Possible Social Deficit Improvement in the Autistic

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Abstract

Progressive alignment techniques can be utilized with clinically-diagnosed autistic children to improve their social cognition, or, more specifically, their ability to recognize different facial expressions according to the associated feeling/emotion. Progressive alignment techniques (that involve comparison and categorization processes) have been shown to lead to changes in children's representations of relational structure, allowing for them to more easily identify more abstract features. In general, intensive, long-term, applied behavior treatment has already been shown to improve the cognitive, language, adaptive, and academic skills of children with autism. Further, other research has proven that the amygdala is also involved in the process of behavior reinforcement through rewards (or positive reinforcement). This literature review, more specifically, aims to both A) support the idea that there is a positive correlation between progressive alignment methods and mildly autistic children with social deficits and B) demonstrate specific, potential experimental methods to support such a relationship.

Literature Review

In comparison to other bodies of scientific research, the disorder of autism has not been as widely studied in the past, and many of those existing studies examined simple emotions, such as happiness, sadness, anger, and fear. However, in this day and age, autism is now slowly growing as a research topic of interest, and other studies are now focusing on the ability of children with autism to recognize and thereby understand more complex emotions. Autistic children are naturally limited in terms of their abilities to both identify and express different emotions through facial expressions, and other symptoms include, but are not limited to, a lack of empathy, a delay in learning to verbally communicate, and a need for a very strict routine (Capps, 2006). Such social deficits make for an increased difficulty with the understanding and communication involved in the interactions of everyday social situations (in comparison to children who do not have autism).

The literature analyzed for this review suggests that progressive alignment is a method in which, by taking a piece of known knowledge or skill and altering it very slightly, you can generate an entirely new piece of knowledge or skill. Dedre Gentner, a professor of Northwestern University's Department of Psychology, is a prominent researcher who has studied progressive alignment, also known as structure-mapping theory, techniques and their effects on children diagnosed with autism. According to Gentner, cognitive development in a child can be heavily weighted in a child's ability to perceive commonalities across a spectrum of different things and in their ability to understand how to categorize things perceived as different or similar. Genter's research suggests that analysis of this relationship is best accompanied by the application of progressive alignment techniques through computer programs simulating successive comparison

examples (Kuehne, 2000). Her work focuses on a child's ability to recognize patterns and conceptualize categories across various physical characteristics, and this can be applied as a methodological foundation to improve a child's ability to recognize and understand different emotions via various facial expressions (Kotovsky, 2008). Further, it is worthy to note that the amygdala actually regulates specific facial expressions in terms of emotional reactions in its extrastriate cortex, and it has been proven that it plays a large part in fear reactivity--fear being, according to research, amongst the easier to classify of the spectrum of emotions (Morris, 1997). This correlation between the amygdala in the brain and its ability to recognize emotional reactions in the form of facial expressions--and, just as importantly, its ability to remember any specific relationships between the prior and the latter--could hold great significance in regards to the effectiveness of progressive alignment techniques when paired with behavior reinforcement through rewards, otherwise known as positive reinforcement (Morris, 1997).

Research today is lacking in terms of a more substantial foundation to support further study of autism, and this progress is of the utmost importance in order to appropriately diagnose and treat those that are affected by the disease. Current research suggests that autistic children respond well to long-term and intensive applied behavior, making significant improvement in the cognitive, language, and overall academic skills (Eikeseth, 2002).

The positive relationship between the ability to smoothly transition between actions and responses in social situations and underdeveloped neurocognitive skills--essentially, the potential link between the possible efficiency of progressive alignment methods and the improvement of various social skills in autistic people--demands attention. Previous

neuroimaging studies have already identified emotion perception neural correlates brains of those who are affected by this disorder (Abdi, 2004). Other imaging studies, such as those done by Marian Bartlett, co-founder and lead scientist of Facet--essentially emotion-perception software--have made progress in the path of providing an empirical way to observe, study, and measure varying and complex facial expressions and their relative emotions. This special software achieves this, or "reads" emotions, by tracking fluctuations and microfluctuations in the movement of facial muscles. Moreover, this software has successfully been used in Bartlett's Machine Perception Lab where it is presented to autistic children in the form of a digital game, and Bartlett's results further support the concept that autistic children do respond well to methods that involve successive applications.

While there is not a lot of research that does cover this disorder, there has been enough profound research confirming and supporting a potential correlation between progressive alignment techniques and the social cognitive deficits of those with autism.

Method: Mands

For the first experiment, progressive alignment techniques are applied in the demand for a cup. In addition, "milestones" are established to elicit responses that provide the correct categorization of facial expressions and gestures.

I. Participants

Participants of the study include mildly autistic children between the ages of 4-9 that fit all of the following identifying categories. These categories include having the ability to maintain eye contact for short (or long) periods of time, having the ability to verbalize, and presenting deficit in social communication/interaction across multiple

contexts. The autism diagnoses were confirmed based on the latest DSM-IV criteria provided by a licensed speech language pathologist with at least five years of experience working with autistic individuals. These pre-qualifying screenings are important in progressive alignment research because participants must start out with a task that can be completed with ease and without prior training.

II. Design

15 of the participants are randomly placed in a treatment group and another set of 15 participants will not be placed in a treatment group (and will, thereby, receive no training). The independent variable is the training (the progressive alignment or lack thereof). The dependent variable is the participants' accuracy in their initial and final response. This measures the level of comprehension that the participant acquires after the application of the techniques.

III. Procedure

The treatment group is exposed to curriculum that is presented in very small increments beginning with the gestural prompting of grasping the cup, whereas the control group is asked to give the full demand of asking for the cup and do not receive a tangible reinforcer. Once the participant in the treatment group reaches a predetermined "milestone" in the manding process, they receive a reinforcer of choice (i.e. edibles, toys, verbal praise such as, "Awesome job!" or "Good try!" within three seconds of a correct demand. These milestones include steps such as maintaining eye contact with the researcher to establish attention. After each milestone is accomplished, no reinforcers are given to the participant until the next step. The participants will then start to verbalize, starting with the "kuh" sound, until the participant reaches the complete mand. The expected outcome is for participants in the treatment group to mand for a cup within a shorter time period and with greater success than the control group of participants.

Method: Facial Expression Recognition Software

The second experiment consists of an interactive game that progressively builds to "activate" specific impairments associated with autism (i.e. recognition of facial expression and the ability to recognize identity through a series of expression changes). The computer program utilized first has the child begin with the identifying of simple facial expressions (that convey simple emotions, such as happy or sad) and then progress to more complex facial expressions. Abstractly, this experiment will measure the effect progressive alignment learning has upon mildly autistic children--whether or not there is a relationship between how embedded a routine activity becomes when it is presented step by step as opposed to all at once.

I. Participants

The participants for this experiment would remain the same as the participants selected for the first method (see above).

II. Design

The outcome of these measures will be provided in the form of the scores given to the participants. The scores are based upon the statistical similarity of the participant's facial markers to that of the given (digitally created) facial expression on the computer screen. The dependent variable is the child's response. Ultimately, the goal is to have the child closely mimic (with accuracy) each facial expression presented by the computer program.

III. Procedure

Participants in the treatment group receive a total of 24 hours of facial expression training with the computer-based intervention program. Following each successful identification, the

computer program displays simple facial expressions (via human images) and then progresses to more complex facial expressions, asking the child to mimic each facial expression produced. Each response will be recorded and analyzed for accuracy. A reward is provided to reinforce appropriate and relatively accurate facial expressions according to each proposed emotion. However, reinforcement is gradually resorted to extinction so as to better prepare the child for real-world scenarios. The hours of training are spread out over a course of eight days, with three hours or training per day. After cumulative training is complete, the participants are given a performance test through the same computer based program. Alternatively, the non-treatment group goes straight to the performance test without having the 24 hours of facial expression training.

Conclusion

It is hoped that, via these experiments, it will be found that 24 hours of progressive alignment training is sufficient to improve facial expression recognition and imitation as assessed by computer recognition software. Results should reveal that participants under the treatment group tend to have a higher mean than the participants in the non-treatment group. In other words, participants who master one single step at a time should have an overall higher score than the participants who are exposed to all the steps combined at once. Overall, these experiments compose merely a snapshot when compared to the number of trials of progressive alignment learning/facial expression recognition training necessary for lasting results, but there is great possibility and potential to significantly improve upon social deficits in autistic children through the implementation of these techniques. Such advances surely will provide a foundation for future research on the overall social understanding of those affected by autism.

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