cognitive empathy. In another study (Blair 1999), emotional reactions of children with autism in response to distressed persons were obtained (emotional empathy) without, however, assessing the interpretation of those emotional stimuli (cognitive empathy). Given that autistic individuals are known to have impairments in emotion recognition (e.g. Njiokiktjien et al. 2001), it is possible that the children in this study may have incorrectly classified the stimuli, leading them to experience emotional reactions that were different from those of typically developed (neurotypical) individuals.

In a previous study, we administered the only multidimensional empathy questionnaire available to date, the Interpersonal Reactivity Index (IRI; Davis 1980) to adults with AS (Rogers et al. 2007). The results of this study showed a dissociation between cognitive and emotional empathy: while the AS group scored lower than the control group on measures of cognitive empathy, there were no differences between the groups on a measure of emotional empathy. However, the IRI and other self-report questionnaires of empathic functioning likely do not fully represent actual empathic abilities because of the limited ecological validity inherent to questionnaires. The gap between real life interactions and written descriptions of such is self-evident. Bridging this gap requires a person's ability to think abstractly and to reflect on her or himself. However, it has been shown that individuals on the autism spectrum often have problems in exactly these areas (e.g., Minshew et al. 2002; Happé 2003). Moreover, given the necessity of explicit questioning on self-report questionnaires, these questionnaires are likely confounded by people's tendency to answer in a socially desirable manner, a trait that although not formally tested to date, individuals with autism are likely to differ from neurotypical individuals. Behaviors relevant to autism, such as asking inappropriate questions, represent the antithesis of conformation to societal norms. As a consequence, individuals with AS may get lower scores on empathy questionnaires, but these lower scores may simply reflect answer patterns that are less biased by social desirability rather than reflecting actual deficiencies in empathy. In contrast, some of the more recent paradigms developed for studying empathy in brain imaging environments make use of concrete situations such as letting a subject witness their significant other receiving a light electrical shock (Singer et al. 2004). Those paradigms measure empathy more implicitly and in a fashion that is more relevant to everyday life. However, while these paradigms are undeniably valuable for studying brain circuits involved in empathy, they do not provide continuous or performance scores of empathic functioning, nor are they feasible (given the individual customization) for larger studies spanning multiple populations.

In the current study we describe a new test of empathy, the Multifaceted Empathy Test (MET), which we developed in an attempt to address some of these limitations. The MET is unique in that it is designed to measure cognitive and emotional empathy simultaneously. At the same time, the MET offers greater ecological validity than self-report questionnaires due to the use of photorealistic stimuli. It also measures emotional empathy in both an explicit (rating of empathic concern) and more implicit (arousal ratings as proxy for empathic concern) manner. Finally, the MET enables researchers to differentiate between emotional reactions in response to non-social stimuli and emotional reactions in response to people. For example, when rating an emotional reaction in response to a picture of a crying child placed within a war scene, that rating will likely entail both a reaction to the war context as well as to the crying child. Individuals with ASD often have emotional reactions that differ from those of typically developed individuals when exposed to situations or objects (e.g., Gillott et al. 2001). As a result, their emotional reactions to more complex photo stimuli might actually reflect reactions to the context or objects shown in the photo rather than to the social content of the photo.

The goals of the current study were twofold. First, we sought to ascertain the validity and reliability of the MET. In addition, we used the MET to assess empathy multidimensionally in a group of adults with AS. Based on our previous research, we expected the adults with AS to score lower on cognitive empathy, while being relatively unimpaired on measures of emotional empathy.

Methods

Participants

Seventeen adults with Asperger syndrome (13 men and 4 women, mean age = 42.4) participated in the study. Diagnoses of AS were made according to DSM-IV AS criteria (American Psychiatric Association 1994) using a videotaped semi-structured diagnostic interview. In addition, diagnoses were confirmed with the Autism Diagnostic Interview–Revised (ADI-R; Lord et al. 1994) in 12 subjects with available parental informants. Only participants with no reported delay in language development were included in the study.

A group of 18 healthy (neurotypical) control subjects (14 men and 4 women, mean age = 48.6), chosen to match the AS group as closely as possible with respect to age, education, and IQ, also participated in the study.

All study participants underwent medical, neurological, psychiatric, and neuroradiologic (MRI) examinations. Any present or prior evidence of significant neurological

or medical disease led to exclusion from the study. All participants gave informed written consent and the research protocol was approved by the IRB of the New York University School of Medicine.

Measures

Empathy

To assess empathy multidimensionally, we administered the Multifaceted Empathy Test (MET). The MET is a naturalistic measure of empathy that allows separate assessment of cognitive and emotional aspects of empathic functioning. In addition, subjects were given a well-validated empathy questionnaire, the Interpersonal Reactivity Index (IRI; Davis 1983), to establish convergent validity of the MET.

Multifaceted Empathy Test (MET) The MET consists of a series of photographs, most of which depict people in emotionally charged situations. To assess cognitive empathy, subjects are required to infer the mental states of the individuals shown in the photographs. After giving their response, participants receive feedback about the correct answer. Then, to assess emotional empathy, subjects rate their emotional reactions in response to the pictures (emotional empathy).

Theoretical Considerations

1. *Independent measurement of cognitive and emotional empathy*: As outlined above, empathy can be viewed as entailing both a cognitive and an emotional component (Blair 2005), where those components are considered to be different yet related. However, to date, most tests and questionnaires of empathic functioning do not allow for such differentiated conceptualization. Given that autistic individuals are impaired on cognitive interpretations of mental states of others (e.g. Baron-Cohen et al. 2001), their emotional reaction to social stimuli is likely different from that of neurotypical individuals. Thus, for the MET we have chosen to provide verbal feedback on the actual mental state of the depicted person before querying for the subjects' emotional reactions in response to the person.

2. *Ecological validity, explicit and implicit questioning*: Currently, questionnaires such as the Interpersonal Reactivity Index (IRI; Davis 1980) are the instruments of choice when assessing empathic functioning. However, as detailed above, questionnaires lack ecological validity, necessitate the ability for abstraction and introspection and are likely

confounded by the tendency for individuals to answer in a socially desirable fashion. Thus, for the MET we chose picture stimuli to better approximate everyday life situations. Also, for the assessment of emotional empathy we adopted in addition to the explicit (i.e., rating of empathic concern: "how concerned are you for that person") an implicit type of questioning (i.e., arousal ratings as proxy for empathic concern: "how calm/aroused does this picture make you feel"). This implicit way of questioning should minimize demands on the ability to self-reflect on a more abstract level and reduce the likelihood of socially desirable answer patterns. It is especially important to consider social desirability when the traits being assessed are valued by the community, as is the case with empathy. In the MET's explicit emotional empathy condition this tendency may be operant because the question can easily be identified as pertaining to the positive trait empathy. However, questions concerning the participant's level of arousal (i.e., the MET's implicit emotional empathy condition) are less clearly associated with empathy and therefore are less likely to elicit a social desirability bias. We chose arousal for this implicit measure of empathy because, according to theoretical threads with roots going back to Wundt (1874), arousal is seen as reflection of the level of psychological engagement (also psychological stress) with the object/subject of emotion.

3. *Dissociation of emotional reaction to social as opposed to context stimuli*: In order to be able to dissociate an emotional reaction in response to a person from the emotional reaction to a specific context within which that person is depicted, we created pairs of stimuli for the MET, one stimulus showing a person experiencing an emotion within a specific context (e.g. defeated woman in hospital room) and one stimulus showing the context only (e.g. hospital room). Emotional ratings for context stimuli were obtained independently from those of the social stimuli in order to (in case of differing answer patterns between groups) enable us to account for those differences in general arousability.

Stimuli and Design

The MET consists of 23 pairs of stimuli (context and person pictures), for which subjects are required to answer a series of questions.

For each context picture, subjects are asked to rate their level of arousal using the Self Assessment Manikin (SAM; Lang et al. 1997). The SAM is a visual-analogue scale that provides scores within a 0–9 range (0 = very calm and 9 = very aroused). For the person pictures, subjects are asked to first infer the mental state of the individual depicted (cognitive empathy; CE). Specifically,

participants are asked to pick one out of four mental state descriptors provided along with the picture, where only one is correct. After those inferences, subjects are given feedback on the correct mental state so as to guarantee that subsequent emotional empathy ratings are based on the same mental state assumption across subjects. Paralleling ratings for the context pictures, subjects are required to rate their level of arousal (emotional empathy implicit; EEI) for the person stimuli next. Furthermore, subjects are asked to rate the degree of empathic concern they feel for the person in the picture (emotional empathy explicit, EEE).

The person stimuli mostly depict individuals feeling sad, fearful or who are in pain or variations of those emotions (e.g. depressed, tortured, miserable) of varying intensities. The individuals shown vary in gender, age, and ethnicity.

Realization

Pictures of the MET were taken from the International Affective Picture System (Lang et al. 1997) or from stock photography databases and image editing (i.e., separating and merging person and context stimuli, respectively) was done using Adobe Photoshop.

Each person stimulus was assigned a mental state word that best described what the person in the picture was currently feeling or thinking. Decisions on those mental state words were made by consensus of three psychologists and one psychiatrist. Three mental state descriptors were picked as distracter answers for each person picture with all three distracters having the same valence as the correct mental state descriptor. We also designed a mental state library, listing all mental state words of the MET together with their definitions, example sentences and synonyms. The main rationale for the library was the fact that

individuals of the autism spectrum have been reported alexithymic (i.e., having problems describing or labeling emotions) (Berthoz and Hill 2005). The library can be used by all subjects at any time during the course of the test.

The picture stimuli and the questions and rating scales pertaining to them, as well as the instructions, were inserted into a Microsoft PowerPoint presentation that can be shown on a regular PC or notebook.

Administration and Scoring

The MET is administered by a tester who controls the presentation of the test's slides. The testing starts with a set of slides informing the subjects about the different conditions and providing examples for the various types of questions. Subjects are instructed to respond verbally to each question. Time limits were not established for viewing or answering, although time for completion was recorded in the current study. Administration of the MET with all its stimuli and conditions takes approximately 35 min.

Correct responses in the cognitive empathy (CE) condition are scored as one point. An overall score, as well as separate scores for the positive and negative valence pictures, are also calculated. Average rating scores are derived separately for the person and context stimuli for arousal (EEI), valence, and empathic concern (EEE). Given the unambiguous nature of the administration and scoring procedure we did not obtain inter or intra-rater reliability. An example of the MET with the conditions reported on in this paper can be seen in Fig. 1.

Interpersonal Reactivity Index (IRI) The IRI (Davis 1980) is a 28-item self-report questionnaire that measures
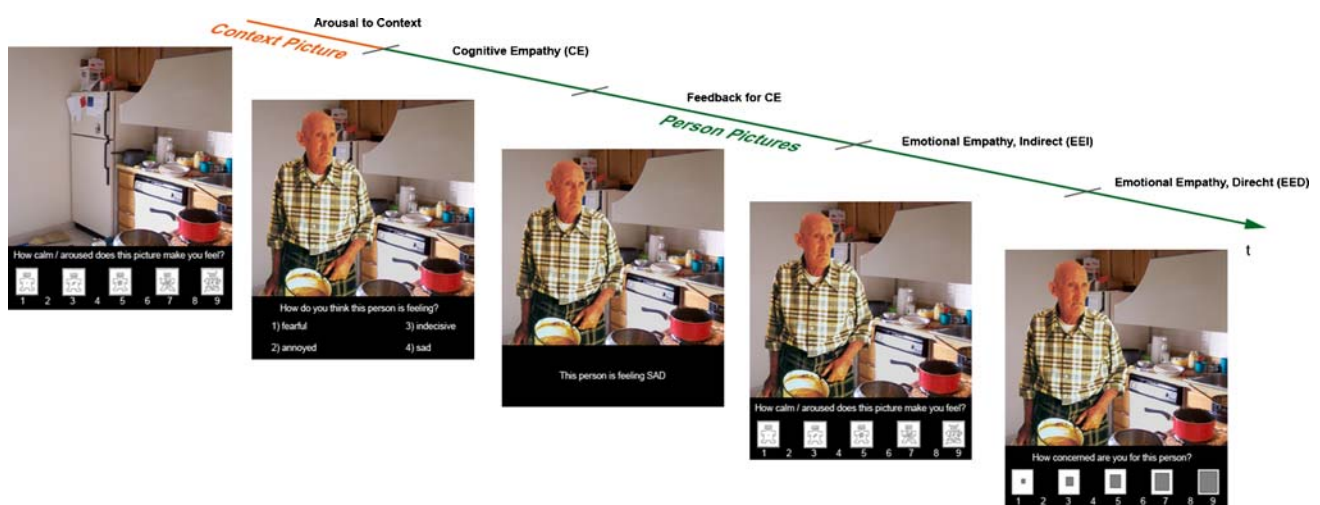

Fig. 1 Example item of the MET

both the cognitive and affective components of empathy separately. The questionnaire contains four 7-item scales: Perspective Taking (PT), Empathic Concern (EC), Fantasy (F), and Personal Distress (PD). Of those scales, the PT scale best operationalizes cognitive empathy and the EC scale and—to a somewhat lesser extent—the PD scale represent the concept of affective or emotional empathy and thus these three scales were used in the current study. Specifically, the PT scale assesses the tendency to spontaneously adopt the psychological point of view of others. The EC scale taps the respondents' feelings of warmth, compassion, and concern for others, while the PD scale assesses self-oriented feelings of discomfort resulting from tense interpersonal settings or emergency situations. While both the EC and PD scale assess emotional components of empathy, the EC scale has been considered to measure a more mature form of empathy, while the PD scale may in part assess anxiety and the inability to monitor and inhibit emotional reactions (compare Baron-Cohen and Wheelwright 2004; Rogers et al. 2006).

The IRI has good internal consistency, with alpha coefficients ranging from 0.68 to 0.79. Furthermore, the IRI has been shown to correlate with other measures of empathy, providing support for the construct validity of the measure (Davis 1980).

Intellectual Functioning

To assess intellectual functioning, the Shipley Institute of Living Scale (Prado and Taub 1966) was administered. The scale consists of both a vocabulary and an abstract thinking test, which are summed to create a total score. The total score was then used to estimate the WAIS-R Full Scale IQ based on published procedures (Zachary et al. 1985).

Social Desirability

The Marlowe–Crowne Social Desirability scale (Crowne and Marlowe 1960) is the most widely used measure of social desirability. The scale assesses the tendency of individuals to think or act in ways that conform to societal norms and to distort self-reports in a favorable direction. It is especially important to control for social desirability when the traits being assessed are, as in the case of empathy, very socially desirable. In the current study, we used the Version C Short Form (MC-Form C; Reynolds 1982), which consists of 13 true/false items taken from the original Marlowe–Crowne scale. Each item describes a highly desirable, culturally-approved behavior that has an improbable chance of occurrence (e.g., I'm always willing to admit it when I make a mistake).

Statistical Analyses

Group differences in demographic variables, social desirability and the various empathy measures were assessed with independent samples t-tests, chi-square, and analysis of covariance, respectively. In order to establish convergent and discriminant validity of the MET, associations between the MET's subscales and the scales of the IRI were analyzed with Pearson correlation analysis. All analyses were two-tailed and the alpha level was set at $p < 0.05$. To establish reliability of the MET, internal consistency was calculated using Cronbach's alpha. All statistical procedures were performed using the Statistical Package for the Social Sciences version 14.0 (SPSS, Chicago, Ill).

Results

Between Group Differences

Demographic Variables and Social Desirability No significant differences were found between groups for age, gender, education, or IQ. In addition, there were no significant differences between the Asperger and control groups on the social desirability scale. Descriptive statistics for the two groups are shown in Table 1.

Multifaceted Empathy Test (MET) Cognitive Empathy: Individuals with AS scored significantly lower than the control group on the cognitive empathy task of the MET (CE; $t = 2.1$, $p < .05$).

Emotional Empathy: In contrast, t-tests examining between-group differences on the emotional empathy tasks of the MET did not yield significant differences (explicit (EEE): $t = -0.3$, $p = .79$; implicit (EEI): $t = -1.6$, $p = .12$).

Emotional Reaction to Context: In order to dissociate the emotional reaction to a depicted person (e.g., sad man, see Fig. 1) from the more general emotional reaction to the depicted context (e.g., dirty kitchen, Fig. 1), we also assessed the subject's arousal when looking at the context only stimuli. Individuals with AS reported the same level of arousal in response to those context stimuli as the control group ($t = -0.6$, $p = .52$).

Response Times: Results from the t-test indicate that the AS group had a tendency towards longer overall test-taking time ($t = -1.9$, $p = .07$).

Data from the MET are presented in Table 2.

Interpersonal Reactivity Index (IRI) Group means comparisons revealed that the individuals with AS scored significantly lower on the cognitive empathy scale of the

Table 1 Demographic variables and social desirability scores for Asperger ($n = 17$) and control subjects ($n = 18$)

	Asperger	Control	p
Gender (male/female)	13/4	14/4	.93
Age (years)	42.4 ± 11.4	48.6 ± 13.9	.16
Education (years)	16.5 ± 1.8	16.3 ± 1.3	.72
WAIS-R IQ	110 ± 9	112 ± 9	.44
Social desirability (MC-Form C)	5.4 ± 2.1	6.8 ± 3.5	.17

p values reflect level of significance from independent samples t-test and chi-square as appropriate. Values are given in mean ± SD

MC-Form C: Marlowe–Crown social desirability scale, version C short form

Table 2 Cognitive (CE) and emotional (explicit (EEE) and implicit (EEI)) empathy in response to person stimuli (negative valence), as well as emotional arousal in response to context stimuli and total time requirements for the MET for Asperger ($n = 17$) and control subjects ($n = 18$)

		Asperger	Control	p
Cog. empathy (max. 14)	CE	11.9 ± 2.3	13.1 ± 0.9	.04
Emo. empathy (max. 9)	Explicit (EEE)	6.3 ± 1.6	6.2 ± 1.3	.79
	Implicit (EEI)	6.7 ± 1.2	6.1 ± 1.2	.12
Arousal to context (max. 9)		5.9 ± 0.7	5.6 ± 1.2	.52
Response time (minutes)		38 ± 13	31 ± 6	.07

p values reflect level of significance from independent samples t-tests. Values are given in mean ± SD

IRI (Perspective Taking (PT); $t = 4.5$, $p < .001$). In contrast, the AS individuals did not score significantly different on the Empathic Concern scale (EC), a measure of emotional empathy, although there was a trend towards lower scores ($t = 2.0$, $p = .051$). The AS group scored higher on the other scale of emotional empathy (Personal Distress (PD); $t = -4.6$, $p < .001$), indicating higher levels of anxiety and discomfort in tense interpersonal settings or emergency situations (see Table 3).

In order to demonstrate that the above reported MET finding of no differences in implicit empathic reactions (arousal ratings in response to person stimuli) was not simply driven by higher scores of the AS group in the PD scale (potentially indicating higher levels of anxiety rather than empathy), we ran univariate analyses of covariance for the MET implicit emotional empathy controlling for PD. The analysis showed that the results remained the same with no significant group differences in the MET implicit measure of emotional empathy ($F = 0.02$, $p = .89$).

MET Reliability and Validity

In order to evaluate the validity of the MET, we conducted a convergent and divergent validity study in the control subjects with help of the well-validated IRI as measure of multidimensional empathy. Substantial correlations between the MET's emotional scales (implicit (EEI), explicit (EEE)) and the emotional scales of the IRI (Empathic Concern (EC), Personal Distress (PD), where correlation with the former should be stronger, given its better operationalization of emotional empathy) and between the MET's cognitive scale (CE) and the cognitive scale of the IRI (Perspective Taking (PT)) would provide support for the validity of the MET. Similarly, to establish divergent validity, we calculated Pearson's correlations between the emotional scales of the IRI and cognitive scales of the MET and between the cognitive scales of the IRI and emotional scales of the MET, respectively. Results of those analyses supported the construct validity of the MET (see Table 4).

Table 3 Scores on the IRI subscales Perspective Taking (PT), Empathic Concern (EC), and Personal Distress (PD) for Asperger ($n = 17$) and control subjects ($n = 18$)

		Asperger	Control	p
cog. empathy	PT	11.1 ± 5.7	18.9 ± 4.4	.001
emo. empathy	EC	16.0 ± 5.7	19.7 ± 5.1	.05
	PD	17.4 ± 6.9	9.1 ± 3.0	.001

p values reflect level of significance from independent samples t-tests. Values are given in mean ± SD

Table 4 Correlations between the MET's cognitive (MC) and emotional scales (explicit: MEE, implicit: MEI) and the IRI's cognitive (Perspective Taking: PT) and emotional subscales (Empathic Concern: EC, Personal Distress: PD) in the control subjects (*n* = 18)

		MET cog. empathy	MET emo. Empathy	
		CE	EEE	EEI
IRI cog. empathy	PT	.28	.39	.19
IRI emo. empathy	EC	.09	.63*	.61*
	PD	−.03	.14	.28

*$p < .01$

Specifically, the MET's emotional subscales EEE and EEI correlated highest with the EC scale of the IRI, indicating that they do in fact measure the intended concern for others and not the less mature form of empathy measured with the PD scale of the IRI, or cognitive aspects of empathy as assed with the PT scale of the IRI. Similarly, although not reaching level of significance, the cognitive scale of the MET (CE) was related to a greater extent to the cognitive scale of the IRI (PT) than to any of its emotional subscales (EC, PD).

Internal consistency of the MET's subscales was assessed by calculation of Cronbach's alpha, which revealed good to highly satisfactory values. Alpha was 0.71 for the cognitive empathy scale, 0.91 for the explicit emotional empathy scale, and 0.92 for the scale of implicit emotional empathy. Moreover, alpha was 0.72 for the arousal ratings of the context only stimuli scale.

Discussion

Since the first description of autism by Kanner in 1943, individuals with autistic conditions have been described as lacking empathy. However, most empirical evidence supporting this claim stems from research focusing on cognitive empathy or from studies which relied on self-report questionnaires (Baron-Cohen and Wheelwright 2004; Shamay-Tsoory et al. 2002), which lack ecological validity and require abilities such as abstract thinking and introspection. Progress in the study of empathy has been hindered by a lack of appropriate instruments that would allow dissociation of cognitive and emotional aspects of empathy. In fact, only recently has a general consensus began to emerge that conceptualizes empathy as having both a cognitive and an emotional component (Decety and Jackson 2004). Thus, the main goal of the current study was to contrast cognitive and emotional empathic abilities in individuals of the autism spectrum using a newly developed test, the MET. Convergent and divergent validity as well as reliability analyses (as established by internal consistency) of the MET proved to be in the good to highly satisfactory range.

Results from the study revealed difficulties in cognitive, but not in affective aspects of empathy in the Asperger group, suggesting that individuals with AS have a comparable amount of concern for the distress of others as do neurotypicals. These results are further strengthened by the absence of differences between the groups on social desirability scores or on ratings of emotional reactions to non-social stimuli (context pictures), which might have represented confounding factors.

In addition to the MET, we administered the IRI as an additional measure of empathy to all study participants. The findings were largely in line with those of the MET, showing significantly reduced cognitive empathy. With regards to emotional empathy, although there was a trend for lower scores on the empathic concern scale, individuals with AS scored higher on personal distress, the other emotional empathy scale. The results of reduced cognitive empathy are in line with previous research (Rogers et al. 2007). Individuals on the autism spectrum consistently score lower on self-report measures of cognitive empathy (Baron-Cohen and Wheelwright 2004; Yirmiya et al. 1992; Rogers et al. 2006) and have been shown to have problems on more objective measures of the ability to recognize the mental states of others (e.g. Golan et al. 2006). To date, few studies have assessed emotional empathy in individuals with autistic conditions and those have reported mixed results. One study (Yirmiya et al. 1992) assessed emotional empathy of children with autism using videotaped vignettes showing children experiencing various emotions. After viewing each vignette, the children with autism were required to report the emotion they felt in response to it. Results of the study indicated that the children in the autism group were less emotionally empathic (established by the number of matching emotional states between the subject and the characters enacting the vignettes) than the control group. However, the authors noted that the children with autism performed "surprisingly well" when responding to the emotions of others, which is in line with anecdotal evidence from relatives and clinicians of individuals of the autism spectrum (see also Baron-Cohen and Wheelwright 2004). In addition, there is some research that suggests appropriate emotional responsiveness to others.

Blair found the electrodermal responses of autistic children to distress cues in photographs not to be different from that of controls (Blair 1999). Furthermore, in a study using self-report measures, adults with AS were shown to report similar levels of empathic concern as a comparison group (Rogers et al. 2007).

The disparity between intact emotional empathy found in the current study and prevailing beliefs about a lack of empathy and compassion in individuals with autistic conditions is remarkable. It is of interest to speculate about factors that might contribute to such beliefs: in neurotypical individuals, emotional reactions to others in distress often include *behavioral* reactions such as change in facial expression (e.g., sympathetic look) or helping behavior (e.g., consoling). However, autistic conditions often involve impoverished facial affect (Yirmiya et al. 1989) and an increase in social anxiety (Dziobek et al. 2006), which might reduce the likelihood of change in facial expression and of helping behavior. This lack of behavioral reactions in individuals with autistic conditions might be perceived as a lack of empathy by typically developed individuals. In addition, the deficits in cognitive empathy that accompany autistic conditions are likely to have an impact. If individuals on the autism spectrum often infer mental states incorrectly, then it seems logical that they will not react in a way that would be expected by typically developed individuals. The MET provides feedback on the mental states of the persons depicted and thus prevents those potential confounds from driving the apparent differences from typically developed individuals. However, to test this hypothesis, the MET could be administered without feedback. Then the emotional reactions to the social pictures should vary depending on how accurately the mental states are identified. That being said, we acknowledge that providing feedback on mental states might introduce a bias for emotional empathy ratings for those items for which mental states were inferred incorrectly. To test for such possibility, we performed post-hoc between group analyses for emotional empathy only including items for the participants of both groups for which mental states were correctly classified. Results confirmed previous analyses in that we did not find differences on emotional empathy (EEE, EEI) between the AS and control group, thus reducing concern about such bias being introduced.

Although it remains to be shown if our findings extend to other autism spectrum conditions, the observed profile of impaired cognitive and preserved emotional empathic abilities might reflect a more general functional pattern in individuals of the autism spectrum. In fact, empathy is not the only psychological construct reflecting cognitive rather than emotional impairments in autistic conditions and reports of abnormal emotion processing come mainly from studies assessing functions where emotion and cognition interact such as emotion recognition or emotion regulation. For example, individuals with autism have been reported to be alexithymic (Hill et al. 2004), the chief manifestations of alexithymia being a difficulty in describing or recognizing one's own emotions. The construct is conceptualized as a disturbance in both affective and cognitive functioning. Using the Bermond and Vorst Alexithymia Questionnaire-Form B (BVAQ-B), Berthoz and Hill (2005) found that many adults with autism have a specific form of alexithymia characterized by impairments in the cognitive rather than the affective domain of the construct, as assessed with different subscales of the BVAQ-B. Most reports of emotional dysfunction in individuals on the autism spectrum encompass studies of impaired recognition of emotion from facial expressions (e.g., Howard et al. 2000) or, albeit to a lesser extent, other emotional cues such as voice intonations (Golan et al. 2007). Similarly, individuals with autistic conditions have been shown to be impaired in tasks requiring emotion regulation, which, in everyday life translates into the use of socially and emotionally relevant information to guide behavior (for review see Bachevalier and Loveland 2006). Although those functions are inherently concerned with emotions, we would argue that they reflect cognitive abilities to a higher degree than emotional abilities.

Interestingly, the dissociation of cognitive and emotional aspects of empathy is of importance for psychopathy, another psychiatric condition that, in tandem with AS, has been coined an empathy disorder (Gillberg 1992). In fact, both conditions have been said to "...share some common characteristics, notably the total absence of human empathy..." (Flor-Henry 1998). However, the pattern of low cognitive empathy in the presence of normal emotional empathy in individuals with autistic conditions seems to be the mirror image of what has been reported for individuals with psychopathy, namely low emotional but intact cognitive empathy. Although yet to be formally tested in one study design, it was suggested that psychopathy and autism would double dissociate on cognitive and emotional empathy (Blair 2005; Rogers et al. 2006). We believe that research using multidimensional measures such as the MET could help to create a more specific profile of the specific empathic phenotype of these conditions.

Despite the recent increase in research investigating the biological basis of autistic conditions and psychopathy, crucial neurophysiological markers remain to be established. The lack of reproducible brain correlates may be due to the scarcity of a more precise characterization of the behavioral phenotype of affected individuals, which is required to guide the search into (potentially only very subtle) abnormalities in brain structure or function. We propose that through the multidimensional study

of empathy, important insight could be gained into the neurobiological underpinnings of those conditions. Moreover, the double dissociation of cognitive and emotional empathy observed in autism and psychopathy could, following classical neuropsychological methodology, provide insight into the brain substrates of empathic functions in the neurotypical brain.

That being said, we do not suggest that conceptualizing empathy as having emotional and cognitive aspects is exhaustive or represents the only possible theorization for the construct. For example, motor empathy (e.g., mimicry and synchronization of facial expressions or postures with those of another person) has been proposed as a form of empathy in its own right (Preston and de Waal 2002).

We developed the MET to allow for the multidimensional measurement of empathy aiming at greater ecological validity than self-report questionnaires. However, we acknowledge that other formats, such as video, could provide an even closer approximation of everyday life situations. Given the constant flux of social information, necessitating rapid on-line integration of visual and auditory social cues, video formats should be more sensitive in picking up on even subtle differences in empathic functioning. Video formats or other measures better reflecting real life empathic functioning such as using third party information (e.g., information provided by family members) could furthermore assist in establishing if the MET represents indeed a measure of greater ecological validity than empathy questionnaires such as the IRI.

There are other avenues for future research that seem worthwhile pursuing. We found a trend for greater completion times of the MET in the individuals with AS. In real life, could this lag in response time be present, and could it contribute to some of the interpersonal awkwardness present in individuals with autism? Unfortunately, we did not acquire separate response times for each of the stimuli so as to be able to assess differences in cognitive and emotional empathy. Future studies should include such response time measurements on a more fine-grain level. Furthermore, it would be of interest to investigate the developmental trajectory of cognitive and emotional empathy in individuals with AS. Specifically, at what ages is the gap between cognitive and emotional empathy biggest and how does development of the one influences development of the other at different ages?

In conclusion, using the MET, a newly developed measure of empathy, we have demonstrated that individuals with Asperger syndrome show equivalent emotional empathy compared to a control group, although they have difficulties with the cognitive aspects of empathy. These findings were not driven by divergent tendencies to conform to societal norms or levels of general arousal. An important task for future research will be to elucidate what factors might contribute to individuals with autistic conditions being perceived as lacking empathy.

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