Face Processing in Children with Autism Spectrum Disorder: Independent or Interactive Processing of Facial Identity and Facial Expression?

Julia F. Krebs · Ajanta Biswas · Olivier Pascalis · Inge Kamp-Becker · Helmut Remschmidt · Gudrun Schwarzer

Published online: 14 September 2010
© Springer Science+Business Media, LLC 2010

Abstract The current study investigated if deficits in processing emotional expression affect facial identity processing and vice versa in children with autism spectrum disorder. Children with autism and IQ and age matched typically developing children classified faces either by emotional expression, thereby ignoring facial identity or by facial identity disregarding emotional expression. Typically developing children processed facial identity independently from facial expressions but processed facial expressions in interaction with identity. Children with autism processed both facial expression and identity independently of each other. They selectively directed their attention to one facial parameter despite variations in the other. Results indicate that there is no interaction in processing facial identity and emotional expression in autism spectrum disorder.

Keywords Autism · Face processing · Facial identity · Emotional expression

Introduction

A human face provides an abundance of information. When we look at a face we detect cues about a person’s gender, age, identity and mood within a few milliseconds. A current aim is to understand how the face processing system copes with this diversity of information. Do different pieces of information interact or interfere with one another in processing? For information on facial identity and emotional expression there is evidence for both independent (e.g. Bruce and Young 1986; Desimone 1991) and interactive processing (e.g. Haxby et al. 2000, 2002). Recent studies with children and adults suggest that there might be a one-way dependency during processing, in such a way that emotional expression processing is influenced by who we are looking at but identity processing remains unaffected by a person’s emotional expression (Schweinberger et al. 1999; Schweinberger and Soukup 1998; Spangler et al. 2010). This asymmetrical pattern of processing has been detected in typically developing individuals, but so far no study addressed this issue in individuals with autism who are known to show atypical face processing. The present study, therefore, investigated the relationship of processing facial identity and emotional expression in typically developing children and children with autism.
Autism is a pervasive developmental disorder characterized by a severe impairment in social function and communication, as well as repetitive behaviour. Face perception is one of the key features for social interaction and individuals with autism spectrum disorder (ASD) show various alterations and deficits in their face processing abilities. Among these are alterations in emotion processing and identity processing, along with their underlying mechanisms. All of these will be described in the following.

Emotion Processing

Numerous studies reported significantly lower performance on emotion recognition tasks for individuals with ASD compared to their typically developing (TD) controls. This is true for both children and adults with ASD: all age groups show difficulties in recognizing and labelling facial expressions (Pelphrey et al. 2002; Tantam et al. 1989). Exploring whether impaired facial expression processing occurs for all basic emotions or only for single emotions in particular, Humphreys et al. (2007) tested adults with autism with an emotion identification task and detected considerable differences between groups for all emotions. Discrepancies were most apparent for fear, disgust, and happiness. In a study with children with autism Wright et al. (2008) identified anger and happiness as the most challenging emotions to be recognized from a face.

In participants with ASD decreased recognition accuracy for emotions is reported not only for basic emotions (Ashwin et al. 2006; Wright et al. 2008) but also for complex emotions such as smugness, awkwardness and concern (Golan et al. 2006): adults with autism performed poorly when they were asked to identify complex emotions and mental states from social interactions in short video scenes (Golan et al. 2006). Performance was also impaired when emotions had to be identified in a social context providing only motion cues but no facial expressions, as in computerized animations of geometric figures (Boraston et al. 2007).

The deficit in emotion recognition abilities in autistic children remains significant even when compared with clinical control groups such as individuals with Down syndrome (Celani et al. 1999) or Williams syndrome (Riby et al. 2008) emphasizing the autism specificity of deficits in emotion recognition.

Although it seems to be natural that a social disorder like autism involves impairment in emotion recognition, there are also studies reporting equal performance in emotion recognition tasks in children with autism and their TD peers (Castelli 2005; Grossman et al. 2000; Ozonoff et al. 1990). These contradictory findings might derive from varying methods and questions addressed in those studies.

Identity Processing

Facial identity processing is also affected in autism. In a comprehensive study Boucher and Lewis (1992) detected lower performance in face recognition tasks in children with ASD compared to TD peers although recognition of buildings was comparable in both groups. Further studies (Corsello 2000; Klin et al. 1999; Trepagnier et al. 2002; Wolf et al. 2008) confirmed this specific face recognition deficit for children and adolescents with ASD. This deficit appears to hold true even when information about identity is provided by only the eyes (Joseph and Tanaka 2003).

However, not all authors report deficits in identity recognition (Celani et al. 1999; Deruelle et al. 2004; Wilson et al. 2007): although autistic participants were less efficient when they had to recognize faces on the basis of gaze direction, gender, lip reading, and emotion, their performance on identity recognition did not differ from that in non-autistic controls.

Processing Mechanisms

It is hypothesized that face processing mechanisms of individuals with autism differ fundamentally from those in typically developing individuals. Children with and without autism differ in, for instance, what facial features they focus on. Eye tracking experiments showed that individuals with autism have a tendency to saccade away from internal facial features (Pelphrey et al. 2002; Spezio et al. 2007). Within a face they do not rely on the eye region which is supposed to provide information most efficiently. Instead they attend to the mouth or peripheral information like the hairline (Langdell 1978; Rutherford and Towns 2008). Also, individuals with autism do not rely on distinct facial features but orient towards less informative ones when processing identity. This became apparent in an implicit memory task where peripheral facial cues were removed, and stimuli faces varied only in their natural distinctiveness (Giovannelli 2006).

Furthermore, individuals with and without ASD differ in their face processing modes, as can be seen in the inversion effect. This effect describes a decrease in recognition of faces which are presented upside-down. It is assumed that face encoding is heavily based on holistic processing of the face gestalt which is distorted by inversion (Yin 1969). Children (van der Geest et al. 2002) and adults with ASD (Hobson et al. 1988) show no or little face inversion effect, suggesting a face processing mode that is less configural. Indeed, there is evidence that individuals with ASD engage feature based strategies over configural processing (Deruelle et al. 2008; Joseph and Tanaka 2003; Teunisse and de Gelder 2003). Recently, however, Wolf et al. (2008) claimed that a general featural bias cannot account for the
face recognition deficit in autism since in their study children with ASD were only impaired in their ability to recognize faces by featural information but not automobiles and houses.

In summary, we know that face processing strategies as well as emotion and identity recognition are untypical in multiple ways. Up to now, emotion and identity recognition abilities in autism have only been studied in isolation. We do not know if and how processing deficits of facial emotions affect the processing of facial identity and vice versa.

Interactive Processing

For TD adults and children studies provided evidence of both independent as well as interactive processing of emotional expression and facial identity (e.g. Odom and Lemond 1974; Young et al. 1986). Adult participants selectively focused on either emotional expression or identity without being distracted by changes in emotional expression further identity processing and might therefore document an interactive processing of facial identity and emotional expression. But it is also possible that performance improvement was simply caused by the increased amount of changes in the faces.

In summary, we know that face processing strategies as well as emotion and identity recognition are untypical in multiple ways. Up to now, emotion and identity recognition abilities in autism have only been studied in isolation. We do not know if and how processing deficits of facial emotions affect the processing of facial identity and vice versa.

Interactive Processing

For TD adults and children studies provided evidence of both independent as well as interactive processing of emotional expression and facial identity (e.g. Odom and Lemond 1974; Young et al. 1986). Adult participants selectively focused on either emotional expression or identity indicating that they processed both dimensions independently of each other (Calder et al. 2000; Etcoff 1984). Haxby et al. (2000, 2002), in contrast, proposed a face processing model which postulates two brain systems: one is thought to be responsible to process invariant facial aspects essential for identity processing. The second supposedly manages changeable facial attributes like emotional expression, facial speech, or gaze direction. The authors assume an interaction between these two systems which results in interdependency between identity processing and processing of changeable facial attributes.

A number of studies, nevertheless, suggest facial identity and emotional expression interact in an asymmetrical manner (Campbell and De Haan 1998; Ellis et al. 1990; Herzmann et al. 2004; Kaufmann and Schweinberger 2004). In a reaction time experiment Schweinberger and Soukup (1998) asked adults to classify faces either by identity or emotional expression thereby ignoring variations in the irrelevant dimension. Participants processed identity without being distracted by changes in emotional expression. Their processing of emotional expression, however, was affected by varied facial identities. Engaging the same method as Schweinberger and Soukup (1998), Spangler et al. (2010) recently replicated these findings in adults as well as in TD children aged 5–6 and 9–10 years. These results indicate that face processing in TD individuals includes both independent and interactive strategies and that these are engaged from early age on with no change in the course of development.

In individuals with autism, only few studies investigated the relation of facial identity and expression processing: Hefter et al. (2005) explored the relationship of face identity and emotional expression processing in a group of adults with autism who were asked to discriminate famous faces from non-famous faces and derive emotions from facial and nonfacial cues. Perception of facial expression correlated with nonfacial expression, but performance in the facial identity task was uncorrelated with facial expression recognition. This might reflect an independent processing for identity and emotional expression. In this study, however, performance was tested in adults only and not compared to a control group. Robel et al. (2004) observed that children with autism did not discriminate diverse faces when they were presented in neutral expression, but recognized faces when facial identity was changed together with facial expression. These results support the idea that changes in emotional expression further identity processing and might therefore document an interactive processing of facial identity and emotional expression. But it is also possible that performance improvement was simply caused by the increased amount of changes in the faces.

Objective

In summary, the reported results cannot fully explain the relationship between facial identity and emotional expression processing in children with ASD. Previous studies tested different age groups, used various methods and did not directly explore the nature of underlying processes. Therefore, our study employed an established paradigm to investigate whether children with ASD show equal interactions in processing facial identity and emotional expression as their TD peers.

In a computer based categorization task children with and without autism were asked to classify faces either by the face’s emotional expression or identity, while disregarding the other dimension. Hereby we followed Schweinberger and Soukup’s method (1998), applied also by Spangler et al. (2010), to obtain results that are comparable between studies. We expected to replicate previous findings, namely an asymmetrical processing in TD children: identity is processed independently from emotional expression but emotional expression processing is influenced by identity changes. Since it is assumed that face processing in children with autism is less integrative and more focused on featural information we expected children with ASD to process facial identity and emotional expression independently of each other.

Method

Participants

This study examined 24 children with ASD and 24 typically developing children. All participants were male and aged between 9 and 15 years. Children with ASD had been diagnosed at the outpatient clinic of the department of child
and adolescent psychiatry, Philipps-University Marburg. The diagnostic classification was made by an experienced clinician according to the standardized criteria of the International Classification of Diseases, 10th revision (ICD-10; World Health Organisation 2006) and comprised diagnoses F84.0 (high-functioning autism, \( N = 10 \)) and F84.5 (Asperger syndrome, \( N = 14 \)). Each autistic participant had met the criteria for ASD on the basis of scores of the German version of the Autism Diagnostic Observation Scale-General (ADOS-G; Lord et al. 2001; Rühl et al. 2004) and the Autism Diagnostic Inventory-Revised (ADI-R; Bölte et al. 2006; Rutter et al. 2003). Intellectual functioning was evaluated using the German version of the Wechsler Intelligence Scales (WISC-III; Tewes et al. 1999). All participants showed full scale IQs (FSIQ) above 70.

Each participant with ASD was individually matched with a TD comparison participant according to age and FSIQ. These children were selected from the department’s participant pool. Neurological disorders and autism symptoms in the control participants were ruled out by a comprehensive parental questionnaire. Table 1 displays participants’ details. Independent samples \( t \) tests did not identify significant differences between the two groups in age, \( t(46) = .08, p = .94 \), and FSIQ, \( t(46) = .51, p = .61 \).

### Stimuli and Apparatus

The stimulus set consisted of eight greyscale photographs that varied in the two dimensions identity and emotional expression: two young men (identity A and B) showed two different emotional expressions (happy and sad). Emotions were expressed in two different intensities (e.g. smiling a little and smiling a lot), so we had two versions of each emotional expression (resulting into 2 identities \( \times \) 2 emotional expressions \( \times \) 2 intensities = 8 pictures, see Fig. 1). Different intensities were supposed to prevent picture-based recognition strategies. An artificial hat was added to all stimuli faces, because Spangler et al. (2010) observed, that especially younger children tended to focus only on the hairline when classifying faces by identity. With the same hat covering the hairline of all stimuli faces, participants were forced to use internal face features for classification.

The experiment was conducted on an IBM Think Pad 390. Participants were seated 70 cm away from the monitor and pictures were 4.6 by 6.0 cm which represented a visual angle of 3.8° \( \times \) 4.9°. The faces were presented on a grey background. A gray and a red response button were placed on the table between computer and participant. Children were asked to press the buttons with their index fingers for classification decisions. Exkey-Keyboard Logic, an equipment associated with the Experimental Rut Time System (ERTS), controlled stimulus presentation and reaction time registration.

### Procedure

We tested all children individually in a quiet room at the Justus-Liebig-University in Giessen. Informed consent was obtained from each participant’s parents and the children received financial reward in return for participating in the study. The task of the experiment was to classify faces by one dimension, either by emotional expression or by facial identity, thereby ignoring the other dimension. As we used a between-subject design, half the children classified faces by identity and half by emotional expression. Participants were randomly assigned to either the identity or the emotion condition. Classification decisions were made by pressing the response button (e.g. the red button for identity A and the grey button for identity B, regardless of emotional expression). The assignment of dimensions to response buttons was counterbalanced between participants. We asked the children to press the buttons as quickly and accurately as possible.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Group demographics and matching information for autistic (ASD) and typically developing (TD) participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASD</td>
</tr>
<tr>
<td>FSIQ</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>103.2</td>
</tr>
<tr>
<td>SD</td>
<td>15.50</td>
</tr>
<tr>
<td>Range</td>
<td>73–133</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>12.6</td>
</tr>
<tr>
<td>SD</td>
<td>1.84</td>
</tr>
<tr>
<td>Range</td>
<td>9–15</td>
</tr>
<tr>
<td>N</td>
<td>24</td>
</tr>
</tbody>
</table>

Fig. 1 The stimulus set consisted of photographs of two different face identities (top vs. bottom row) showing either a happy or a sad expression (left vs. right half), each emotional expression in two versions.
The experiment began with a short introduction, in which the task was explained to the children. This was followed by a training phase and two test phases with a short break in between. The training phase was a short version of the test phases; stimulus faces were presented only 12 times and had to be classified either by emotional expression or identity. This was repeated until 10 out of the 12 faces were classified correctly with a maximum of five repetitions. All participants reached this learning criterion. The training phase was included to make sure all children understood the task, and to guarantee high level of correct answers. Results of the training phase were not included in analysis.

Each of the two test phases consisted of three blocks, each block comprising one of the three experimental conditions (described below). Consequently each subject worked on two blocks of the same experimental condition. The order of blocks was counterbalanced. Within each test block, 40 faces had to be classified; 40 trials × 3 blocks × 2 test phases led up to 240 test trials per subject. Like Spangler et al. (2010) we considered the initial 20% of each experimental block as further training and therefore excluded them from analysis. Consequently 192 trials per subject were relevant.

Each trial started with a fixation cross located in the middle of the screen. Stimulus faces appeared after 1,150 ms. They were presented until a button was pressed, to a maximum of 5,000 ms. To sustain motivation in children, we reinforced the tests. At the start of the experiment, we showed a picture with eight stars. After each training and experimental block, we transformed one of the stars into a picture of a comic tiger.

Experimental Design

The experiment explored the effect of variation in an irrelevant stimulus dimension on a relevant dimension. Participants were asked to classify stimuli by a relevant dimension (e.g. face identity). In three different conditions the irrelevant dimension (then emotional expression) was varied: in the control condition the irrelevant dimension was held constant (e.g. both identities expressed the same emotion); in the correlated condition it correlated with the relevant dimension (e.g. identity A only happy, identity B only sad); and in the orthogonal condition the irrelevant dimension varied across the relevant dimension (both identities were combined with both emotional expressions).

The task was speeded and response times were recorded. Comparison of reaction times between the three conditions was considered to answer the question of whether participants processed the relevant dimension independently of or in interaction with variations in the irrelevant dimension.

No reaction time differences between the three experimental conditions would argue for an independent processing of the relevant dimension. In contrast, longer reaction times in the orthogonal condition compared to the control condition would reflect an interference effect, indicating that variations in the irrelevant dimension did affect processing of the relevant dimension. Faster reaction times in the correlated condition compared to the control condition would be interpreted as a redundancy gain, because the correlated presentation of the irrelevant dimension supported processing of the relevant dimension. But such a redundancy gain could also occur if participants disregarded instructions and classified by the irrelevant dimension. To ensure that longer reaction times in the control condition compared to the correlated condition indeed reflected a redundancy gain, mean reaction times of the correlated condition would have to be faster than mean reaction times of the control condition of the irrelevant dimension.

To sum up, an interference effect or a redundancy gain would indicate that the irrelevant dimension influenced processing of the relevant dimension, which we interpreted as interactive processing of the two dimensions.

Results

Our analysis was based on reaction times of correct responses. To compare results with the study by Spangler et al. (2010) we defined responses as correct when the appropriate button was pressed between 150 and 2,000 ms. Within the 192 relevant trials per subject 75% had to be answered correctly. All participants reached this drop-off criterion.

Correct Answers

Both groups reached high levels of correct answers (TD: M = 97.2%, SD = 2.4%; ASD: M = 96.4%, SD = 4.0%) indicating that there was no speed-accuracy trade-off. There were no significant differences in proportion of correct responses between the two groups, t(46) = .79, p = .43.

Reaction Times

Between-group comparison of overall reaction times revealed significantly slower responses in the ASD group as in the control group, t(46) = −2.26, p = .03. This was due to significantly longer reaction times in the autistic children in the emotional expression task, t(22) = −2.03, p = .05. Both groups showed similar reaction times when
Fig. 2 Mean reaction times and standard errors of classification judgements for facial identity (grey line) and emotional expression (black line) separated by group. The repeated-measure variable is “condition” (correlated, control, orthogonal) classifying faces by identity, \( t(22) = -1.03, \ p = .31 \) (Fig. 2).

Control Group

In the group of TD children the results from Spangler et al. (2010) were meant to be replicated. That was primarily a significant interference effect and possibly a redundancy gain. Therefore two repeated-measure ANOVAs with the repeated-measure variable “condition” (1. control versus orthogonal condition; 2. correlated versus control condition for a redundancy gain) and the between-subject factor “dimension” (categorization by identity, categorization by emotional expression) were conducted. For the interference effect, ANOVA including the control and orthogonal condition revealed a significant main effect of condition, \( F(1, 22) = 12.48, \ p = .002, \ \eta^2 = .36 \), and a significant interaction effect of condition and dimension, \( F(1, 22) = 6.22, \ p = .02, \ \eta^2 = .22 \). According to post hoc \( t \) tests reaction times in the orthogonal condition (\( M = 644 \) ms, SD = 141 ms) were significantly slower than in the control condition (\( M = 602 \) ms, SD = 149 ms) for classifying faces by emotional expression, \( t(11) = -3.38, \ p = .006, \ r = .71 \). This was defined as an interference effect and interpreted as interactive processing: variations in facial identity influenced classification by emotion in the TD group. In contrast, for classifying faces by facial identity there was no significant difference in reaction times between the control (\( M = 677 \) ms, SD = 126 ms) and the orthogonal condition (\( M = 684 \) ms, SD = 129 ms), \( t(11) = -1.14, \ p = .28 \), reflecting no interference effect. Accordingly this was interpreted as independent processing: identity processing was not influenced by variations in emotional expression.

ANOVA including the correlated and control condition as repeated measure variables showed no main effect of condition, \( F(1, 22) = .67, \ p = .42 \), nor a significant condition x dimension interaction \( F(1, 22) = 2.11, \ p = .16 \). These results indicated that there was no redundancy gain in the group of TD children.

ASD Group

Again, we conducted two repeated-measure ANOVAs with the repeated-measure variable “condition” (1. control versus orthogonal condition; 2. correlated versus control condition) and the between-subject factor “dimension” (categorization by identity, categorization by emotional expression) to determine interference effect and redundancy gain. Analysis including the control and orthogonal condition, revealed no interference effect: there was no main effect for condition, \( F(1, 22) = .37, \ p = .55 \), nor a significant condition x dimension interaction, \( F(1, 22) = .12, \ p = .74 \). Likewise, ANOVA including control and correlated condition revealed no redundancy gain: there was no main effect for condition, \( F(1, 22) = 1.29, \ p = .27 \), nor an interaction effect for condition and dimension, \( F(1, 22) = .35, \ p = .56 \).

Discussion

Our study examined whether the processing of facial identity and emotional expression differed in children with ASD compared to TD children. In sum, we were able to replicate previous results of an asymmetrical pattern of processing facial identity and emotional expression in our control group of TD children (Schweinberger and Soukup 1998; Spangler et al. 2010). In contrast, children with autism did not show an interference effect but independent processing of both facial identity and emotional expression. Additionally, ASD children were slower than their matched TD control children when classifying faces by emotional expression but were equally fast when they had to classify by identity.

Both groups showed high levels of correct answers with no significant differences between them. This demonstrates that both groups were highly competent and equally able to manage the task.

Our findings for the TD children match results of previous studies employing the same method (Schweinberger and Soukup 1998; Spangler et al. 2010). Like Spangler et al. (2010), we only found an interference effect in TD children when they classified faces according to emotional expression but not when they classified faces according to identity. The absence of a redundancy gain also corresponds to results of Spangler et al. (2010). Thus, for TD...
individuals, our results support the interaction-asymmetry assumption and extend it to a new age range of participants, namely 9–15 year old children, whereas previous studies focused on adults and children aged 5- to 6- and 9- to 10 years of age. The results from our study further support assumptions that the interaction-asymmetry does not undergo qualitative changes throughout childhood and adolescents (Spangler et al. 2010).

Autistic participants processed both dimensions independently of each other. This corresponds to findings by Heftet et al. (2005) for adults with autism. In their study performance in face recognition tasks was uncorrelated with performance in emotion recognition. We did not find indications in our results to support Robel et al.’s finding (2004) that emotional expression supports identity processing.

Results of children with ASD do not fit the model by Haxby et al. (2000, 2002) which proposes an interactive processing of invariant aspects and changeable criteria of a face. If, as postulated by the authors, interactive processing of invariant and changeable aspects of a face is modulated by connections between different neuronal systems, it has to be assumed that these work differently in individuals with autism.

Obvious performance differences between children with and without autism occurred in our study, when faces had to be classified by emotional expression: in the ASD group emotion processing was uninfluenced by changes in facial identity implying that face identity processing does not interfere with emotional expression processing. This possibly derives from non-configural or less integrative face processing strategies as frequently reported in the past (e.g. Deruelle et al. 2008; Joseph and Tanaka 2003; Teunisse and de Gelder 2003). It has been observed that participants with ASD preferred to look at the lower half of a face (Gross 2004; Langdell 1978) and rather used the mouth region than the eye region to gain information from a face (Back et al. 2007; Hobson et al. 1988; Joseph and Tanaka 2003; Klin et al. 2002). Since most cues about a face’s identity are provided by the eye region, avoidance of this region and focussing on the mouth instead, might reduce influence of identity information on emotional expression processing. This might explain why children with ASD process emotional expression independently of facial identity.

The question as to which mechanisms are responsible for the different performance in the ASD group compared to TD children is challenging because it is not yet understood what causes asymmetrical processing in TD individuals. Garner (1976) suggested that the asymmetry in physical differences causes an asymmetrical processing of the relevant properties. Transferred to our experiment this means identity could appear without any emotional information, namely in a neutral expression, but emotional expression cannot be perceived without any underlying identity. Thus, emotional expression could only be processed in connection with facial identity but not vice versa. Our participants’ results challenge this assumption: physical properties were the same in both groups, but the autistic participants did not reflect them in their performance. Thus, the differences in physical properties alone cannot explain asymmetry in interactive processing of facial identity and emotion. Alternatively one might consider if such differences might be acquired through learning. Since facial expressions are constantly changing it might be more efficient for the brain to block out any effects of emotional expression when one has to recognize a person’s identity. Individuals would learn this way to disregard emotional expressions when processing identity. If we consider such a learning model, individuals with ASD may differ in this developmental process, perhaps due to less attention to faces during development.

A further explanation for asymmetrical processing is provided by Schweinberger and Soukup (1998). They assume that the stimulus variation conveying identity information differs from that conveying e.g. emotional expression. In particular, they argue (1) emotional expression variations are predominately spatial transformations (e.g. mouth shapes) whereas facial identity variations reside in non-spatial variations (e.g. pigmentations) and (2) spatial face variations are related interactively to face identity processing, whereas non-spatial face variations (e.g. face identity), are processed independently. Hence independent processing of emotional expression (spatial transformation) and identity (non-spatial face variation) in children with ASD could be understood as an indicator of fundamental differences in emotional expression processing, namely not in terms of spatial variations but more in terms of non-spatial variations. Children with ASD might concentrate for instance on whether teeth are visible or not for the recognition of a happy face. Further research is needed to test this assumption.

There was one more remarkable performance difference in our two groups: children with autism performed as fast as their TD peers during the identity task, but when they classified faces by emotional expression TD children were significantly faster than the children with autism. It seems as if the identity task was of similar demand for both groups while the emotional expression task was more demanding for the children with ASD than their TD peers. This is in line with previous studies that reported no impairment in identity recognition in ASD groups, but did show impairment in all other tasks concerning social information like emotional expression (Celani et al. 1999; Deruelle et al. 2004).

Our results support previous reports about emotion processing differences in children with ASD. We demonstrated that these differences also become apparent in the
absence of interactive processing of emotional expression and facial identity.

References


