ESI Preprints **Not Peer-reviewed**

The Effectiveness of a Training Program Based on Theory of Mind in Developing of Emotional Discrimination among Children with Autism Spectrum Disorder

Dr. Maryam Alshirawi,
Department of Learning and Developmental Disabilities, Arabian Gulf University at the Kingdom of Bahrain
Huda Hajji,
Academic Researcher, Arabian Gulf University at the Kingdom of Bahrain

Doi: 10.19044/esipreprint.2.2023.p64

Approved: 04 February 2023
Posted: 8 February 2023

Cite As:
Alshirawi M. & Hajji H. (2023). *The Effectiveness of a Training Program Based on Theory of Mind in Developing of Emotional Discrimination among Children with Autism Spectrum Disorder*. ESI Preprints.
https://doi.org/10.19044/esipreprint.2.2023.p64

Abstract

Weakness in the skill of Emotional Discrimination is one of the obstacles that stand in the way of interaction and social communication of children with autism spectrum disorder, and for its development, it is necessary to prepare a program that helps improve deficiencies and gives good indicators of program performance. This study explored the effectiveness of a training program based on a theory of mind on the development of deficiencies in the skill of emotional discrimination. The study is consistent with previous studies and adds to the limited literature on the experience of developing emotional discrimination in children with autism spectrum disorder. The results could be useful in improving social interaction and supporting children's expression and emotional expression needs, which in turn reduces their social and communication deficits.

Keywords: Emotional discrimination, theory of mind, autism spectrum disorder, special education, development

Introduction

Individuals with autism spectrum disorder face a clear deficiency in responding to social situations, represented in recognizing facial expressions and emotions. As Al-Smadi (2007) believes that the inability to visualize the intentions of others and not to know and share their feelings, leads to the inability to understand daily social situations, and therefore the inability to understand the feelings and emotions of others through signs, gestures, and body position. Not knowing what is going on in the minds of others and their way of thinking may lead to certain behaviors that may negatively affect others, which may constitute a deficiency in thinking and result in not interacting with others and not participating emotionally or emotionally properly. Given that facial expressions are important signals for social communication, the inability to identify such signals may impede an individual's social functioning and quality of life (Michael, 2013).

Individuals with autism spectrum disorder suffer from weakness in social communication, which is represented in the difficulty of communicating in both its verbal parts, such as linguistic expression, speech, and the use of vocabulary appropriate to the social and non-verbal context: such as understanding hints, gestures, pointing, different facial expressions, and distinguishing emotions, which can be divided into two types: basic emotions (joy, sadness, anger, fear) and complex emotions (shyness, self-esteem, disgust). This negatively affects their ability to understand different social situations, which in turn impedes their integration into society (Al-Shaibani, 2017).

A study by (Ahmed, 2009; Amr, 2012; Lazarus, 2006) confirmed that the ability to recognize emotions through facial expressions is a daily social skill that is difficult to dispense with, because of its importance in expressing feelings, emotions, needs, and intentions. Also, understanding facial expressions is an important factor in the process of social interaction. Woodburn (2008) shows that emotional discrimination is one of the basic components of the theory of mind, as it is one of the skills used in measuring the theory of mind through a task that is called the task of "the emergence of real emotion", which means the ability of the individual to understand the emotions presented to him, and therefore any deficiency in the theory of mind leads to Lack of the ability to discriminate emotionally, and understanding mental states give individuals the ability to understand verbal and non-verbal patterns in social situations, as well as the ability to read the emotions of others.

The theory of mind refers to "how the individual deals with the thoughts, beliefs, and feelings of others in terms of understanding, perceiving and predicting." Some studies have also indicated that individuals with autism spectrum disorder, have a deficiency in understanding and issuing an

appropriate response to the expressions and feelings of others, which reduces their ability to respond and interact with others (Reported in Al-Khouli, 2019).

The study of Weigelt et al.(2013) shows that recognizing facial expressions is essential for social interaction, and individuals with autism spectrum disorder find it difficult to recognize and understand facial expressions because a full understanding of emotions contributes to providing appropriate responses to different social situations, which is what individuals with autism spectrum disorder lack.

Several studies have attempted to identify the emotional facial expressions of individuals with autism spectrum disorder, but the results are still mixed. The studies (Song and Haduka, 2018) indicated; (Al-Nour, 2016) indicated that individuals with autism spectrum disorder do not suffer from a general weakness in recognizing emotional expressions, but rather a qualitative weakness in recognizing basic emotions (joy - sadness - anger - fear), and it can be said that recognizing emotional facial expressions in individuals with autism spectrum disorder is not nonexistent but selective.

However, (Tell, 2009), (Romp et al., 2009), and (Balconi and Carrera, 2007) studies showed that individuals with autism spectrum disorder fail to recognize all basic facial emotional expressions.

Despite the differences in the results reached by these researchers, they do not disagree on the fact that the lack of the ability to distinguish emotionally and understand the feelings and desires of others leads individuals with autism spectrum disorder to express their emotions in a way that is socially unacceptable and does not suit the different situations they go through. Because the deficiency in one of the skills of the theory of mind represented in (emotional discrimination) is one of the main reasons for the problems of social interaction in individuals with autism spectrum disorder, the purpose of the current study was to investigate whether recognizing and distinguishing emotions could be developed by a training program based on theory of mind. We hypothesized that children with autism spectrum disorder, when exposed to direct training sessions, would improve their ability to distinguish emotional from basic emotions.

Methods

Participants and Setting

The participants were (10) children with autism spectrum disorder who were enrolled in the Al-Wafa Autism Center of the Bahraini Society for Intellectual Disability and Autism, between 6-11 years old. According to the records of the workers in the center, these children suffer from autism spectrum disorder without any other disabilities, and most of them have acceptable language skills and can respond correctly if asked.

All participants were evaluated (before the program) using the emotional discrimination scale prepared by the two researchers, to determine the number of emotional expressions they were able to distinguish between a set of twelve pictures, each picture depicting different emotional expressions for simple expressions such as 'joy, sadness, fear and anger' Each target picture was presented with three distraction pictures and participants was asked to indicate the target emotional expression. Responses were scored as correct when the child indicated the target facial expression. All other responses were scored as incorrect if the child did not respond to the first prompt or indicated more than one facial expression on which a single prompt was made (e.g., point to happy).

Setting and materials

The sessions were conducted by the researchers, five days a week, and each session lasted about 25-30 minutes. The program continued until certain proficiency standards were met. The training sessions were conducted individually in a private classroom equipped with means and tools. The training room contains a workbench, a set of chairs, program materials, and activity files, where games and reinforcers were clearly displayed. Cards of each emotion were placed in separate transparent boxes, with icons and pictures identifying the materials in each box.

There is a set of cards with each drawing of a child's face: either happy, sad, angry or afraid. These stimuli have been validated and used extensively in program preparation and research. These feelings were included as participants had previously been taught to use these cards and were familiar with them. There were also a number of situation cards, each representing a simple graphic of a context that could be described as producing one of the primary emotions (happy, sad, angry, or afraid). The cards for happy situations included representations of: 'It's a birthday', a child playing with his friends, the cards for sad situations included cards representing: 'His friends won't let him play', 'He fell and hurt himself', and 'The death of his goldfish'. The angry situation cards included representations of: 'his balloon bursting', and 'his sister pulled the remote control out of his hands', and the fear situation cards showed representations of a dentist appointment, thunder and lightning sounds, and the breaking of a glass of water.

Procedures

During each session, participants were presented with 20 trials, and four cards placed on the table in front of the participant. There was one card for each type of emoticon. These cards were randomly selected for each trial, except that each card representing each of the four emotional expressions

was presented 5 times. Once the situation Cards were presented, the participant was given one expression card (either happy, sad, angry, or afraid) that represented one of the emotions described in the situation Cards. These expression cards were randomly selected for each situation, except that each emotion was selected at least 6 times during the session. The participant was asked to place the emotion card on top of the situation card that it represents, using the appropriate signals and vocal requests for each participant. If the participant places an emotion card over a situation card that depicts that emotion, it is recorded as the correct response. If an emotion card is placed over the inappropriate situation card, or a response is not made in 10 seconds, it is scored as an incorrect response. Then, the situation cards are removed, and a 5-second period ensues to start the session again.

During the matching training phase, the participant had to match a given emoticon card to one of four emoticon cards. However, two additional procedures have been introduced for this learning phase – the reinforcement procedure and the praise feedback for the correct response. Each participant was asked to point the expression card at the correct situation card, along with a verbal request (e.g., “Put the happy face with the birthday boy”). This was practiced with all participants in each trial. Verbal cues were used to help. To be recorded correctly the participant had to place the expression card on top of the appropriate situation card. . If the expression card is matched correctly with the situation card, the child is reinforced with verbal praise (e.g., “Well done, the kid is happy because it's his birthday!”). The response is incorrect if the expression card is placed over an inappropriate situation card, or If no response was issued within 10 seconds, after each session there were 5 seconds to re-correct using software help via the iPad.

During the matching phase, the memorization was stopped, and the participants were asked to match the expression card with one of the four situation cards shown without immediate assistance. If the expression card is correctly matched to the situation card, the child is reinforced with verbal praise (e.g., “Well done, the child is happy because it's his birthday!”). An incorrect response was defined as expressions not matching the target situations correctly, or no response was given within 10 seconds.

At this point, four emotion cards were presented, one each for happiness, sadness, anger, and fear, along with four cards for other unfamiliar emotions (e.g., disgust). The four situation cards were presented in random order, except that there were at least 6 emotion cards for situation cards of each emotion. Then the participant was asked to present the emotion card that matches the situation card to the researcher. Each presentation of the situation card was also accompanied by a verbal cue. For happiness, these cues included: "It's his birthday, how does he feel?", "His friends have come over to play, how does he feel?", Sad situations included: "His goldfish

died, how does he feel?", "He fell and hurt himself, how does he feel?" And so with other emotional situations, and in order for the points to be scored correctly, the participants had to choose from the happy, sad, angry, and fearful emotion cards they had, and exchange them with the researcher when answering the question. The researcher's response to the correct match was to reinforce the behavior with a description (e.g., "The child is happy because it is his birthday, or the child is angry because the balloon burst", etc.). An incorrect response was defined as presenting an expression card that did not match the situation, making an irrelevant response (e.g., a picture card that was not a facial expression), or making no response.

At this stage, to measure the ability to understand emotionally, papers and pens were presented to the participants, following the instructions of the researcher, where the participants had to draw the appropriate emotional expression for each situation presented to them, so the correct response would be recorded if the emotional drawing matched the situation presented to him, and an unresponsive response would be recorded. valid if the correct drawing is not submitted.

In the last stage, the participants were asked to search for emotional expressions through a set of pictures presented to them, distinguish them and put them in the special boxes for each emotion. The correct response is recorded if the participant was able to distinguish the emotions and put them in the appropriate box that bears the same expression, for example the participant is expected to put each emotional expression that represents happiness in the box that bears the expression of happiness. The wrong response is recorded if the participant puts the wrong emotional expression in the wrong box.

The ability to distinguish emotional situations was also measured by presenting the situation cards that represent the four emotions, different from those presented in the previous stages, and the participant has to present appropriate emotional cards and link them to the emotional situation cards presented to him - as each situation card has 3 emotional cards for one expression: (A happiness emotion situation card is matched by 3 happiness emotion cards, and so on). The correct response is recorded if the participant is able to distinguish the emotions and link them to the situation card. The wrong response is recorded if the participant associates a situation card with a wrong emotion card, or if he does not issue any reaction within 10 seconds.

Results

Results related to the first hypothesis:

To verify the validity of the first hypothesis, which states: There are statistically significant differences between the pre-application and the post-

application on the emotional discrimination scale for children with autism spectrum disorder in favor of the post-application.

Table 1. The arithmetic means and standard deviations of the scores of the experimental group on the emotional discrimination scale in the pre and post application

Dimension	the experimental group	The arithmetic mean	The standard deviation
The emotional understanding	**Pre**	**13**	**2.23**
	post	**21.2**	**.837**
the emotional attitudes	**Pre**	**4.8**	**.837**
	post	**7.2**	**.837**
The overall standard	**Pre**	**17.8**	**2.38**
	post	**28.4**	**1.34**

Table (1) shows that the arithmetic mean of the total score of the emotional discrimination scale for children with autism spectrum disorder in the experimental group in the pre-measurement is equal to (17.8) with a standard deviation of (2.38), while the arithmetic mean in the post-measurement was (28.4) with a standard deviation of (1.34). It was also found that the arithmetic mean of all dimensions in the post-measurement exceeded the arithmetic mean in the pre-measurement, and to verify the significance of the hypotheses obtained between the mean scores of the pre- and post-measurements, the Wilcoxon test was used, as in Table (2):

Table 2. Results of the Wilcoxon correlated samples test for the differences between the mean ranks of the experimental group for the two pre and post measurements.

Dimension	ranks	The number	Total ranks	Mean ranks	Z value	Seen indication
The emotional understanding	Negative ranks*	0	0	0	2.03	0.42
	positive ranks**	5	15	3		
the emotional attitudes	Negative ranks*	0	0	0	2.06	0.39
	positive ranks**	5	15	3		
The overall standard	Negative ranks*	1	0	0	1.89	0.06
	positive ranks**	4	10	2.50		

It is clear from the results in table (2) and depending on the positive ranks, we find that all children in the experimental group had higher scores in the dimensional measurement than their scores in the tribal measurement

in the total score of the scale and in the dimensions, where the average of the positive ranks was (2.50), while the average of the negative ranks was equal to zero, and by referring to the values of the significance level, we find that it is less than the significance level (0.05), and therefore the difference between the mean ranks of the experimental group in the pre and post measurements is statistically significant.

Results related to the second hypothesis:

To verify the validity of the second hypothesis, which states: There are statistically significant differences between the experimental group and the control group in the post application of the emotional discrimination scale for children with autism spectrum disorder in favor of the experimental group.

Table 3. The arithmetic means and standard deviations of the scores of the experimental group and the control group were calculated on the emotional discrimination scale in the post-measurement

Dimension	the experimental group	The arithmetic mean	The standard deviation
the emotional understanding	Control	17	2.8
	experimental	21.7	3.1
the emotional attitudes	Control	11	2.04
	experimental	24.2	3.53
The overall standard	Control	17	2.8
	experimental	26.8	2.5

Table (3) shows the arithmetic mean of the total score of the emotional discrimination scale for children with autism spectrum disorder for the experimental group equal to (26.8) with a standard deviation of (2.5), while the arithmetic mean of the total score of the control group was (17) with a standard deviation of (2.8), and to verify the significance of the differences from the significance Differences between the mean scores of the experimental and control groups on the emotional discrimination scale for children with autism spectrum disorder The Mann-Whitney test was also used to verify the significance of the differences between the mean scores of the experimental and control groups on the emotional discrimination scale for children with autism spectrum disorder, as in the table (4):

Table 4. The results of the Mann-Whitney test for the differences in the mean scores of the two groups on the emotional discrimination scale in the post-measurement

dimension	group	Mean ranks	Total ranks	(U) value	Seen indication
the emotional	experimental	8.00	40		

understanding				0.01	0.002
	Control	3.00	15		
the emotional	experimental	7.4	37		
attitudes				0.00	0.004
	Control	3.1	15.5		
The overall	experimental	8.00	40		
standard				0.00	0.007
	Control	3.00	15		

It is clear from the table 4 that the mean ranks of the total score of the emotional discrimination scale for children with autism spectrum disorder in the experimental group in the post-measurement is (8), while the value of the average ranks of the total score of children with autism spectrum disorder in the control group was (3). The results of the Mann-Whitney test show that the difference between the two averages is statistically significant, as the level of significance was equal to (0.07), which is greater than the level of significance (0.05), and the difference was in favor of children with autism spectrum disorder in the experimental group, where their average score was the highest.

The results of the Mann-Whitney test also indicated that the difference between the averages of children with autism spectrum disorder in the experimental and control groups in the emotional understanding dimension is statistically significant, as the level of significance was equal to (0.02), which is less than (0.05), and depending on the value of the average ranks, this The difference was in favor of children with autism spectrum disorder in the experimental group, where the mean score for their scores was (8), which is higher than the mean score for children in the control group, which was (3).

The results of the Mann-Whitney test also showed the difference between the averages of children with autism spectrum disorder in the experimental and control groups in the dimension of emotional attitudes statistically significant, as the level of significance was equal to (0.04), which is less than (0.05), and when looking at the value of the average ranks, the difference In favor of children with autism spectrum disorder in the experimental group, where the mean score of their scores was (7.4), which is higher than the average score of children with autism spectrum disorder in the control group, which was (3.1).

Results related to the third hypothesis:

To verify the validity of the third hypothesis, which states: There are statistically significant differences between the post application and the follow-up application on the emotional discrimination scale for children with autism spectrum disorder in favor of the follow-up application.

Table 5. Arithmetic means and standard deviations for the scores of the experimental group on the emotional discrimination scale in the post and follow-up applicatio

Dimension	the experimental group	The arithmetic mean	The standard deviation
the emotional understanding	Pre	21.2	.83
	post	22.4	1.5
the emotional attitudes	Pre	29.4	.894
	post	28.4	1.3
The overall standard	Pre	28.4	1.3
	post	29.4	.894

It is clear from table (5) that the arithmetic mean of the total score of the emotional discrimination scale for children in the experimental group in the post-measurement is (28.4) with a standard deviation of (1.3), while the arithmetic mean in the follow-up measurement was (29.4) with a standard deviation of (.894), and to verify the significance The differences between the mean scores of the post and follow-up measures, the Wilcoxon test was used, as shown in the table (6):

Table 6. Results of the Wilcoxon correlated samples test for the differences between the mean ranks of the experimental group for the post and follow-up measurements

Dimension	Ranks	The number	Total ranks	Mean ranks	Z value	Seen indication
the emotional understanding	equal ranks*	3	0	0	1.34	0.180
	positive ranks**	2	3	1.50		
the emotional attitudes	equal ranks*	2	0	0	1.35	0.180
	positive ranks**	3	3	1.50		
The overall standard	Negative ranks*	0	0	0	-2.41	0.07
	positive ranks**	5	15	3		

It is clear from the results in table (6),that there are no statistically significant differences between the averages of children in the post(and follow-up measurements in the total scores, as the level of significance reached (0.07), which is higher than the level of significance (0.05). The post and follow-up scores were not statistically significant, as the level of significance for all dimensions was less than the level of significance (0.05), and the results indicate the continuation of the positive impact of the program after a period of time has passed since its completion.

Summary and Conclusion

The results of the current study indicated the effectiveness of the training program based on the theory of mind in improving the skill of emotional discrimination among individuals with autism spectrum disorder, and the results of the study hypotheses can be interpreted in the light of what was confirmed by previous studies (Ahmed, 2009; Mezak, 2010; Al-Arabi, 2018; Ramadan2018 Al-Khouly, 2020) that the training programs have a role in improving the emotional expressions of individuals with autism spectrum disorder, and all of these studies are consistent with the results of the current study in terms of the effectiveness of the training program based on the theory of mind in developing the skill of emotional discrimination among individuals with autism spectrum disorder, while the results of this study differ with the study of (Tell, 2009), whose study results indicated that there is a significant deficit among individuals with autism spectrum disorder in understanding and distinguishing emotional expressions. The participants in this study were able to develop the skill of emotional discrimination, which enabled the children to distinguish between emotional expressions and understand them relatively, which means that intensive training and well-designed programs for them can help improve and develop the skill of emotional discrimination in children with autism spectrum disorder.

In the light of the results of the study, the improvement and development of the emotional discrimination skill can be attributed to the philosophy of the program and the criteria that the study relied on during implementation, as the selection of program activities was taken into account in accordance with the characteristics of the sample in terms of the degree of autism, chronological age, in addition to the activities containing skills. It works to improve the skill of emotional discrimination, which was characterized by integration, diversity, and the factor of excitement and suspense, and the researchers used material and moral reinforcement, which contributed to increasing the child's confidence with positive participation. The regularity of the study sample in the program sessions using activities and techniques helped in the development of their emotional discrimination skill significantly, and the continuity of its impact after the completion of the program and its sessions.

Limitations

The sample size could be viewed as a potential limitation of this study and the results could be difficult to relate to the population of ASD individuals. Accessibility to one scale for rating the social skills could be another limitation of this study.

In conclusion, this study could be expanded to include a larger population of individual with ASD. Further studies resulting from this

research could be beneficial for a variety of populations (individuals with intellectual disabilities, children with hearing impairment etc.).

References:

1. Abdel Nour, Kermish. (2016). Identify the child with autism with emotional facial expressions. *Diaa Journal of Psychological Research, University of Algiers, 2* (7), 1-21
2. Ahmed, Faiza Ibrahim. (2009*). The effectiveness of a behavioral therapy program in developing some emotional expressions among a sample of autistic children*. Paper presented to the *International Scientific and Educational Conference of the Faculty of Education, University of Damascus*. Syrian Arab Republic.
3. Al-Khouli, Ezzat. (2020). *The effectiveness of a training program based on theory of mind in improving emotional expressions among a sample of children with autism spectrum disorder. Alexandria* University, Egypt . Extracted on 5/6/2020, from Alexandria University database.
4. Al-Samadi, J., Al-Khatib, J., Al-Hadidi, M., Al-Zriqat, I., Yahya, K., Al-Amayreh, M., Al-Rosan, F., Al-Natour, M., Al-Sorour, N., . (2007). *Introduction to the generalization of students with special needs.*Amman: Dar Al-Fikr for Publishing and Distribution, The Hashemite Kingdom of Jordan.
5. Al-Shaibani, Siham Abdul Nabi. (2017). Mind reading tasks and their relationship to social competence among children with mild mental disabilities in the city of Tripoli. *Sabratha University Scientific Journal, 3*, 71-91
6. Amr, Israa Muhammad. (2012). *Brain injury and its relationship to the onset of depressive symptoms and the ability to recognize emotions through facial expressions.* University of Jordan, The Hashemite Kingdom of Jordan. Extracted on 25/9/2019 from Dar Al-Manzouma database.
7. Balconi, M., & Carrera ,A.(2007).Emotion representation in facial expression and script A comparsion between normal and autistic children. *Research in Developmental Disabilities, 28.*
8. Elaraby, Nevin Abdel Moneim. (2018). *The effectiveness of an electronic program for the development of emotional expressions among a sample of autistic children,* Faculty of Psychological Sciences, Cairo University. Extracted on 5/03/2019 from Cairo University database.
9. Lazarus,R.(2006).Emotions and interpersonal relationships: Toward a person-centered conceptualization of emotion and coping. *Journal of Personality*.*4*, 9-46.

10. Michel, J.(2013). *Enhancing the Ability of Adults with Mild Mental retardation to recognize facial expression of Emotions*. A dissertation submitted in partial fulfillment of the requirements for the degree doctor of philosophy (clinical psychology), Walden University. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/1417714
11. Myszak, J.(2010).Effectiveness of A Computer Program In Increasing Social Skills In Children With Autism Spectrum Disorder, Ph.D, Indinana University,in fulfillment of the requirements for the degree of Doctor of philosophy.Retrieved from https://www.researchgate.net
12. Ramadan, Ahmed Fathi Mohamed. (2018*). The effectiveness of a program based on the concepts of theory of mind to improve attention and social interaction in autistic children (unpublished master's thesis*). Faculty of Early Childhood Education, Cairo University**.**
13. Rump, K.M., Giovannelli, J.L., Minshew, N.J., &Strauss, M.S. (2009).The development of emotion recognition in individuals with autism. *J.Child Development ,80* (3) 542-553
14. song, y., & hakoda, y. (2018). selective impairment of basic emotion recognition in people with autism: discrimination thresholds for recognition of facial expressions of varying intensities. *Journal of autism and developmental disorders,48*(6),1886-1894.
15. Tell, D.(2009). *Recognition of emotions from facial expression and situational cues in children with autism. Ph.D*., Loyola University, Chicago.
16. Weigelt, S., Koldewyn, K.,& Kanwisher, N. (2013). Face recognition deficits in autism spectrum disorders are both domain specific and process specific. *PLoS One, 8*(9), e74541.
17. Woodburn, E. (2008). *The social aspects of learning: The role of theory of mind, children's understanding of teaching and social-behavioral competence in school readiness*. (Doctoral Dissertation). University of Pennsylvania. Retrieved from https://www.researchgate.net.