

# Emotion

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# Emotion Regulation in Asperger's Syndrome and High-Functioning Autism

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It is generally thought that individuals with Asperger's syndrome and high-functioning autism (AS/HFA) have deficits in Theory of Mind. These deficits have been previously linked to problems with social cognition. However, we reasoned that AS/HFA individuals' Theory of Mind deficits also might lead to problems with emotion regulation. To assess emotional functioning in AS/HFA, 27 AS/HFA adults (16 women) and 27 age-, gender-, and education-matched typically developing (TD) participants completed a battery of measures of emotion experience, labeling, and regulation. With respect to *emotion experience*, individuals with AS/HFA reported higher levels of negative emotions, but similar levels of positive emotions, compared with TD individuals. With respect to *emotion labeling*, individuals with AS/HFA had greater difficulties identifying and describing their emotions, with approximately two-thirds exceeding the cutoff for alexithymia. With respect to *emotion regulation*, individuals with AS/HFA used reappraisal less frequently than TD individuals and reported lower levels of reappraisal self-efficacy. Although AS/HFA individuals used suppression more frequently than TD individuals, no difference in suppression self-efficacy was found. It is important to note that these differences in emotion regulation were evident even when controlling for emotion experience and labeling. Implications of these deficits are discussed, and future research directions are proposed.

*Keywords:* emotional reactivity, emotion regulation, autism, autism spectrum disorder, Asperger's syndrome

One of the key deficits in individuals with Asperger's syndrome and high-functioning autism (AS/HFA) is thought to center around impairments in their cognitive and affective Theory of Mind and related perspective taking processes (Shamay-Tsoory, Tomer, Berger, Goldsher, & Aharon-Peretz, 2005). In particular, individuals with AS/HFA often show an impaired comprehension of other people's mental states, such as thoughts, beliefs, and intentions (e.g., Frith & Frith, 2003; Frith & Happé, 1994). These deficiencies in Theory of Mind previously have been linked to deficits in social communication such as diminished facial expressivity, low levels of joint attention, and diminished sharing of emotions (Baron-Cohen, 1995; Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). We propose that deficits in Theory of Mind also may help to explain clinical and initial empirical reports that individuals with AS/HFA have difficulties regulating their emotions (e.g., Laurent & Rubin, 2004; Rieffe et al., 2011).

## Theory of Mind and Affective Functioning: Theoretical Expectations

Although Theory of Mind is typically seen as referring to the ability to assess other people's mental states, there is strong evidence that the processes of assessing one's own and other's mental states are closely related (Frith, 1989; Frith & Frith, 2003). This suggests that Theory of Mind deficits might also lead to difficulties assessing one's own mental states (e.g., Moriguchi et al., 2006). It is important to note that this may not only hold for cognitive states, but also for emotional states. If this is correct, Theory of Mind deficits should be related to difficulties reading and labeling one's own emotions, as well as those of other people. If AS/HFA children express little emotion (e.g., Yirmiya, Kasari, Sigman, & Mundy, 1989) these difficulties might be exacerbated by the fact that caretakers of these children would have difficulty mirroring their children's emotions and teaching them adequate emotional responses.

What implications might such deficits have for emotion regulation? It has been suggested that the ability to accurately label one's emotional states is an important prerequisite for successful emotion regulation (Barrett, Gross, Conner, & Benvenuto, 2001). This observation generates the prediction that individuals with AS/HFA might have difficulties with emotion regulation. In particular, Theory of Mind deficits might compromise emotion regulation strategies that rely on cognitive processes related to perspective change. One example of such a cognitive emotion regulation process is reappraisal, an adaptive emotion regulation

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strategy that is strongly related to cognitive change (Gross & John, 2003). This line of reasoning suggests that individuals with AS/HFA would be less likely to use reappraisal than typically developing (TD) individuals.

### Emotion Experience, Labeling, and Regulation: Empirical Findings

Consistent with these expectations, prior research indicates that the emotional responses of individuals with AS/HFA are less differentiated, more negative, and less positive than those of controls (e.g., Ben Shalom et al., 2006; Capps, Kasari, Yirmiya, & Sigman, 1993; Joseph & Tager-Flusber, 1997; Kasari & Sigman, 1997; Samson, Huber, & Ruch, 2011a). In addition, individuals with AS/HFA experience significant difficulties adequately assessing and labeling their own emotions (i.e., alexithymia; see Berthoz & Hill, 2005; Fitzgerald & Bellgrove, 2006; Fitzgerald & Molyneux, 2004; Hill, Berthoz, & Frith, 2004; Szatmari et al., 2008; Tani et al., 2004).

Recent studies have also provided initial evidence for emotion regulation deficits among AS/HFA populations. For example, Konstantareas and Stewart (2006) showed that children diagnosed with ASD employ fewer adaptive coping strategies in mildly frustrating situations. Immature patterns of behavior that might be related to emotion regulation, such as chewing on clothing or carrying around unusual objects, have also been observed among AS/HFA individuals (Geller, 2005; Laurent & Rubin, 2004; Myles, 2003; Volkmar & Klin, 2003). However, so far no study has focused on specific, well-defined emotion regulation strategies such as reappraisal and suppression.

### The Present Study

The goal of the present study was to examine emotion regulation in individuals with AS/HFA, as well as TD individuals. Using an online survey methodology, adults with and without AS/HFA were asked to complete a battery of measures concerned with emotional experience, emotion labeling, and emotion regulation. Under the assumption that individuals with AS/HFA have more Theory of Mind deficits, we expected that compared with TD adults, individuals with AS/HFA would (a) experience more negative and less positive emotions, (b) have more difficulties labeling their own emotions, and (c) have more difficulties with emotion regulation, particularly with strategies associated with cognitive reappraisal. We expected differences in emotion labeling and regulation to persist even when statistically controlling for emotion experience, and differences in emotion regulation to persist even when controlling for expected differences in emotion experience and labeling.

## Method

### Participants

Twenty-seven individuals with AS/HFA and 27 TD control participants matched on gender, age, and educational level completed the questionnaires online. Male participants made up 41% ( $N = 11$ ) of both groups. There was no age difference between the TD ( $M = 35.22$ ,  $SD = 12.82$ , range = 18–64 years) and the

AS/HFA group ( $M = 33.56$ ,  $SD = 12.82$ , range = 18–53 years);  $F(1, 53) = .28$ , nonsignificant ( $ns$ ). The two groups did not differ in their educational level,  $\chi^2(1) = .77$ ,  $ns$ : 63% of individuals with AS/HFA and 74.1% of the TD group were in college, or already had a college degree. The other participants were in high school or had a high school degree.

As expected, individuals with AS/HFA scored higher ( $M = 25.44$ ,  $SD = 4.53$ ) than the controls ( $M = 8.19$ ,  $SD = 4.51$ ) on the short German version (AQ-k; Freitag et al., 2007) of the *Autism-Spectrum Quotient* (AQ, original long version by Baron-Cohen et al., 2001),  $F(1, 53) = 196.77$ ,  $p < .001$ ,  $\eta = .89$ . A score of 17 is seen as the cutoff for a diagnosis with autism. One individual with AS had an AQ-k score of 16 and was therefore excluded from further analysis. Therefore, all AS/HFA participants (and none of the TD participants) had scores greater than this cutoff. It is important to note that the AQ-k is not a formal diagnostic instrument. The reliability was very good in the present sample (Cronbach's alpha = .76 for the TD group, .83 for the AS/HFA group).

### Procedure

An invitation e-mail with the link to the online survey was sent to 50 German-speaking individuals who had participated in previous studies (e.g., Samson, Huber & Ruch, 2011b). All had a diagnosis of AS (ICD-10: F84.5) or HFA, confirmed by a referring psychotherapist or psychiatrist. In total, 26 individuals with AS and 2 individuals with HFA filled out the questionnaires completely (however, one individual with AS was excluded because of an AQ-k score of 16). The same invitation e-mail was sent to approximately 150 control individuals who had previously taken part in online experiments or were currently on a mailing list at a German-speaking university. Seventy-six individuals filled out the questionnaires completely, of whom we selected 27 control participants who matched the AS/HFA individuals on gender, age, and education level. In the online survey, participants received general instructions regarding the study and were assured that their data would be handled confidentially. They were then asked for demographic information. Prior to each of the questionnaires, participants received specific instructions explaining the answer formats. In the end, they were thanked for participating in the online survey.

### Measures

**Emotion experience.** The Positive and Negative Affect Schedule (PANAS) is a 20-item self-report measure of positive and negative affect developed by Watson, Clark, and Tellegen (1988). The German version was used (Krohne, Egloff, Kohlmann, & Tausch, 1996) in the present study. Positive Affect (PA) reflects the extent to which a person feels enthusiastic, active, and alert. Negative Affect (NA) reflects the extent to which a person feels negative affective states, such as being nervous and upset. The scale ranged from 1 (*very slightly or not at all*) to 5 (*very much*). In the current study the time frame for responses regarding emotional experience was "during the past weeks." Cronbach's alpha's were satisfactorily high for PA (.93 for AS/HFA, .82 for TD) and NA (.70 for AS/HFA, .79 for TD).

**Emotion labeling.** The 20-item Toronto-Alexithymia-Scale (TAS-20; Parker, Bagby, & Taylor, 1993; German version: Bach,

Bach, de Zwaan, Serim, & Böhmer, 1996) is a 20-item measure that assesses alexithymia on a 5-point scale from 1 to 5, resulting in a sum score ranging from 20 to 100. The cutoff of  $\geq 61$  describes high alexithymics (see Franz et al., 2008). The reliability for both groups was very good for the subscales “difficulty identifying feelings” (Cronbach’s alpha = .76 for AS/HFA, .87 for TD), “difficulty describing feelings” (.81 for AS/HFA, .73 for TD), and the total score (.84 for AS/HFA, .87 for TD), but reliability for “external-oriented thinking” was only moderate (.65 for both groups).

**Emotion regulation.** The Emotion Regulation Questionnaire (ERQ; Gross & John, 2003; German version: Abler & Kessler, 2009) measures the frequency of use of two types of emotion regulation: reappraisal, defined as trying to change the meaning of a situation in order to change its emotional impact (6 items), and suppression, defined as trying to inhibit emotion-related behaviors (4 items). In addition, we administered a parallel set of items that measure emotion regulation self-efficacy for reappraisal (6 items) and suppression (4 items; Goldin, Manber-Ball, Werner, Heimberg, & Gross, 2009). Reliabilities were adequate to good for reappraisal frequency (Cronbach’s alpha = .86 for both groups), reappraisal self-efficacy (.93 for AS/HFA, .92 for TD), and suppression self-efficacy (.85 for AS/HFA, .98 for TD). However, the reliability for suppression frequency was .60 in the TD group and .52 in the AS/HFA group. Therefore, the results related to suppression frequency should be interpreted with caution.

## Statistical Analyses

In primary analyses, differences between the AS/HFA and TD individuals were assessed using one-way analyses of variance. The  $p$  values were Bonferroni-adjusted within the domains of emotional experience and emotion regulation to control for Type I error. In secondary analyses, we computed two sets of analyses of covariance (ANCOVAs); first, labeling and regulation measures were outcomes and the experience measures were covariates, and second, regulation measures were outcomes and the experience and labeling measures were covariates.

## Results

### Emotional Reactivity

The group comparisons on the PANAS revealed that individuals with AS/HFA reported higher levels of negative emotion ( $M = 25.30$ ,  $SD = 5.67$ ) than TD individuals ( $M = 18.33$ ,  $SD = 4.70$ ),  $F(1, 53) = 24.15$ ,  $p < .001$ ,  $\eta = .56$ , but did not differ from controls regarding positive emotion (AS/HFA:  $M = 33.55$ ,  $SD = 6.05$ , TD:  $M = 31.30$ ,  $SD = 9.26$ ),  $F(1, 53) = 1.13$ ,  $ns$ .

### Emotion Labeling

Individuals with AS/HFA had more difficulty identifying ( $M = 23.63$ ,  $SD = 4.76$ ) and describing ( $M = 18.19$ ,  $SD = 4.24$ ) their emotions than the control group (identifying:  $M = 14.52$ ,  $SD = 5.15$ ),  $F(1, 53) = 45.63$ ,  $p < .001$ ,  $\eta = .68$ ; (describing:  $M = 11.22$ ,  $SD = 3.66$ ),  $F(1, 53) = 41.67$ ,  $p < .001$ ,  $\eta = .66$ . No significant differences were found in external-oriented thinking in individuals with AS/HFA ( $M = 19.59$ ,  $SD = 4.67$ ) and TD

individuals ( $M = 16.96$ ,  $SD = 3.95$ ),  $F(1, 53) = 4.99$ ,  $ns$ . The total score of the TAS-20, indicating alexithymia, was significantly higher in AS/HFA ( $M = 61.41$ ,  $SD = 10.85$ ) than in TD individuals ( $M = 42.70$ ,  $SD = 10.35$ ),  $F(1, 53) = 42.02$ ,  $p < .001$ ,  $\eta = .66$ . Sixty-three percent of the individuals with AS/HFA group exceeded the cutoff score for alexithymia, whereas none of the TD individuals exceeded the cutoff score of 61.

## Emotion Regulation

As expected, individuals with AS/HFA reported using less reappraisal,  $F(1, 53) = 9.12$ ,  $p < .05$ ,  $\eta = .39$ , and indicated less reappraisal self-efficacy,  $F(1, 53) = 9.65$ ,  $p < .05$ ,  $\eta = .39$ . Furthermore, individuals with AS/HFA reported using more suppression,  $F(1, 53) = 11.08$ ,  $p < .01$ ,  $\eta = .42$ , than the control group. However, because frequency of suppression yielded very low Cronbach’s alpha, this scale has to be interpreted with caution. It is interesting to note that no differences in suppression self-efficacy were found between the two groups,  $F(1, 53) = 0.00$ ,  $ns$  (Figure 1).

## Secondary Analyses

ANCOVAs of the labeling and regulation measures were performed in which positive and negative emotions were entered as covariates. Even when positive and negative emotions were entered as covariates, the groups differed in alexithymia,  $F(3, 50) = 16.65$ ,  $p < .001$ ,  $\eta = .71$ ; reappraisal frequency,  $F(3, 50) = 8.50$ ,  $p < .001$ ,  $\eta = .58$ ; reappraisal self-efficacy,  $F(3, 50) = 9.47$ ,  $p < .001$ ,  $\eta = .60$ ; and suppression frequency,  $F(3, 50) = 7.51$ ,  $p < .001$ ,  $\eta = .56$ . ANCOVAs of each of the emotion regulation measures were also conducted in which emotion experience (positive emotion, negative emotion) and labeling (alexithymia) were entered as covariates. Results indicated that the groups still differed on reappraisal frequency,  $F(4, 49) = 7.13$ ,  $p < .001$ ,  $\eta = .61$ ; reappraisal self-efficacy,  $F(4, 49) = 7.78$ ,  $p < .001$ ,  $\eta = .62$ ; and suppression frequency,  $F(4, 49) = 7.10$ ,  $p < .001$ ,  $\eta = .61$ .

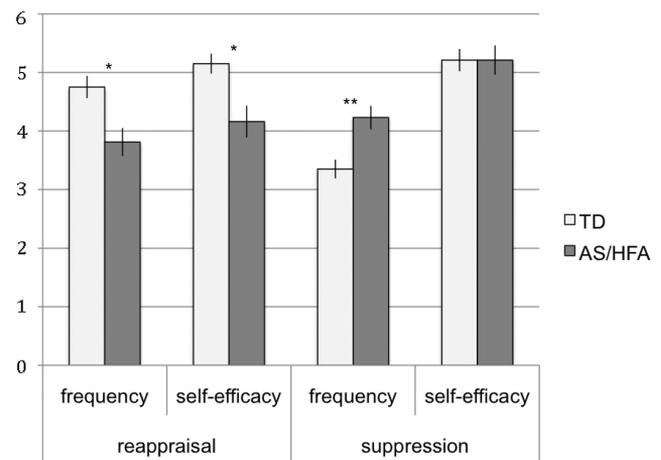


Figure 1. Emotion regulation profiles (means and standard errors) in individuals with Asperger’s syndrome and high-functioning autism (AS/HFA) versus typically developing (TD) individuals. \*  $p < .05$ . \*\*  $p < .01$ .

## Discussion

Motivated by our analysis of the implications of Theory of Mind deficits for affective functioning, we examined patterns of emotion experience, emotion labeling, and emotion regulation in a sample of individuals with AS/HFA as well as TD individuals. Our findings suggest that compared with TD participants, individuals with AS/HFA had greater levels of negative affect, more difficulty identifying and describing their emotions, lower levels of reappraisal use and self-efficacy, and greater levels of suppression. These differences between groups persisted even when differences in emotion experience and labeling were controlled for.

### Emotion Experience and Labeling

Our finding of elevated negative emotion in AS/HFA is consistent with prior findings (Capps et al., 1993; Joseph & Tager-Flusbert, 1997; Kasari & Sigman, 1997). Inconsistent with our expectations, we found comparable levels of positive emotions in the two groups. One reason for this finding could be that most of the studies investigating positive emotions in ASD did so by focusing on emotions in social contexts (see also Dawson, Hill, Spencer, Galpert, & Watson, 1990; Kasari, Sigman, Mundy, & Yirmiya, 1990), whereas the PANAS is context free. Therefore, other sources might have been taken into account while the participants responded to the items of the PANAS, such as concrete emotion-eliciting events, which lead to more positive emotions in high-functioning adults with autism than social interactions do (Jaedicke, Storoschuk, & Lord, 1994).

As expected, we also found that individuals with AS/HFA have more difficulty identifying and describing their emotions than TD individuals do, with approximately two-thirds of the AS/HFA individuals exceeding the cutoff for alexithymia. This difference persists even when controlling for emotion experience. This finding suggests that differences in emotion labeling cannot be explained by differences in emotion experience.

### Emotion Regulation

In the domain of emotion regulation, adults with AS/HFA reported using less cognitive reappraisal than TD individuals. They also expressed less self-efficacy in reappraising their emotions. However, they had comparable self-efficacy scores in using suppression, a less adaptive emotion regulation strategy. In addition, individuals with AS/HFA used more suppression than TD individuals. This suggests a less adaptive emotion regulation profile in individuals with AS/HFA compared to TD individuals (see Geraerts, Merckelbach, Jelicic, & Smeets, 2006; Gross & John, 2003; Richards & Gross, 1999).

These emotion regulation effects persisted even when controlling for differences in emotion experience and in the ability to describe and identify emotions. This is important because emotion experience, labeling, and regulation influence and affect one other (e.g., Bailey & Henry, 2007; Berthoz & Hill, 2005; Gross, 1999; Sifnéos, 1973; Swart, Kortekaas, & Aleman 2009) and yet, in this case, regulation difficulties cannot be solely explained by labeling difficulties. It is important to note

that reappraisal, that is, the process of taking another mental perspective on a stimulus or situation in order to reinterpret its meaning, is most strongly affected in individuals with AS/HFA. One potential explanation for this is that reappraisal relies on abilities linked, or similar, to perspective taking processes and Theory of Mind, while other strategies, such as suppression, are distinct from perspective taking processes and therefore less affected in AS/HFA.

### Implications for Assessment and Intervention

The present findings suggest several implications for assessment and intervention. The present findings suggest the value of assessments that differentiate among multiple types of emotion regulation including cognitive reappraisal and expressive suppression. With respect to intervention, several strategies might improve affective functioning in individuals with AS/HFA. These include techniques that enhance the ability of individuals with AS/HFA to attend to and discriminate emotions (emotional attention and clarity), as well as strategies that aim to increase the ability to respond flexibly to one's own emotions. Given that individuals with AS/HFA report that they experience greater difficulty reappraising stressful and negative life events or situations as neutral or positive, interventions concerned with emotional functioning should encourage the development of cognitive processes associated with reappraisal. For example, interventions could enhance cognitive flexibility, which seems to be positively related to emotion regulation success (see, e.g., Gyurak, Ayduk, & Gross, 2010), or interventions could focus more directly on the reappraisal process by teaching and training reappraisal strategies.

Efforts have been made to develop techniques and strategies for individuals with ASD that address stress management (Myles, 2003), anger management (Sofronoff, Attwood, Hinton, & Levin, 2007) and emotion regulation (e.g., Prizant, Wetherby, Rubin, & Lauret, 2003; Scarpa & Reyes, 2011), and suggest the promise of this research direction. While cognitive-linguistic strategies to enhance self-regulation (Prizant et al., 2003) and "thinking tools" as part of the intervention program described by Scarpa and Reyes (2003) have been described, the findings of the present study provide an impetus to design an emotional intervention treatment that specifically aims to teach and ameliorate reappraisal strategies, focusing on improving the perspective changing abilities in the AS/HFA population.

### Limitations and Future Directions

Although the present study adds to our growing understanding of emotion regulation in AS/HFA, it has several limitations. First, although online studies have been shown to be as reliable and valid as paper-pencil based assessments (e.g., Gosling, Vazire, Srivastava, & John, 2004), and previous studies have shown that individuals with AS/HFA are able to respond to self-report questionnaires adequately (e.g., Berthoz & Hill, 2005), the format limited our assessment. Future research should include performance measures for emotion regulation and Theory of Mind. Although the ERQ correlates with performance-based assessments (Fladung, Baron, Gunst, & Kiefer, 2010; McRae, Jacobs, Ray, John, & Gross, 2012), future studies

should test other emotion regulation strategies including distraction, situation modification, and avoidance to fully understand the nuances and complexities of emotion regulation in AS/HFA. Moreover, although the Autism Quotient is related to Theory of Mind, an important step in future research is to empirically assess Theory of Mind and perspective taking abilities, and their relation to emotion regulation.

A second limitation concerns the generalizability of the results found in the present study. Usually, the prevalence of alexithymia ranges between 5% to 15% in normal populations (Kokkonen et al., 2001; Salminen, Saarijärvi, äärelä, Toikka, & Kauhanen, 1999). However, in our TD group, no one exceeded the cutoff for alexithymia. The exceptionally low alexithymia scores in our TD group suggest the importance of investigating whether our findings extend to other samples. Furthermore, although we have no available information on IQ scores, we can assume that we had a high functioning clinical sample, on the basis of the educational level. Our findings are therefore not necessarily representative of lower functioning individuals with AS/HFA, for whom additional difficulties with language and IQ might interfere with regulating emotions. Emotional reactivity and regulation in low functioning autism must be explored in future studies. Usually, more males than females are diagnosed with AS/HFA. This means that females are overrepresented in the current sample relative to the larger population. At the same time this overrepresentation is a strength of the present study, since information about females with AS/HFA is limited in the literature. For future work with larger samples, it will be important to assess the possibility of gender-specific findings related to emotion regulation.

Finally, as previous studies on emotion regulation difficulties in ASD have mainly concentrated on children, our study shows that emotion regulation difficulties are also present in adulthood. It would be interesting to investigate the developmental trajectories of emotion regulation in individuals with AS/HFA in more detail. Our findings suggest that individuals with AS/HFA learn to use certain specific regulation strategies to manage their emotions, but not others. In the present study, we found that they use suppression as well as TD individuals, but are less able to employ reappraisal. A study investigating developmental aspects and various emotion regulation strategies would be enlightening for the understanding of emotion regulation in AS/HFA individuals.

## Concluding Comment

Although emotional problems are not usually seen as part of the core features of ASD, recent findings have shown that there is an overlap between core diagnostic features and emotional/behavioral problems in ASD (Georgiades et al., 2011). Our study helps us to better characterize emotional difficulties in AS/HFA that we suggest may flow from deficits in Theory of Mind and perspective taking. Our results show that emotion regulation difficulties, most pronounced in reappraisal, cannot be explained by differences in the emotion experience or emotion labeling. Moreover, difficulties in reappraisal, one of the most adaptive emotion regulation strategies, might be specifically associated with deficits in perspective taking abilities related to Theory of Mind. However, further research is needed to better understand emotion regulation in AS/HFA and its links to core symptoms of the disorder.

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