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Correlations Between Dynamic Facial And Body Emotion Perception And Autistic Traits

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Abstract

The study examined the correlation between autistic traits, perception of body emotion from dynamic point-light displays, and perception of dynamic facial expression in adults. A sample of 172 adults from Georgia completed an online survey. The results revealed a correlation between autistic traits and perception of facial anger emotion and in identifying anger and happiness of body emotions. The difficulty perceiving the emotion of anger is generalized in both modalities, facial and body movements. Our results indicate that the perception of emotions in faces and the perception of emotions in the movement are not the same factors concerning autistic traits and autistic traits are associated with difficulty perceiving negative emotions in healthy people.

Keywords: Autistic traits, Facial Emotions, Body Emotions

Introduction

We express emotions daily during interactions with people, which serves as a mechanism of biological adaptation (Ekman, 1999). Perceiving other people's emotions requires integrating signals from different sensory channels. In particular, facial expressions, intonation, body language, and contextual information contribute to our understanding of the intentions, thoughts, and feelings of others (Black et al., 2017).
In everyday social encounters, a person's facial expression outwardly manifests their internal emotional state (Ekman & Friesen, 1971). Difficulty perceiving other people's social signals can lead to deteriorating communication and social interaction. Recognizing emotions earlier equips us to cope with various situations and manage our emotional responses (Ekman, 2003).
In the interaction process, the accuracy of emotion perception, encoding, and responding to facial and body signals are skills that facilitate adequate understanding of others' emotions and accurate responses. Various emotions, such as enjoyment, anger, surprise, fear, and sadness, accompany these interactions.
Additionally, the interaction process may be influenced by autistic characteristics, which are not considered pathological in the general population (Baron-Cohen et al., 2001b). Autistic features are viewed as a set of primary symptoms of autism spectrum disorder and are distributed throughout the general population (Constantino & Todd, 2003; Posserud et al., 2006). Any person can exhibit "autistic features," representing a "broad phenotype" (Bailey et al., 1995).
However, individuals with more pronounced autistic features often experience social difficulties and exhibit lower non-verbal emotion perception abilities (Uljarevic & Hamilton, 2013). Studies indicate that the ability to recognize emotional expressions is related to the degree of autistic traits present in an individual (Poljac et al., 2012).

Literature Review

Basic emotion theory was laid down by Darwin (Darwin, 1872) and later developed by Tomkins (Tomkins, 1962), followed by Ekman (Ekman & Friesen, 1969; Ekman, 1984) and Izard (1977). Initially, Ekman proposed seven basic emotions: fear, anger, enjoyment, sadness, disgust, surprise, and contempt, but he subsequently removed the emotion of contempt from the list, leaving six emotions.
According to Ekman's theory of basic emotions, some emotions are innate and universal. However, there are complex emotions that are equally important and arise from the combination of basic and non-basic emotions.
Izard (1977) argued that basic emotions' biological and social functions are essential for evolution and adaptation and possess innate, universal behavioral characteristics (Shpigler et al., 2017). For example, fear and anger contribute to self-preservation, prompting a person to flee or fight for safety or self-defense.
Emotions are related to physical processes that can be perceived. In the case of emotional expression on the face, changes in the facial muscles provide us with information about a person's emotional state. For instance, one exhibits lowered and wrinkled eyebrows, an intense gaze, and a raised chin when expressing anger. Joy is expressed by raising the corners of the mouth. A dropped jaw characterizes the emotion of surprise, raised eyebrows, and widened eyes. When experiencing fear, individuals open their mouths, widen their eyes, and frown. During sadness, the eyebrows are furrowed and the corners of the lips are turned down (Ekman et al., 2002). Emotions are expressed differently in specific regions of the

face; for example, negative emotions are more prominently expressed in the upper part of the face, while positive emotions are more evident in the lower part (Dimberg & Petterson, 2000). These expressive changes reflect a person's inner feelings, motives, needs, and intentions (Ekman, 1992).
Research by Jack and colleagues demonstrated that disgust and anger are characterized by similar facial expressions in the nose area, while fear and surprise are marked by raised eyebrows (Jack et al., 2014). The distinction between these emotions has subsequently evolved for social functions rather than mere survival (Mansourian et al., 2016).
Both facial and body kinematics are important for emotion recognition (Atkinson et al., 2004; Clarke et al., 2005). Among social signals, body movement plays a vital role in conveying others' feelings, intentions, and emotions, with its significance comparable to facial expressions (de Gelder et al., 2010; de Gelder & de Borst, 2015). There is a strong correlation between facial and bodily emotion perception, with the ability to recognize emotions generalizing across both modalities (Alaerts et al., 2011; Baron-Cohen et al., 2001). Alaerts (Alaerts et al., 2011) conducted a study comparing static faces and moving bodies, finding a strong correlation between facial and body emotions.
Most studies have focused on static face recognition; however, facial behavior is dynamic in real life. Generally, dynamic information enhances the recognition of facial expressions, particularly for low-intensity and subtle stimuli (Krumhuber et al., 2013). Dynamic expressions are more accurately distinguished from one another than static expressions (Fiorentini & Viviani, 2011).
The dimensional theory of emotion (Wundt, 1897), which is based on the basic theory of emotion, suggests that emotions differ in intensity (Ekman, 2003). People express emotions in different gradations, which is a natural process.
It should also be considered that when the task uses stimuli depicting high-intensity emotions, this may increase the probability of emotion recognition. As task demands become more complex and emotional expressions more subtle, the results are affected.

Thus, while faces are universally recognized as the primary signaling and communication channel for emotions (George, 2013), a growing body of evidence regarding body-expressed emotions shows that body kinematics are also crucial for recognition (Atkinson et al., 2004; Clarke et al., 2005).
Body kinematics play a fundamental role in recognizing certain emotions, while facial expressions are crucial for recognizing others (Actis-Grosso, 2015). For example, the expression of fear can be mistaken for that of a surprised person if not carefully observed (Smith & Schyns, 2009; George, 2013). Conversely, body kinematics associated with some emotions, such as sadness, can be confused with neutral kinematics. For instance, body language conveying sadness is often associated with slow walking or the bowing of the head. However, for some individuals, these characteristics may not express any particular emotion or appear neutral.
A relationship exists between the ability to recognize emotional expressions and an individual's autistic traits. According to studies, individuals with high autistic characteristics experience difficulty correctly identifying emotions (Poljac et al., 2012; Hasegawa et al., 2014; Actis-grosso et al., 2015). Negative emotions are recognized with less accuracy when observing the face, particularly during expressions depicting sadness, anger, or disgust. Additionally, study participants required intense facial images to identify emotions better. The correlation between the broad autism phenotype (BAP) and social cognition is indicated by a study in which individuals with high characteristics of the broad autism phenotype struggled to read facial emotions (Hasegawa et al., 2014).

The "Amygdala Theory of Autism" suggests that in the case of autism spectrum disorder, the amygdala plays a crucial role in social dysfunction (Baron-Cohen et al., 2000), particularly in facial information processing (Adolphs, 2008). The amygdala contains neurons that visually select facial emotions (Fried et al., 1997) and specifically encodes eye gaze (Cao et al., 2021). Moreover, the amygdala regulates the quality of emotions, including the intensity and clarity of the emotion displayed on the face (Wang et al., 2017). According to the results of the Actis-Grosso study, where the participants were people with low autistic traits (LAT) and high autistic traits (HAT—including individuals with clinically diagnosed autism), overall, they were able to accurately perceive facial and body emotions, although differences emerged in terms of individual emotions. The LAT group relied more on static faces when detecting sadness and dynamic bodies when detecting fear. Facial expressions played an essential role in recognizing sadness, given that sadness is often associated with behaviors such as crying or complaining and is better expressed on the face. Anger is more closely related to a jerky gait (Ikeda & Watanabe, 2009). This finding is also consistent with the idea that fear is usually associated with behaviors, such as trembling, that are better expressed in body language than in facial expressions. The study found that the HAT group did not use body cues when recognizing fearful emotions.

Our research aims to study the relationship between the perception of emotions expressed by the body and face and autistic traits in dynamic expressions in the Georgian population. We want to answer the research questions: Does the perception of emotions expressed by the face and body correspond to the same factor? What is the relationship between autistic traits and emotion perception? We expect that the higher the autistic traits, the more difficult it will be to identify emotions when presented with both facial and body emotional expressions.

Methods

The study was conducted using a correlational research design.

Participants

The Ethics Committee of Ilia State University approved the study.
Study participants were practically healthy adults with no history of mental health problems. A total of 240 people participated in the selection phase of the study, and 179 participants continued, with a mean age of 32.45 years (SD = 4.757). Gender distribution was 87.2% female and 12.8% male. Most participants had higher education, followed by professional and secondary education (see Table 1).

Questionnaires

We used the Autism Spectrum Quotient (Baron-Cohen et al., 2001b) to assess autistic characteristics. The AQ is a self-report instrument that is not diagnostic but evaluates the degree of autistic traits in normally developing adults. The Likert scale used in the instrument (completely agree, partially agree, more disagree, completely disagree) includes 50 questions in the original version. Each of the 10 questions assesses 5 different skills: social skills, attention switching, attention to detail, communication, and imagination.

The factorial structure was processed to validate the questionnaire in the Georgian language, resulting in a final questionnaire consisting of 17 statements covering the field. CFI = 0.871; TLI = 0.839; RMSEA = 0.058 (0.051–0.066); SRMR = 0.052; χ^2 = 302.465, df = 109; p = 0.000.

For facial emotion recognition, we used the Amsterdam Dynamic Facial Expression Set-Bath Intensity Variations (ADFE-BIV; Wingenbach et al., 2016), which is an adaptation of ADFE (van der Schalk et al., 2011) and includes three standardized video intensities for each emotion: low, medium, and high. In our research, we used the following basic emotions: anger, disgust, fear, sadness, surprise, happiness, and "neutral." When viewing a video displayed on the screen, lasting between 0 and 2 seconds, the participant had to choose one of the listed emotions, with a total of 138 videos.
Body emotion identification was measured using a computerized version of the Point-light task (PL) (Heberlein et al., 2004), consisting of 40 videos, each lasting 5-10 seconds. A white silhouette can be seen on a black background, representing different emotions with the body, where the face is not visible. Emotions assessed included fear, anger, sadness, happiness, and "neutral."

Mental health was assessed using anxiety and depression screening tests: the Center for Epidemiologic Studies Depression Scale (CES-D) – Boston Form (Kohout et al., 1993) and the Generalized Anxiety Disorder Assessment (GAD-7) (Spitzer et al., 2006). Both are validated to Georgian language.

Procedure

After obtaining informed consent, we administered anxiety and depression screening tests to study participants to rule out mental health difficulties. Next, we sent a link providing access to videos of facial and body emotions and a screening questionnaire to assess autistic traits. Participation in the study was voluntary, with a guarantee of confidentiality.

Results

Data were processed using SPSS software (version 24).
A statistically significant negative correlation of autistic traits was noted with the perception of facial anger emotion (r = -0.191, p = 0.012), as well as with the identification of anger (r = -0.157, p = 0.040) and happiness (r = -0.161, p = 0.035) of body emotions.

There was a negative relationship between autistic traits and the perception of negative emotions in the face when we combined the following emotions: anger, disgust, fear, and sadness (r = -0.151, p = 0.048). After the analysis, according to the intensity of facial expression of emotions, a negative correlation was revealed between autistic traits and the low intensity of anger ($r=-0.172$; $p<0.05$), and also with high intensity of fear ($r=-.161$; $p<0.05$).

No connection was found between the perception of positive emotions expressed in the face and autistic traits, including the emotions of sadness and fear expressed by the body (see Table 2).

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Table 1 *Demographic Characteristics of Participants*

	n	%
Gender		
Female	156	87.2
Male	23	12.8
Marital status		
Single	2	1.1
Married/partnered	163	91.1
Divorced/widowed	14	7.8
Educational level		
High school	17	9.5
Professional education	17	9.5
Postgraduate degree	145	81

Table 2 Correlations between Body Emotion (Point light), Face emotion (Dynamic) and Autistic Traits (AQ)

	Body Emotion Happy	Body Emotion Sad	Body Emotion Neutral	Body Emotion Angry	Body Emotion Fear
Autistic Trait AQ	-.161*	-	-	-.157 *	-
Face Emotion Happy	.305 **	.389 **	.154 *	.253 **	.340 **
Face Emotion Sad	.191 *	.271 **	.189 *	.255 **	.240 **
Face Emotion Neutral	.246 **	.286 **	.280 **	.254 **	.322 **
Face Emotion Angry	.221 **	.300 **	-	.251 **	.272 **
Face Emotion Surprise	.253 **	.340 **	.156 *	.290 **	.342 **
Face Emotion Fear	-	-	-	-	.161*

Note: N=172, *p<0.05 **p<0.01

Conclusion

First of all, the correlation between autistic traits and the perception of anger as expressed through facial and bodily cues is noteworthy. Individuals with high autism scores have difficulty perceiving the emotion of anger in both modalities when observing facial and body movements. According to other studies, individuals with autism experience challenges in recognizing emotions such as anger (Ashwin et al., 2006), fear, and disgust (Humphreys et al., 2007; Wallace et al., 2008), as well as sadness (Corden et al., 2008; Wallace et al., 2008). Emotion recognition of sadness, anger, and fear is primarily associated with the eye area, while happiness and disgust are linked to the mouth (lower face) area (Calder et al., 2001).

Studies utilizing eye-tracking technology have examined how children with autism scan emotional faces. They generally focus less on key features (e.g., eyes, nose, and mouth) than typically developing children (de Wit et al., 2008). Reduced attention to the eyes and increased focus on other areas of the face and body may hinder the ability to recognize negative emotions (Dalton et al., 2005; Klin et al., 2002; Pelphrey et al., 2002).

Another study conducted with individuals on the autism spectrum highlights the deficit in recognizing negative emotions, specifically anger, sadness, and fear when interpreting facial expressions. When perceiving bodily emotions, they found it challenging to recognize happiness and fear. Significant deficits in emotion recognition were observed in individuals on the autism spectrum compared to controls across the spectrum of emotions (Philip et al., 2010).

Regarding the recognition of body emotions in individuals with autism spectrum disorder, emotions are recognized with less accuracy: anger (Atkinson, 2009; Nackaerts et al., 2012), happiness (Atkinson, 2009; Philip et al., 2010; Nackaerts et al., 2012; Mazzoni et al., 2020), disgust (Atkinson, 2009; Nackaerts et al., 2012), fear (Philip et al., 2010; Mazzoni et al., 2020), and neutral expressions (Mazzoni et al., 2020).

The results of our study also revealed a negative relationship between the emotion of happiness expressed in the body and autistic traits.

Although most previous studies on emotion processing in ASD have utilized static facial expressions, participants with ASD took longer to recognize dynamic stimuli (Mazzoni et al., 2022). In our study, there were dynamic tests for both facial and body emotion recognition; however, participants were not time-restricted.

Our results indicate that the perception of emotions in faces and the perception of emotions in movement are not the same concerning autistic traits. Only the emotion of anger was generalized across both modalities, unlike the other emotions. Facial and bodily emotions are perceived differently by individuals with autistic traits, consistent with other studies (Actis-Grosso et al., 2015; Philip et al., 2010).

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Conflict of Interests The author state that there is no conflict of interest.

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