Facial Expression Production and Recognition in Autism Spectrum Disorders: A Shifting Landscape

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Facial Expression Production and Recognition in Autism Spectrum Disorders:

A Shifting Landscape

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KEYWORDS

• Autism spectrum disorder • Facial expression • Emotion recognition
• Emotion expression • Interaction • Alexithymia

KEY POINTS

- The social difficulties documented in autism spectrum disorder (ASD) may, in part, be a product of neurotypical-autistic differences (ie, differences in facial expressions).
- Neurotypical and autistic individuals typically exhibit expressive differences, with autistic individuals displaying less frequent expressions that are rated as lower in quality by non-autistic raters. It appears that alexithymia may contribute to these expressive differences.
- Autistic individuals have difficulties recognizing neurotypical facial expressions and vice versa.
- Task-related factors (eg, intensity of the emotional stimuli) and participant characteristics (eg, age, IQ, comorbid diagnoses and co-occurring alexithymia) may influence emotion recognition ability.
- Future research should investigate what specifically is different about the facial expressions produced by autistic and neurotypical individuals (eg, how dynamic aspects of expressions affect emotion recognition) and incorporate measures of alexithymia.

THE SHIFTING LANDSCAPE OF AUTISM RESEARCH AND ITS RELATIONSHIP WITH FACIAL EMOTION RESEARCH

Autism spectrum disorder (ASD) is a neurodevelopmental disorder, characterized by restricted and repetitive interests and difficulties with social communication and interaction.[1] Earlier research suggested that autistic people *lack* certain social abilities (including emotion recognition), and this absence of "social building blocks" led to social interaction difficulties in everyday situations (e.g., Refs.[2,3]). This view ignored the fact that social *interactions* are exactly that, an *interaction between individuals.* Autism

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research is now shifting towards an emphasis on the *differences* in certain abilities between autistic and neurotypical people. In the example of facial expression, when feeling sad, an autistic person might move their face into an expression that is not the downturned mouth expression that most neurotypical individuals would adopt. One consequence of this is that, because this expression is different from the norm, a neurotypical person might not recognize that the autistic person is feeling sad. Similarly, because the neurotypical person expresses their sadness in a different way from the autistic person, the autistic individual might not recognize the neurotypical individual's sadness. This "bidirectional" approach to evaluating social interactions leads to a consideration of both sides of the interaction.

Much of the research focusing on the bidirectional nature of social interactions in autism has emphasized body movement differences.[4,5] Arguably, the success and fluidity of an interaction depend on an accurate understanding and prediction of another's movement, facilitating the appropriate attribution of affective states (emotions) and intentions of the interaction partner.[6,7] Furthermore, we are better able to accurately infer emotional states/intentions, via nonverbal cues, when our interaction partner is someone who usually moves in a similar way to ourselves. Current literature indicates a high heterogeneity in the movement profiles of autistic individuals,[4] suggesting that autistic individuals move quite differently from both neurotypical and other autistic individuals.[4] Thus, the movement interpretation and resulting social interaction in autistic-autistic pairs may be no better than autistic-neurotypical pairs. Thus, what previously had been thought of as "social deficits" in autistic individuals may actually reflect a *mismatch* in movement profiles between autistic and neurotypical (or other autistic) individuals.

The mechanisms underpinning the difficulties in bidirectional emotion recognition depend on both emotion expression and emotion recognition. Typically, studies of emotion in autism have focused on the ability to perceive and label others' emotional expressions (ie, "emotion recognition"). However, recent evidence suggests that autistic and neurotypical individuals are less divergent in emotion recognition than in the active facial expression of emotion (ie, "emotion expression"), suggesting the latter is at least, if not more, important in the bidirectional misunderstanding of emotion.[8]

This review first asks whether there is evidence in support of the view that emotional expressions are different for autistic compared with neurotypical people. Second, the research assessing autistic individuals' emotion recognition (ie, recognition of neurotypical expressions) is reviewed. Finally, a small amount of research investigating neurotypical individuals' recognition of autistic expressions of emotion is discussed. Throughout, the authors identify factors that may be contributing to mixed findings in these literatures and highlight important areas for future research.

Facial Emotion Expression

Emotion expression in autism spectrum disorder

Key components to consider when examining whether autistic individuals exhibit differences in emotional expression include the frequency and duration of the expressions and the intensity of the emotional expressions (expressiveness). Meta-analytic, and numerous empirical, studies suggest that during naturalistic social interactions autistic children typically display facial expressions less often and for a shorter duration compared with non-autistic children.[9–12] In terms of expressiveness, autistic and neurotypical individuals exhibit comparable intensities of expression.[12] Several studies report no differences in facial expressiveness between autistic and neurotypical individuals during automatic imitation (as measured by motion tracking),[13] while

participants view emotional stimuli (eg, images, videos),[14–16] and when mimicking emotional facial expressions[17,18] (as measured by facial electromyography). These latter findings suggest that differences in emotion production are more likely due to atypical spontaneous productions as opposed to a physical inability to produce appropriate expressions.[19] Autistic individuals may execute expressions that are visually different (ie, using different parts of their face), less accurate (ie, socially incongruous), or lower in quality (as rated by typical observers/experimenters) rather than simply lower intensity.

In line with this interpretation, numerous studies report that autistic individuals produce spontaneous expressions that are perceived as lower in *quality,* and rated as odd, stilted, or mechanical by non-autistic observers and experimenters.[10,19–21] Research concerning mimicry of facial expressions has demonstrated that, compared with non-autistic children, those with ASD mimic facial expressions *less accurately* (ie, with lower congruency).[17,22] Therefore, it appears that autistic individuals have the physical capacity to mimic facial expressions; however, when they do, the expressions are of lower quality.[a] In line with this, recent meta-analytic data suggest that facial expressions of autistic individuals are less accurate and are lower in quality relative to controls.[12] Overall, it appears that autistic individuals display facial expressions less frequently and for a shorter duration, and when they do so they are less accurate and lower in quality as rated by non-autistic observers.

Although there is evidence that autistic and neurotypical individuals exhibit expressive differences, research has not yet identified *what* specifically is different about these facial expressions. Facial expressions can be quantified in several ways. One could look at the final arrangement of facial features and ask whether there are *spatial* differences between expressions produced by autistic and non-autistic individuals (eg, one group might open their mouth further when smiling to express happiness). One can also ask whether there are *kinematic* differences between groups (eg, when expressing happiness, one group might break into a smile more quickly). Although autistic and neurotypical facial expressions could, in principle, differ in terms of spatial or kinematic features, to the best of the authors' knowledge, studies have not specifically aimed to assess the contributions of these two factors. Future research to characterize the spatial and kinematic expressive differences between ASD and comparison groups could lead to a better understanding of autistic facial emotional expression. Such research results could be used to better train caregivers and clinicians to interpret autistic facial expressions, thus facilitating more successful social interactions.

Alexithymia and emotion expression

Alexithymia is a subclinical condition characterized by difficulties identifying, expressing, and differentiating emotions.[23] Recent evidence suggests that, across both neurotypical and autistic populations, alexithymia may be implicated in the production of atypical facial expressions. Approximately 50% of the autistic population experiences co-occurring alexithymia[24] in comparison to just 14% of the typical population.[25] The "alexithymia hypothesis" postulates that difficulties in emotion processing in ASD are caused by co-occurring alexithymia, rather than ASD itself.[26] This hypothesis builds on the observation that the systems responsible for the experience of a particular emotion contribute to the recognition of the same emotion in others.[27–29] The

[a] Note that, given that non-imitative autistic facial expressions tend to be rated low in quality/accuracy, these results cannot be taken as evidence of atypical *imitation* mechanisms. It is more likely that they reflect differences in emotional expression.

alexithymia hypothesis highlights that alexithymic individuals, by definition, exhibit differences in experiencing their own emotions (eg, difficulties with labeling their emotions), and this has a "knock-on effect" on the ability to recognize others' emotions.

Alexithymia has been associated with reduced quantity of facial expressions produced by both autistic and neurotypical individuals. A recent study, using iMotion's facial expression analysis technology[30] to estimate the extent to which an emotion is being expressed at any given time, examined the contributions of several variables on emotion expression in autistic and non-autistic children.[31] This study identified that alexithymia (as measured by the Children's Alexithymia Measure[32]), and not intelligence quotient (IQ, sex, or ASD traits, predicted the between-subject variance in the facial expressions produced by child participants.[31] Despite some mixed findings, these results are consistent with studies investigating populations without ASD.[33–36] For example, increased alexithymia is associated with diminished production of facial expressions by patients during therapeutic interaction[33] and production of less salient facial expressions in undergraduate students as evaluated by trained raters.[34] Overall, it appears that alexithymia is implicated in the production of facial expressions across multiple populations. Future studies investigating facial emotion expression in autism must account for the potential co-occurrence of alexithymia.

Facial Emotion Recognition

Recognition of others' emotions in autism spectrum disorder

Emotion recognition has been a topic of interest in autism research for more than 30 years, with studies generally documenting difficulties in the autistic population. Indeed, recent research indicates that ASD-related facial expression recognition[b] difficulties are present cross-culturally, illustrating that emotion recognition difficulties are widespread in the autistic population.[37] In addition, recent meta-analytic evidence finds robust emotion recognition difficulties in ASD,[38,39] with the latter incorporating 43 studies (41 of which used static stimuli with posed expressions, and 40 of which used forced-choice tasks) with more than 1500 participants. Nevertheless, this literature is rife with conflicting findings,[40–45] with some studies reporting profound difficulties and others reporting no differences between autistic and neurotypical participants (see Refs.[38,39,46] for reviews). Several factors may account for variation in findings across ASD facial emotion recognition studies.

Task-related factors

Intensity of emotional expressions Differences in the intensity of facial expression stimuli may influence facial expression recognition ability[47–49] and hence may contribute to inconsistencies in research findings. Most studies that have failed to find emotion recognition difficulties in ASD (eg, Refs.[40–45]) have used 100% intensity, or "full-blown" emotional expressions. Therefore, it is possible that the tasks used were not sufficiently sensitive to detect ASD-comparison group differences and were confounded by ceiling effects. Relatively few studies have directly compared the facial expression recognition ability of autistic and neurotypical individuals across different intensity levels. The findings from studies that have done so are mixed, with conflicting evidence suggesting difficulties recognizing low-, but not high-intensity expressions,[47–49] and difficulties with medium-, but not low-/high-intensity expressions.[50] Some studies suggest no effect of expression intensity on facial expression recognition in ASD.[51–53] Importantly, many of the studies that suggest differential impairment as a

[b] In the literature, the terms "facial affect recognition" and "facial emotion recognition" are also used. In this review, "facial expression recognition" will be used to refer to all of these terms.

function of expression intensity have used small samples (often <20 in the ASD group). Two more recent studies with larger sample sizes (N = 95 and N = 127, respectively) indicate that young autistic individuals (aged 6–14 and 6–16, respectively) were less accurate than young neurotypical individuals at labeling basic (happy, surprise, angry, sad, fear, disgust) emotional expressions across all intensity levels,[51,54] even though both neurotypical and autistic individuals had better facial expression recognition as the intensity of the expressions increased. Future studies should investigate the emotion recognition ability of autistic adults across various intensity levels.

Static versus dynamic stimuli Two broad types of stimuli are commonly used to investigate facial expression recognition: static and dynamic. Because spontaneous facial expressions are inherently dynamic, dynamic depictions are presumed to have higher ecological validity.[39,55] Moreover, given that studies using dynamic tasks are greatly underrepresented in meta-analyses (about 21% of studies included in Uljarevic and Hamilton[39] and just 0%–5% in Lozier and colleagues[38]), greater inclusion of dynamic stimuli in future research is necessary.[55] Although this assertion is true, the authors believe that there is also great utility in using *both* static and dynamic stimuli to assess emotion recognition. Incorporating both types of tasks allows one to distinguish whether autistic individuals have difficulties with processing static (ie, the configuration of facial features relative to each other) or dynamic (ie, speed of movement of features, or temporal order of face movements) features of facial expressions. Krumhuber and colleagues[55] point out that the benefits of viewing dynamic (as oppose to static) stimuli are most apparent when subtle expressions are used. Consequently, it appears that when expressions are less intense, there is greater reliance on the dynamic features of facial expressions. More research, however, is necessary to understand the extent to which, and under what conditions (eg, for subtle emotions), *autistic* individuals specifically rely on dynamic versus static information in facial emotion recognition tasks.

The few studies that have examined the processing of dynamic facial information indicate autistic-neurotypical differences. One study identified that autistic individuals tended to rate slow moving morphs as more "natural looking" than neurotypicals.[56] Another study used a professional actress to slowly portray emotional (joy, surprise, sadness, and disgust) and non-emotional (pronunciation of 3 vowels A, O, I, and tongue protrusion) expressions. The velocity of the videos was then artificially manipulated to give 3 conditions: "normal condition" (accelerated), "slow condition" (the filmed version), and "very slow" (deaccelerated).[57] Although, in the primary analyses, the autistic children exhibited lower facial expression recognition than verbal age-matched and nonverbal age-matched controls for both the emotional and the non-emotional stimuli, they had even lower accuracy with the emotional stimuli.[57] In post-hoc analyses, the investigators found that the autistic group had better emotional facial expression recognition in the slow relative to the normal speed condition.[57] Indeed, further post hoc analyses demonstrated that children with moderate to severe autism (ie, with Childhood Autism Rating Scale[58] scores $\geq$35 in this study) had better performance when the expressions were displayed slowly and/or very slowly.[57] As a whole, the investigators comment that each autistic child will have their own pattern of "perceptual and cognitive reactivity to the speed of facial motion," with slow presentations generally being most easily recognized.[57] More research, which formally uses a control group in their statistical comparisons, is necessary to elucidate whether enhancements in facial expression recognition for slowed facial stimuli are ASD-specific. In sum, although there is a paucity of research in this area, a handful of studies suggest differences in processing dynamic aspects of facial expressions in autism.

Findings from behavioral investigations of dynamic expression processing in autism resonate well with those from neurophysiological studies. Although there is some inconsistency,[59] and caution is advised, this literature indicates that, relative to neurotypicals, autistic individuals display slowed processing of static face images as indexed by N170 latency.[60–64] It is possible there is a link between slowed neural processing of facial information in ASD, enhanced recognition of slow-moving faces,[57] and the perception that slow-moving faces are more natural looking.[56] Future studies that combine behavioral and neurophysiological investigations are necessary.

In conclusion, it appears that differences in emotion recognition are evident between autistic and neurotypical individuals for both static and dynamic stimuli, and hence, it is unlikely that use of differing stimuli types contributes to the mixed findings. Importantly, however, it appears that dynamic stimuli confer the greatest benefit when expressions are low intensity, suggesting a reliance on dynamic information when viewing subtle expressions. The evidence from neurophysiological studies and studies using dynamic tasks suggests that autistic individuals may exhibit slowed processing of facial information. More research using dynamic stimuli, however, is necessary to confirm whether the kinematic properties of face stimuli specifically influence facial expression recognition ability.

Participant characteristics

Age and intelligence quotient In addition to task demands, participant characteristics (eg, age and IQ) may influence the presence and magnitude of emotion recognition differences in ASD.[46] Although emotion recognition improves throughout life for neurotypicals,[65] studies suggest that this may not be true for autistic individuals.[65] In accordance, a recent meta-analysis divided the existing studies that have investigated emotion recognition into those that assessed pediatric (younger than 18 years) and those that assessed adult autistic participants.[38] In both groups, there were differences in emotion recognition relative to neurotypical participants (who had been age-matched in 32 of the 41 studies used for these age-based analyses); however, differences were greater in the adult group than in the pediatric group.[38] Furthermore, when these researchers modeled the mean participant age in each study as a predictor in a linear regression, age was a significant predictor of emotion recognition accuracy in the regression model.[38] Such results suggest a widening gap in emotion recognition ability between neurotypical and autistic individuals as they grow older.

IQ is also implicated in the emotion recognition ability of both autistic and neurotypical individuals. Individuals with a higher IQ tend to have better emotion recognition.[66,67] High intelligence may buffer against emotion recognition difficulties[68] (**Fig. 1**).

Overall, it appears that although neurotypicals improve in their emotion recognition with age, this is not the case for autistic individuals, thus resulting in greater group differences in adulthood. The interaction between age and IQ is important to consider, especially because it seems that autistic and neurotypical individuals proceed along different developmental trajectories, and so compensatory mechanisms (e.g., IQ) may be more important at later developmental stages when there is a greater disparity in emotion recognition.[38]

Comorbidities Comorbid conditions may influence the presence and extent of differences in emotion recognition between autistic and neurotypical individuals. For instance, Sinzig and colleagues[69] showed that individuals with ASD and comorbid attention deficit hyperactivity disorder (ADHD) symptoms showed greater differences,

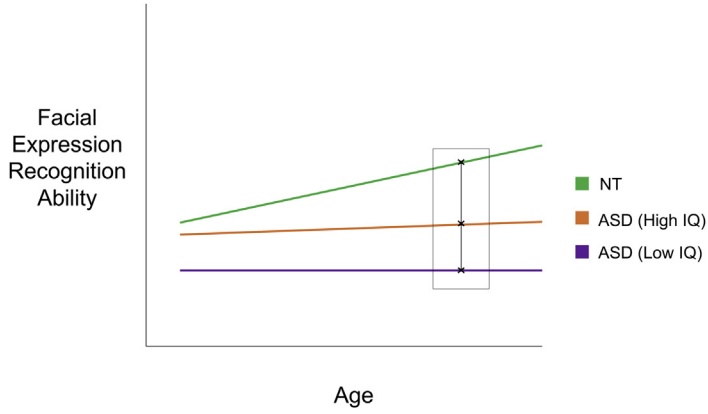

Fig. 1. The developmental trajectory of facial expression recognition ability between neurotypical (*green*), high IQ autistic (*orange*), and low IQ autistic (*purple*) individuals. Note that the purple and orange lines are flat as evidence suggests no age effect for autistic individuals; however, the evidence is limited. The crosses and line represent that participants must be age- and IQ-matched. If participants are not matched on these factors, then the impact of ASD (above and beyond that of age and IQ) on facial expression recognition cannot be suitably examined. NT, neurotypical.

relative to neurotypicals, in facial expression recognition than those with only ASD.[69] Similarly, subclinical ADHD traits, such as attentional distractibility, are associated with facial expression recognition atypicalities in autistic participants.[70] Thus, ADHD-related traits may increase the likelihood of experiencing difficulties with facial expression recognition. High comorbidity between ASD and ADHD (29%[71]) may result in apparent expression recognition differences between autistic and neurotypical populations, which more accurately reflect the presence or absence of ADHD (not ASD) -related traits.

A similar argument has been forwarded for traits related to mood disorders. For instance, response biases toward negative emotions have been documented in mood-related disorders, such as anxiety and depression,[72,73] which are known to co-occur with ASD.[74] Negative emotion response biases have been identified when autistic individuals complete forced choice labeling tasks[51] (which are commonly used in the emotion recognition literature). Hence, Evers and colleagues[51] emphasize the impact of response biases and suggest that they may account for the inconsistent results between studies. Mood disorder–related traits may therefore comprise a further characteristic that biases individuals toward experiencing difficulties with facial expression recognition. Further research is necessary to assess the extent to which mood disorder–related traits contribute to expression recognition in autism. Response biases tend to be amplified with low-intensity and ambiguous stimuli.[54,75] Future studies might use low-intensity/ambiguous expressions to gain an estimate of bias, which can then be taken into account when comparing differences in facial expression recognition between groups.[54]

Co-occurring alexithymia may contribute to emotion recognition difficulties in individuals with ASD. Indeed, alexithymia is associated with emotion recognition difficulties in neurotypical populations (see Grynberg and colleagues[76] for a review), even after controlling for depression and anxiety scores.[77] Furthermore, because rates of alexithymia are higher in autistic than in non-autistic populations,[23,24] alexithymia may contribute to apparent emotion recognition differences between these

populations. In line with this, research has demonstrated that, after controlling for alexithymia, attentional biases away from the eyes,[78] and emotion recognition difficulties[79] are no longer associated with ASD. Moreover, Cook and colleagues[79] found that possessing alexithymic traits, and not ASD traits, predicted poorer emotion recognition. Therefore, it appears that emotion recognition difficulties typically attributed to autism may be associated with co-occurring alexithymia rather than ASD itself.

Neurotypical Recognition of Autistic Expressions

Although there are several studies in which neurotypical raters/experimenters/research assistants have rated the quality, intensity, or accuracy of autistic facial emotional expressions (for example, Refs.[19–21]) very few studies have specifically aimed to evaluate whether neurotypical individuals have difficulty recognizing autistic facial expressions.[5,19,21,80] Most of those who have done so report difficulties for neurotypicals in recognizing autistic expressions.[5,21,80] For instance, Brewer and colleagues[5] asked autistic and neurotypical participants to match facial expressions that had been posed by autistic and neurotypical individuals with 1 of 6 prompted emotions. Interestingly, a "same-group" advantage was identified for the neurotypical but not the autistic group.[5] That is, neurotypical participants more accurately matched expressions produced by other neurotypical individuals, but performed more poorly when it came to recognizing the expressions of autistic individuals. Such findings are paralleled in the work of Edey and colleagues,[4] which investigated arm movements. In this experiment, autistic and neurotypical participants used magnetic levers to animate shapes such that they depicted mental state interactions (eg, fighting, following). Edey and colleagues[4] observed that neurotypical individuals accurately recognized the mental states depicted in animations produced by other neurotypical participants, but not by autistic participants. Therefore, it appears that in a similar way to how autistic individuals may have difficulties inferring others' emotion,[38,39,46] neurotypicals may also find it difficult to read and interpret autistic facial expressions and bodily movements.

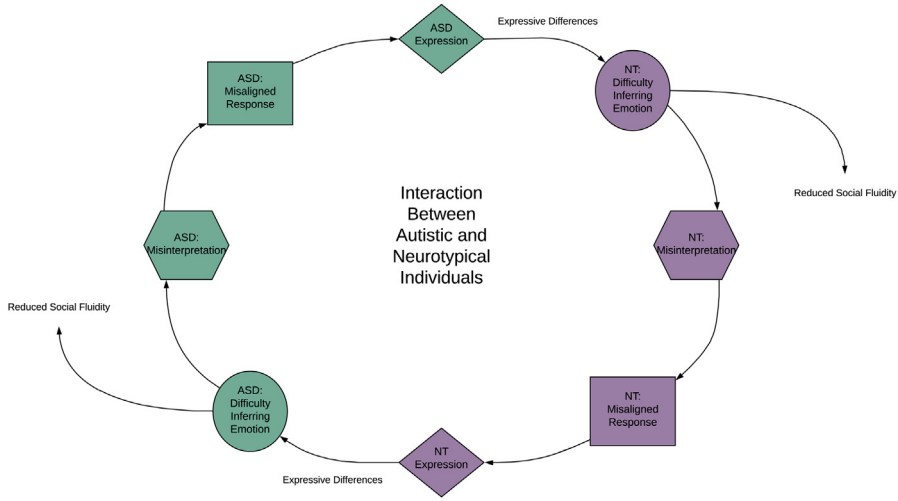

Fig. 2. How the interaction between autistic and neurotypical individuals may result in social difficulties.

SUMMARY AND FUTURE DIRECTIONS

Autism research is turning away from a focus on a lack of emotion recognition skills in autistic individuals and orienting toward the view that emotion processing depends on common representations of emotions between interaction partners. In line with this, the authors asked the following three key questions.

1. Does evidence support the idea that emotional expressions are different for autistic compared with neurotypical people?
   The studies reviewed provide evidence that there are broad differences between autistic and neurotypical individuals. The extant literature indicates that, in social situations, autistic individuals execute facial expressions less frequently,[12] and neurotypical individuals rate autistic expressions as lower in quality compared with neurotypical expressions.[12] Importantly, recent research suggests that alexithymia is implicated in the production of facial expressions; however, more research is necessary to clarify the extent of this involvement. Moreover, the way in which autistic expressions differ from neurotypical expressions is currently unclear. Future research should aim to elucidate *what* specifically is different about facial expressions produced by autistic and neurotypical individuals by assessing the spatial and kinematic properties of these expressions.
2. To what extent can autistic individuals recognize neurotypical emotional expressions?
   The evidence also indicates atypicalities. However, this is a very mixed literature: In some studies, autistic individuals display emotion recognition performance that does not differ from that of neurotypical individuals, whereas other studies report considerable differences.[46] Both task requirements (eg, differences in the intensity of emotional expressions) and individual differences (eg, age, IQ, comorbidities, alexithymia, and so forth) may influence the presence and severity of emotion recognition difficulties. Comorbidities, such as depression and alexithymia, are particularly important to consider because an autistic individual who also experiences one of these conditions is likely to exhibit facial emotion recognition difficulties, although such difficulties are more likely associated with the comorbid condition than with autism per se. To bring clarity to this research field, it is important that future research controls for comorbidities like alexithymia[81] and makes use of *dynamic* tasks, which facilitate the investigation of temporal and kinematic aspects involved in facial expression recognition. Such research will elucidate whether expression recognition differences are (a) present in individuals that are autistic and have no comorbidities, and (b) due to differences in the processing of spatial, temporal, or kinematic information. Future research has the power to, for example, clarify whether autistic individuals exhibit slowed processing of facial stimuli. Results may have significant implications: for example, if studies indicate slowed processing of emotional information in ASD, interventions could be designed to train caregivers and clinicians to move their faces more slowly when conveying emotional messages. Crucially, this could scaffold interpersonal abilities and elevate social competency, which could lead to greater social participation and lower social isolation.[82]
3. To what extent can neurotypical individuals recognize autistic emotional expressions?
   The evidence indicates that neurotypical individuals may have difficulties reading and interpreting autistic facial expressions and bodily movements. However,

to date, there are very few studies addressing neurotypical recognition of autistic emotions. Further research is necessary to advance the understanding of the magnitude and consequences of these neurotypical-autistic emotion recognition difficulties.

Overall, this review suggests that, in the laboratory, there are bidirectional difficulties between autistic and neurotypical individuals in reading each other's facial expressions (**Fig. 2**).[5] Consequently, it may be the case that autistic and neurotypical faces are essentially "speaking a different language" with respect to conveying emotions. If this is indeed the case, there are several corresponding practical implications. For instance, caregivers and clinicians could be trained to "read the language" of autistic facial expressions, leading to a reduction in bidirectional sociocommunicative difficulties. Furthermore, as Edey and colleagues[4] argue, these bidirectional sociocommunicative difficulties have important implications for the clinical diagnosis of autism. Thus far, ASD has been diagnosed following observational behavioral assessments of social ability by a qualified clinician. However, it is possible that individuals may be evaluated, by non-autistic clinicians, as lacking in expression when, in reality, they have an incompatible movement profile with the assessor. To give an example, a nonverbal individual may be attempting to communicate via their facial expressions that they are happy but, if the expression is one that the clinician is unfamiliar with and would not use in his/her own behavioral repertoire, he or she may conclude that the individual is not exhibiting the correct emotion. Thus, a *different* style of emotional expression is falsely interpreted as a *lack* of emotional expression. In conclusion, it appears that the view of emotion recognition in ASD is shifting away from the idea of "deficit" toward one of "difference" resulting from neurotypical-autistic *interactions.*

DISCLOSURE

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