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Previous research in autism has suggested that various features such as social and cognitive impairments as defined by one's inability to recognize facial expressions of others. Eye gaze has played as one of the key concept in distinguishing autism; hence, various studies focus on defining characteristics like eye gaze to understand how autistic individuals detect emotions. Similarly, another disorder known as prosopagnosia has been noted to identify those who are incapable of recognizing faces and therefore are unable to notice emotions. The following paper discussed variables of both disorders, autism and prosopagnosia, and how one can help identify the other at an earlier stage. Specifically, this paper examines the methods of prosopagnosia, and how if applied, can be used to detect autism in infants. Furthermore, the design had participants perform two diverse experiments, which measured their hemodynamic response. Expected results were then further discussed to understand how the prosopagnosic methods would aid early autism detection in children as young as six months.

Technology is advancing at a very fast pace and its new methods, materials, and ideas have influenced the scientific world. Due to such advances, it is possible today for scientists to take two diverse ideas and transform them into a novel scheme. Prosopagnosia and Autism are similar in some aspects, they are but different in many more. However, by piecing the two disorders together, it is possible to generate solutions to aid the human population. For several years, Autism has been identified by the presence of social and cognitive impairments, as reflected in an inability to effectively communicate or recognize facial expressions of others (Tell, 2010). It has also been hypothesized that social difficulties during childhood have an alarming influence on one's ability to process facial and emotional cues properly. Hence, many studied have focused on facial processing impairments such as: correspondence of face identities, understanding and expressing emotion, as well as the occurrence of abnormal eye-to-eye gaze patterns in social situations (Tell, 2010). Individuals with autism have difficulty recognizing emotions that have been expressed through facial features, which is believed to be because of atypical face scanning patterns. Particularly, these individuals display an inclination for the mouth over the eye when understanding what emotion is being shown. This preference however, is an issue because eyes are believed to hold certain information necessary for judging emotions. In fact, infants as young as two- months -old show a preference for eyes over any other area of the face (Tell, 2010). Ability to demonstrate mutual eye contact and to track the gaze of someone usually develops very quickly. These characteristics are important milestones in an infant's life since they are essential for attachment, attention and language development. Observing eye gaze direction can aid in the recognition of various emotions.

Direct gaze was found to help recognize anger and happiness, where as averted gaze was

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found to signify fear and sadness (Tell, 2010). Another disorder identified as Prosopagnosia occurs when an individual is incapable of recognizing faces (Posamentier, 2002). This paper will discuss the notion of using a disorder like Prosopagnosia to further understand and aid children with Autism. Moreover, generating a novel method from prior studies of Prosopagnosia can help identify the onset of symptoms in children as young as 6 months. This research can advance understanding the underlying cause of Autism and how those diagnosed with it can lead a healthier life from the start.

Prosopagnosia a rare face processing disorder, is so severe to the point that the individuals are sometimes even incapable of recognizing their own face. These individuals rely heavily on cues such as voice and other features of the person for the recognition process (Posamentier, 2002). According to Eimer, Gosling and Duchaine (2012), there are many different types of prosopagnosia. Appreciative prosopganosia is selective deficit of face perception. Associative prosopagnosia is a disorder in long-term memory that specifically applies to remembering faces, as well as, a disconnection between perception and memory of faces. According to the authors, prosopagnosia can result from lesions to the areas of the brain that are responsible for face processing. These areas are usually found in the occipito-temporal visual cortex, which includes the fusiform gyrus (FG). Yet, there have been many cases where prosopagnosia is not associated with obvious acute neurological damage. Another type of prosopagnosia is developmental / congenital prosopagnosia (DP) which has an early onset. According to Eimer et al., (2012), there is evidence of an identity sensitive face processing mechanism which can be observed through the skin conductance of individuals shown faces of famous or familiar people.

Autism Spectrum Disorder (ASD)

ASD is defined as a continuity that includes autistic disorder, Asperger syndrome, as well as many other developmental disorders. Symptoms of abnormal social development include poor eye contact, delayed or lack of gaze, inability to understand others mind as well as lack of facial expression. Most of these symptoms can be observed before the age of three- years. According to Tell (2010), autistic individuals show certain abnormalities in some brain regions during face processing and attempting to understand someone else's emotion. They show weak activity in the FG, which is the area that processes facial features. However, these individuals tend to show increased activity in the inferior temporal gyrus (ITG), which is involved in processing objects. Since the FG lies between the ITG and parahippocampal gyrus, it can be inferred that face processing takes place in the same place where object processing happens. To investigate the problem, DeGelder's et al. study (1991, as cited in Tell, 2010), focused on autistic children from the age of six- to sixteen-years. Results showed that they did poorly on face recognition tests but performed no differently that the typical control group on the non-face recognition tasks. Hence, this shows that the problem in recognition is purely discriminated towards faces. Even when the task was switched to matching faces according to their identity and matching two similar objects, they performed poorly on face recognition but not on the object recognition task.

A study by Bar-Haim, Shulman, Lamy and Reuveni (2006) showed that normally developing individuals rely on the eyes for cues regarding the psychological state of others. However, those with autism have difficulty understanding the mood of others just by looking at their eyes. This illustrates that eyes are very importance for typical individuals but for autistic individuals, eyes are only important when it is task related. Moreover, the author also states that a study done by Klin, Jones, Schultz, Volkmar and Cohen (2002) found that

during a movie, typical individuals fixated more on the eyes, while autistic individuals focused more on the mouth area of the characters. This study examined the difference between typical and autistic children when a facial stimulus was presented. A probe detection task was used to compare the attention given to the eyes in comparison to the mouth area in autistic and non-autistic boys. In the first half of the study, a small dot probe was placed near the eye and the mouth region of the photograph. The other half did not involve a probe. Participants were asked to answer as fast as possible when they detected a probe. Results showed that with upright faces, both groups fixated more on the eyes area than the mouth. It was suggested that abnormal face processing in autistic children is not because of atypical attention portion to areas of the face, because both autistic and non-autistic kids first fixate on the eyes. However, according to the authors, this could be because of the atypical behavior that might not be obvious until a more complicated moving stimulus in a naturalistic setting is observed.

A study by Hudson (1986) focused on both autistic and non-autistic individuals understanding of the "meaning" of a certain emotion, gesture and vocalization of a specific emotion. The purpose was to see if the children were able to identify how various facial expressions of a certain emotion are linked with one another, and that what sort of emotion would an individual display in certain situations. Participants were shown videos of the observer acting out various facial, gestural and vocal expressions of four emotions and then displaying those emotions in various situations. This was done by presenting "emotions" and "things" videotapes to the child. The "emotions" tape featured a masked experimenter who executed a gesture that the child had to match to a facial expression. Hence, the child would choose anger, unhappiness, happiness or fear as one of the options. Following this test, the child had to listen to non-verbal vocalizations and match one of the emotions to what they had heard. Lastly, the "things" video was presented and the child observed the context rather than the movement. In comparison to normal and mentally challenged children, the autistic individuals displayed a significant impairment when selecting the proper emotion to match the gesture they saw and the vocalizations they heard. Yet, they showed no impairments with the "things" task.

A study by Ashwin, Chapman, Colle and Baron-Cohen (2006), stated that recognition of emotions such as fear and anger (negative emotions), have led researchers to compare ASD individuals with those who have damage to their amygdala since they show similar emotional recognition patterns. Even though the evidence is very weak for loss of fear in ASD, the findings for recognizing emotion connects ASD to impairments of the amygdala (area where emotion is regulated). For example, those with ASD show atypical perception of the direct gaze and the trustworthiness of others and both of these involve the amygdala. Moreover, people with damaged amygdala are unable to perceive these facets altogether. Functional neuro-imaging showed decreased activity of the amygdala in ASD individuals when negative emotions were processed. The author also states that structural neuro-imaging studies show difference in the size of the amygdala in autistic individuals as well as differences in the neural communication amongst the amygdala and other parts of the brain. Furthermore, brain autopsies have also revealed that ASD individuals have atypical cells in the amygdala. Therefore, the amygdala plays fundamental role in ASD individuals since it can affect recognition of emotions. So, in order to test facial recognition in ASD males, the author used photographs to display basic facial emotions. The authors stated that if recognizing emotions in ASD individuals was restricted to only complex emotions, then there should be no difference between the two groups when basic emotions were presented. Furthermore, if lack of emotional recognition were linked to deficits in the amygdala, then

less precise recognition for negative emotions would be expected. The first experiment consisted of a collection of emotional photographs, which displayed fear, disgust, anger, surprise or sadness. The participants had a list of the above-mentioned emotions and had to match them to the picture that corresponds to the appropriate word. According to the results, ASD males were less accurate when identifying basic emotions specifically fear, anger and disgust (negative emotions). This shows that the deficit is more apparent when identifying negative emotions. Moreover, the participants also displayed regular recognition for some of the non-negative emotions. Therefore, ASD males do not seem to simply lack the ability to recognize facial expression, but instead there exist a specific deficit in recognizing negative emotions. In the second experiment, the authors included neutral and happy emotions in the photographs and observed to see if the results would be consistent with the first test. They also included the Benton Face Recognition Test (Benton et al., 1983 as cited in Ashwin et al, 2006) to distinguish a target face from six novel faces that were also displayed. Participants were asked to identify which faces matched the target face. The results for experiment two were consistent with those of experiment one, which showed impaired performance by the ASD males for negative emotions and showed no difference for the non-negative ones'. Hence, such serious deficits in basic emotion recognition could influence one's social development, thereby hindering their ability to understand others' thoughts. Therefore, people with ASD have difficulty in situations that involve social interaction with others.

Another study by Dawson, Carver, Meltzoff, Panagiotides, McPartland and Webb (2002) reported that autism is correlated to the dysfunction of the areas in the brain specialized for early development of social interaction. The authors were interested in testing young children's electrical brain responses to both familiar and unfamiliar faces and objects. According to Klin, Sparrow, de Bildt, Cicchetti, Cohen et al. (1999), children with autism scored lower on face recognition tasks than those who were developmentally disabled and were not autistic. The current authors also presumed that the neurons that integrate face recognition appear in the early stages of life and this suggests that the impairment in these neural systems may be indicative of abnormal brain development. Experiment on monkeys showed that specific neurons that recognized faces are available in the ITG, the superior temporal regions (amygdala and ventral striatum), and in the inferior nodule. FMRI studies on face recognition have shown that damage to FG and the amygdala can result in the disability to recognize faces. Also, the anterior inferior temporal cortex and superior temporal sulcus extend to the amygdala as well. In this case, the amygdala linked proper significance to the faces and hence, influenced attention and suggestive features that acted as hints when processing faces. The authors used a high-density event related potentials (ERP) recordings to observe electrical brain activity when familiar and unfamiliar faces and objects were shown to ASD, developmental delay (DD) and typically developing children. First, the authors photographed the mothers with a neutral expression and matched them with other mothers within the same ethnicity. They also looked to see if some of the mothers wore glasses and made sure the matched- mother did too. When objects were selected as the stimuli, each parent was asked to bring their child's favorite toy. Each toy was matched with a digitally modified toy that other parents had bought. A key concept to be noted was that the "familiar" toy was from the same category (e.g., trucks), but the "unfamiliar" toy was only similar in shape, size and color not in function. The children were shown both categories and their neutral activity was recorded. The results showed that in comparison to the DD and typically developing children, ASD children did not show differential brain electrical response to

their mothers face or the unfamiliar face. In fact, they showed more activity when the unfamiliar and familiar objects were presented. Surprisingly, their ERP response to the objects was actually similar to those of typically developing children. Moreover, the authors stated that a specialized system for face processing exists, which may have a genetic abnormality, that caused the ASD to children to produce such results when they were shown their mother's and a stranger's face. Furthermore, newborns were capable of recognizing faces, which suggested that face processing is present from birth. According to PET scans performed, this recognition takes place in the right FG. (Mazoyer et al., 1999, as cited in Dawson et al., 2002). However, the authors also stated that the experience might have influenced the atypical development of face processing in autistic individuals. It was also suggested that lack of experience driven input might result in diminished significance the child may give to the face.

Study by Pierce, Muller, Ambrose, Allen and Courchesne (2001), stated that the lack of social interaction and emotion detection might be because of structural and functional brain defects. In fact, the authors stated that research such as Baron-Cohen et al. (1999) and Critchley et al. (2000) have found diminished activity in the amygdala in social situations and during emotional processing. Other authors such as Schultz have found decreased activity in the FG and elevated activity in the ITG during basic face processing. The authors of this study also stated that autistic individuals have the ability to differentiate between males and females, but as the processing becomes more detailed, their performance begins to decline. Furthermore, autistic individuals do not look at the face holistically but focus on each feature individually. Commonality in face processing behavior between autistic individuals and participants with acquired fusiform lesions suggests that autistic individuals might have a structural anomaly in their cortex. The amygdala has been established as an essential structure in many aspects of facial processing (e.g., acknowledging a threatening versus non-threatening face). The purpose of this study was to use fMRI on autistic individuals to observe activity in various areas of the brain during facial processing. The hemodynamic response of the individuals was measured during a face perception task. FG was chosen as the dominant cortical Region of Interest (ROI) since it is the most involved during facial processing. Differences between typical and autistic individuals were analyzed by measuring the grey and white matter that including the range of the Fusiform Face Area (FFA). The results revealed that low or no activation was seen in the FFA which maybe due to the lack of experiences with faces throughout development. Moreover, compared to typical individuals, autistic persons viewed faces by using various different neural circuits than normal individuals.

Prosopagnosia

The study by Eimer, Gosling and Duchaine (2012) used event related brain potential indicators of face processing that is specific to one's identity, to explore covert (hidden) face recognition. This measure was chosen because event related potentials provide information about the neural connections involved in the cognitive processes taking place and show discontinuity between both covert and overt identification. Moreover, the researchers aimed to observe the presence, and the neural base of covert face recognition in those with DP. Participants were asked to judge familiarity of famous and non-famous faces. Along with the event related potentials, an electroencephalography (EEG) was also recorded during the participants' performance. They found that in six of the twelve participants with DP, non-recognized famous faces provoked an occipito temporal N250 element, which mirrors the activity of the stored visual memory of familiar faces. Therefore, event related potential showed that DP individuals

classified famous faces as familiar faces. In general, these event related potentials showed neurophysiological support for covert face processing in DP and demonstrated that it results from discontinued links between identity specific visual memory and semantic face processing stages.

A study by Le Grand, Cooper, Mondloch, Lewis, Sagiv, de Gelder and Maurer (2006) investigated individuals with DP and their facial processing skills. All individuals mentioned a constant difficulty with facial recognition including the faces of family or close friends, even though they have had no history of any brain trauma. Many tasks such as face identification, holistic face processing, bias towards facial identity, indentifying the sex of the face, and judging one's attractiveness were included in this experiment. The authors compared the DP individuals to a typical control group. The first task (i.e., face detection) required the participants to recognize whether the stimulus was a face or not. They used the Mooney images, which are images that have the local features changed into black and white. According to the authors, the Mooney faces triggered the FFA. Results showed that the DP performed well and were able to tell the difference between the Mooney image and the scrambled stimuli. The second task (i.e., the holistic task) required the DP to recognize the top and the bottom half of the face being presented, which is called the composite face effect. If the halves of the face are inverted, this disturbs the process of matching the two halves together, which makes it difficult to integrate the individual features. Participants had to match the bottom half with the top half of the face and vice versa. The results for this task showed that seven individuals demonstrated the composite effect and performed exceptionally well in identifying which half belonged to which. The third task (i.e., bias towards facial identity) included the "Jane task", which is when a single face is changed to make three sets of face stimulus with four faces in each set. The participants are asked to judge whether the faces presented were the same or different. For this task, the results showed that the DP participants struggled because they could not process the curvature of the face. The fourth task (i.e., attractiveness) required them to judge eighteen faces on a five point Likert scale. Results displayed that most of the individuals made average judgments on attractiveness. Lastly, the fifth task (i.e., the sex of the faces) required the participants to decide if the stimulus presented was a female or male. Here the results displayed that DP performed normally as well. Yet, even with the results the authors disagreed and stated that these results cannot be generalized in the real world.

Another study by Marotta, Genovese and Behrmann (2001), examined the pattern of activity in the FG of patients with prosopagnosia and compared them to a control group. The participants included two males who had experienced head trauma. The experiment included grayscale pictures of faces, objects and jumbled images, as well as a fixation cross. The authors used an fMRI and found that activated vaxels; yet the location of the activation was different between all participants. When viewing various faces, prosopagnosic individuals showed more activity in the back area of the FG than the control group.

Lastly, a study by Campbell, Heywood, Cowey, Regard and Landis (1990), examined one's ability to identify frontal eye gaze under various environmental situations. Participants were asked to choose the face that was looking straight at them, from the paired stimuli (photographs) presented. They aimed to establish whether individuals with prosopagnosia would be impaired in performing this task. It was discovered that these individuals possessed significant impairment in the task. The authors predicted that the deficit in the gaze task might be a result of the intact face-affect and face identity recognition. Surprisingly

however, one of the two individuals was able to name picture of objects properly.

The aim of the current longitudinal study is to determine if the use of prosopagnosic methods on infants that show symptoms of autism could be used to detect early onset of autism. This study is unique because it uses very young participants to see if the use of these methods could help detect autism before major symptoms start to present themselves. It was hypothesized that individuals that show minor symptoms would (1) show low-level activity in the FG and amygdala when presented with a neutral face photograph of their caregiver, (2) show decrease in activity in the FG and amygdala region when they view a smiling strangers photograph, (3) display an increase in ITG and FG when they view the three objects (square, triangle and circle) and (4) display no increase in FG, ITG or amygdala when they see the makeshift smile.

Methods

The current study will examine infants that display various symptoms of autism. These participants will be observed to establish which areas of the brain are stimulated during the two separate experiments that will be taken at two different times. Corresponding results from past studies displayed similar results which demonstrated that damage in the amygdala and FG could hinder one's ability to process emotion and facial expressions, as well as individuals with autism are able to distinguish between objects which means that autism is specifically discriminative towards faces.

Participants

The study was a longitudinal design that observed ten participants at two different times. The first time was when they were six months and the second time was when they were four years old. The participants that were selected all showed symptoms of autism such as lack of eye contact and social interaction, failure to respond to his or her own name, resistant to cuddling or holding, delayed speech and repetitive movements (e.g., rocking), (Melinda, Jeanne and Ted, 2013). The study also included a control group of ten healthy, typical individuals who were examined at six-months and four years to compare activity in both autistic and normal individuals.

Materials

Stimuli.

Face stimuli. A digital camera against a white background will obtain photographs of each child's caregiver (familiar stimuli). All caregivers' will wear a black turtleneck to cover their neck area and will express a neutral face. After that, a picture of a random female smiling in front of a white background will be selected from the Internet (non-familiar stimuli). The neck of the girl will be colored in with black to keep the stimuli consistent. Lastly, a picture two black lines and a black half crescent suggesting a makeshift smile will be presented against a white background.

Object stimuli. A grey square, circle and triangle will be designed against a white background. None of these objects will include a face.

Functional near-infrared spectroscopy (fNIRS). An fNIRS will be used to examine which area of the brain (amygdala, FG or ITG) will be activated when a certain stimuli is presented. Any change in the blood oxygenated level will be noted when the subjects perform the face and object recognition task. Six non-repeating stimuli will be presented for thirty seconds each with a five second interval in between.

Regions of Interest (ROI*).* Before the analysis, three cortical ROI's were established. The FD, temporal gyrus and the amygdala will be tracked by the high resolution images for each participant's through. The subjects are expected

to have some activity in certain ROI's during the task when specific stimulus is presented. As cited in Pierce et al. (2001), the procedure used to outline the cortical ROI (specifically the FG) to observe the difference between autistic and typical individuals can be by measuring the volume of grey and white matter that surrounds the FFA.

Procedure

Experiment 1. The six months old infants will be placed in the lap of one of the experimenters in front of a blank screen. A total of six slides will be presented for thirty seconds each. The first slide will have the picture of the caregiver with a neutral expression. The second slide will include a picture of the random female. The third, fourth and fifth slide will include the three shapes in no particular order. Lastly, the sixth slide will have the makeshift smile that will be presented. Following each slide, the area activated in the brain using fNIRS will be observed to see which region is triggered after stimuli is presented.

Experiment 2. When the participants (both autistic and typical children) turn four, they will be brought back to the lab to perform the same study. The conditions of this experiment will be similar to those of the first and there will be change in the content of the slide. After the experiment is conducted, the results will be compared to see if the data from experiment one is consistent with data from the second experiment. The children who were later diagnosed with autism should display the same results.

Data Analysis

A t-test and a ROI will be used to determine which areas of the brain were activated when the two stimulus were presented. The ROI will be calculated first and a t test will then be performed, comparing both experimental conditions.

Discussion

The current study will use prosopagnosic methods to observe infants that display symptoms of autism. Prosopagnosic techniques are being used because individuals with this disorder show a similar indication of a lack of face processing as ASD individuals. Previous studies have shown that both groups have difficulty processing faces. Specifically, autistic individuals have difficulty understanding emotions, while individuals with prosopagnosia have difficulty processing faces, since they observe each feature of the face separately, which hinders their ability to understand emotion (Pierce et al., 2001). The critical question then is: Do methods used with propsagnosic patients will apply to autistic individuals? Therefore, the current longitudinal study will use infants that show symptoms of autism, at time one and time two, to measure the activity in the three ROI's through the use of fNIRS. It was hypothesized that autistic individuals (1) would display a weak level of activity in the fusiform gyrus and the amygdala when a neutral face of the caregiver is presented, (2) would also display a low level activity in the amygdala and the fusiform gyrus when a strangers smiling face was viewed, (3) would have the inferior temporal gyrus activated when the three objects were presented, and (4) neither of the ROI's (FG,ITG, amygdala) observed would display an increase in activity when a makeshift smile is presented.

Since the experiment has not yet been conducted, the current paper has inferred certain results that could be expected of the study. For experiment one, it could be anticipated that certain areas of the brain should and should not be activated when certain stimulus has been presented. Particularly, according to hypothesis one, it is expected that the autistic individuals will display a very low amount of activity in FG when they see the picture of their caregiver. This is expected because although it is in the FG that typical individuals process faces, the FG's

of autistic individuals are likely to be damaged (Tell, 2010). Although the caregiver has a familiar face, according to previous literature (Dawson et al., 2002), individuals with autism have difficulty processing faces, which hinders their preference for a familiar face over a non-familiar face, according to previous literature (Dawson et al., 2002). Hence, damage to this area can result in impaired facial recognition. Moreover, the amygdala will most likely display a decrease in activity, since it is not only responsible for emotion but also assists the brain in processing faces. Damage to both areas may hinder their ability to process faces, which will also influence their ability to recognize the emotion displayed. Even if the caregiver in the experiment does not show a positive or negative emotion, the infant is likely to show a decrease in the level of activity in the amygdala, which could be due to several reasons such as its size, structure or the abnormal cell formation (Dawson et al., 2002; Ashwin et al., 2006).

For hypothesis two, it is expected that a similar set of results will be found since the autistic infant lacks the ability to discriminate between familiar and non-familiar faces. These individuals will have difficulty processing the smile in the unfamiliar picture and, most likely, will display a very low amount of activity in the both the FG and the amygdala. Such results were also displayed in Dawson's et al, study (2002), which found that there was no difference in activity when the mothers face and a strangers face, was presented.

In regards to hypothesis three, when a triangle, square and a circle are presented, the child is likely to show an increase in both FG, as well as ITG. This is because the object processing takes place in the ITG and, since the FG is located between the ITG and parrahippocampal gyrus, FG might also be involved in this process (Tell, 2010). This idea is supported by previous literature because similar results were found when autistic participants were compared to typical participants, and showed a similar outcome during the object recognition task (Tell, 2010; Dawson et al., 2002; Campbell et al., 1990).

Lastly, for hypothesis four, it is expected that when a makeshift smile is presented to the individuals, there should be low activity in the FG, ITG and amygdala. This is because the picture holds no significance to the child so FG and ITG will fail to acknowledge its features (i.e., the lines and the curve). Also, due to the autistic child's inability to understand emotion, the amygdala will also show very low levels of activity since they will not be able to comprehend the smile.

For the second experiment, similar results will be expected since the children that first displayed symptoms of autism and were later diagnosed with the disorder, will likely to show no change. The purpose of the second experiment is to merely to confirm the results through comparison.

There are many limitations that could affect this study. First of all, the age of the participants will present a challenge since the participants will be too young to understand any verbal communication. Therefore, it could only be assumed that they understood the content and the task based on what they saw on the screen. Moreover, due to the lack of communication in the first experiment, the second experiment cannot provide any verbal clarification of what is expected of them in order to maintain consistency and not influence the participant's judgment. Another limitation could be the number of participants. The current study only included twenty participants, which is too small of a sample to generalize the findings.

The major goal of this study was to see if the methods from prosopagnosic studies could be applied to young infants who showed symptoms of autism before they are diagnosed with the disorder. This study could also enhance the current understanding of autism and face processing in affected individuals. Studies like

this could go beyond just the conventional idea of only testing older individuals. The involvement of younger participants can help researchers gain a deeper understanding of the disorder and possibly lead to solutions that could prevent or control the disorder before major symptoms start to appear. Lastly, using novel techniques from corresponding disorders can increase our knowledge and encourage the research community to use unique methods, which may include better techniques/

In the future, research should focus on involving young individuals that have the advantage of understanding verbal communication. This way, basic questions like what they see or how they feel towards a stimulus could be asked. Asking such questions as well as being able to explain the task to them may be more appropriate to help explain what is being expected of them. Also in the future, the use of a color that is not too luminous but also not too dull may be helpful in attracting the participants' attention to what is being presented. This way, research could improve the accuracy of the results in regards to what areas are activated when the stimuli is presented.

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