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RESEARCH PAPER

Role of Behavioral Intervention in Developing Non-Verbal Communication Skills in a Boy with Autism Spectrum Disorder: A Case Study

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PAPER INFO	ABSTRACT
	The current study focused to investigate the efficacy of discrete trial training program under multiple contexts for developing social communication skills in a boy with autism spectrum disorder in Pakistani society. Single subject experimental design was employed to investigate the phenomenon of the study. This research design was consistent with specific reversal design (Seah, 1997) such as A-B-C-D-E-A and two follow up periods. Enrolled children at Govt. Special Education Centers across the Punjab province of Pakistan were taken as the population of the study. The researchers completed the procedure into seven steps. Descriptive statistics supported the researchers to describe the features of the obtained data of the study. Task objective 1, 2, 3, 4, and 5 was developed at higher percentage during phase E, phase C, phase E, phase E, and phase E respectively.

Introduction

Autism Spectrum Disorder (ASD) is a developmental disorder of a varying severity that affects communication skills and behavior of children. The broad range of conditions under the spectrum can be diagnosed at any stage of life but symptoms normally appear in the early two years of life. In accordance with the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, 2013), ASD is characterized by significant impairments in social communication and building relationships as well as repetitive behaviors, restricted behaviors and stereotypical patterns of gross motor skills and fine motor movements and/or interests.

Children with ASD are often recognized first by their social ineptness and communication failure. In fact, these children are lacking social communication skills needed when using language to: 1) communicate with others; 2) and engage in

conversations with others. It is because they do not know: 1) how to use language in a structured way for a range of functions, for example: a) to provide information to others; b) to question; c) to negotiate with others; d) to suggest to others; and e) to clarify to others; 2) how to conversant, for example: a) starting conversations; b) finishing conversations; c) maintaining a topic of conversation; and d) taking turns in a conversation; 3) how to understand shared and/or assumed knowledge, for example; a) how much piece of information the listener needs to understand; 4) how to understand and use non-verbal communication skills, for example; a) eye contact; b) facial expressions; c) gestures; d) proximity; and e) distance; and 5) how to understand implied meanings. These social communication lacks can be dealt with various tools of behavioral interventions.

Previous research studies addressed different aspects of above-mentioned social skills deficits under the umbrella of DTT. Nientimp& Cole (1993) taught socially credible social responses were taught to children with severe disabilities. Zanolli et al. (1996) made spontaneous initiations possible. Garfinkle and Schwartz (2002) increased social interactions. Shabani et al. (2002) increased social initiations successfully with tactile prompts in children with ASD. Gena et al. (2005) taught socially affective behavior (s). Likewise, social interactions were increased in children with ASD (Garfinkle& Schwartz, 2002), eye contact was built up (Jones et al., 2006), and imitation skills were developed (DeQuinzio et al., 2007). DTT was used by using prompt to promote joint attention in children with autism (Pollard et al. 2012). Verbal responses to social greetings were increased by using audio script fading and multiple-exemplar training in children with autism (Garcia-Albea et al., 2014). Groskreutz et al. (2015) also increased initiations skills and social responses in children with ASD using novel script-frame. Harris et al. (1990) and Reeve et al. (2007) conducted a study on how to offer help to others and established a range of helping behaviors for others. Likewise, perspective taking skills were taught (LeBlanc et al., 2003), increased joint attention skills and taught smile models (Kasari et al. 2006; Jones et al. 2006; Krstovska-Guerrero & Jones, 2013), empathy skills were developed through modeling (Schrandt et al., 2009), and sharing skills were taught (Marzullo-Kerth et al., 2011). Likewise, Simpson et al., (2004) embedded computer-based instructions and video to develop social skills among children with autism spectrum disorder.

Literature Review

Autism spectrum disorder emerged in 1800s formerly known as feral children. It began to recognize in the reports presented by Kanner (1943). Kanner (1943) firstly used 'autism' for children with deficits in social interaction. As time passed, significant progress has been done in the social neuroscience of ASD (McPartland et al., 2014). Later, Voos et al. (2013) conducted a research on neural mechanism to improve social motivation in two children with ASD. In this way, it is said that social nature of ASD and the ways to treat unusual social nature of ASD became clearer.

It is important to teach social skills to children with ASD. Developing appropriate social skills ultimately promote natural language among children with ASD (Leaf, 2017). Leaf et al. (2017) also explained that social interaction increases likelihood of peer approval for children with ASD and hence ultimately increases further opportunities to communicate with others. Here, Leaf et al. (2017) added that social skills can lead individuals to learn additional skills without consuming extra amount of time and cost. Ladd et al. (1999) defined that positive relationships with peers and teachers enable children to enjoy participation and thence achievements in school life. Bauminger and Shulman (2003) stated that social skills enable children to help, share, co-operate and obey societal rules among children with ASD. On other hand, Baumingerand Shulman (2003) defined that lack of appropriate pro-social relationships welcome unpleasant consequences such as loneliness. Likewise, Hurley (2008) defined that lack of pro-social behavior leads individuals towards negative consequences such as depression. Dodd et al. (2016) found that poor social skills increase likelihood of thinking and attempting suicide among individuals with intellectual disability and attempt in children with ASD(Mayes et al., 2013).By summing up negative consequences found in children with inappropriate social skills, Leaf et al. (2017) concluded that developing social skills should be prioritized among children with ASD.

Teaching social skills is complex. It includes multitude of variables (Leaf, 2017). According to Brodheard et al. (2016) teaching social skills is more complex than to teach skills such as requesting. Likewise, receptive labeling is not as complex to develop as to social skills (Grow and Van Der Hijde, 2017). Farber et al. (2016) also defined that matching is comparatively easy task to develop than to teach social skills. Regardless of its difficulty, it is essential to develop and improve different social skills among children with ASD (Leaf, 2017).

Parents and professionals resist prioritizing social skills to develop among children with ASD. Most commonly heard statement is "children with ASD are not social". Rather, children with ASD are unable to display appropriate social functioning (Leaf et al., 2017).Hence, social skills should be prioritized within structured interventions specifically designed for children with ASD. Contrary to this, heavy focus of attention is inclined towards language development and language improvement (Sundberg & Michael., 2001; Johnson et al., 2017). Likewise, academic skills are prioritized within research (Stasolla, 2016) such as developing and improving academic skills(Kelly et al., 2015). Tremendous amount of research within interventionists have focused on the reduction of abnormal behavior (s) and to investigate the function of abnormal behavior (s) (Santiago et al., 2016), and especially when the abnormal behavior makes learning difficult (Koegelet al., 1974).But the researchers in this research planned to execute DTT to answer the following question:

1. What is the efficacy of discrete trial training program under multiple contexts for developing social communication skills in a boy with autism spectrum disorder in Pakistani society?

Materials and Methods

Research Design

Single subject experimental design was employed to investigate the phenomenon of the study. This research design was consistent with specific reversal design (Seah, 1997) such as A-B-C-D-E-A and two follow up periods. A phase was the baseline. B phase, C phase, D phase, and E phase were the various intervention phases of discrete trial training and related conditions. These intervention phases enabled researchers to investigate the efficacy of discrete trial training program under multiple contexts for developing social communication skills in a boy with autism spectrum disorder. Researchers implemented intervention steps given by Smith (2001) as the following

Cue/discriminative stimulus/delivering the task direction

Researchers provided the instructions within ten seconds and then waited for five seconds for the response to occur. It included the following: a) researchers will keep the task direction short and clear; and b) researchers delivered the task direction once for each DTT trial in the experimental session. Targeted tasks related to social communication skills were selected on the basis of baseline measurements determined on the basis of DSM-5 diagnostic criteria.

Prompt

Researchers used most to least physical prompt to get the child alert and hence to ensure compliance with instructions to obtain response. In this situation, the researchers obtained responses on prompt within five seconds. If the case remained consistent, then first step was repeated.

Response

Each child was allotted an intra-trial response time for developing the new skill cued by the researchers. The duration of this interval ranged between one to three seconds, as defined by Smith (2001), but may be adjusted up-to five seconds based on each of the child's learning style and the specific skill being taught. In this step, responses observed in the following three cases such as: 1) if incorrect response/error will occur; 2) if correct response occurred; and 3) if interrupted behavior (s) occur.

1. The researchers provided the answer of the given task if incorrect response or error occurred hence corrected error or signaling no to initiate the next discrete trial and later new skill.

2. The researchers reinforced the behavior if correct response occurred and hence initiated the new DTT trial. The researchers reinforced the behavior

and repeat until mastery level determined at 90% on correct responses for consecutive three DTT trials of the given task was achieved within the allocated time of five seconds.

3. The researchers cancelled the discrete trial if interrupted behavior (s) occurred across three consecutive trials.

Consequence

Immediate positive reinforcement was the consequence. Each targeted social communication skill of each of the chosen children was reinforced specifically within the allocated time of five seconds.

Inter-trial interval

Inter-trial interval time was of five seconds which give chance to each of the chosen children of the study to access reinforcement and gave the researchers a chance to reset materials, take data and make decisions for the next trial.

Population

Enrolled children at Govt. Special Education Centers across the Punjab province of Pakistan were taken as the population of the study.

Participant's Profile

Participant of the study (a pseudonym) was enrolled at Govt. Special Education Centre, Gojra. He was a boy of seven years and one month old. He was a boy. His order in siblings was fourth. He had no sibling with disability in family. He belonged to a lower middle social class with family income of twenty thousand per month. His religion was Islam.

He was a minimal-verbal child with autism spectrum disorder. He required support (level 1 of severity) based on the diagnostic criteria of DSM-5 for the autism spectrum disorder. His symptoms associated with autism spectrum disorder were evidently present in early developmental period. These symptoms were causing difficulties in his daily functioning. He had persistent deficits in social communication and non-verbal communication and had restricted/stereotyped behaviors observed on the diagnostic criteria of DSM-5 for the autism spectrum disorder.

He had deficits in the area of social communication with a total score of 34 and non-verbal communication with a total score of 16 measured on the autism diagnostic interview (ADI-R). He had restricted/stereotyped behaviors with a total score of 4 and abnormal developmental patterns at or before the age of 6 months with a total score of 3 measured on the autism diagnostic interview (ADI-R).

He had mild to moderate range of severity for the autism spectrum disorder with T-score of 66 measured on the social responsiveness scale (SRS-2). She had I.Q score of 71 (low average) measured on WISC-V. She obtained a total score of 14 on non-verbal index and 35 on general ability index. Her mental age was of four years old child.

Participant of the study had deficits associated with autism spectrum disorder but what were the core areas of deficit was investigated using self-developed tool based on DSM-5 and validated by experts with Chronbach's alpha value of 8.75.

Procedure

The researchers completed the procedure into seven steps as given below:

Identifying core areas of deficit of Participant of the study

At first step, the researchers identified two areas of deficit: a) Impaired Coordinated/IntegratedNon-Verbal Communication; and b) Impaired Detection of Facial Expressions by using Rating Scale for the Identification of Social Communication Deficits of Children with Autism Spectrum Disorder.

Formulating task objectives based on the core areas of deficit

At second step, the researchers formulated task objectives based on the core areas of deficit as the following:

Task objective 1 based on core area of deficit 1: Developing coordinated proximity with eye contact

The child will be able to stop distance set at five steps straight from the fixated point and inhibit irrelevant facial expression with independent responding (IR) during 90% of opportunities across three consecutive teaching sessions. Mastery for each step is set at 90% correct independent responses during three consecutive teaching periods.

Task objective 2 based on core area of deficit 1: Developing coordinated proximity with gestures

The child will be able to stop distance at five steps straight from the fixated point and inhibit irrelevant gesture with IR during 90% of opportunities across three consecutive teaching sessions. Mastery for each step is set at 90% correct independent responses during three consecutive teaching periods.

Task objective 3 based on core area of deficit 1: Developing coordinated proximity with facial expressions.

The child will be able to stop distance at five steps straight from the fixated point and inhibit irrelevant facial expression with IR during 90% of opportunities across three consecutive teaching sessions. Mastery for each step is set at 90% correct independent responses during three consecutive teaching periods.

Task objective 1 based on core area of deficit 2: Developing recognition and detection of happy facial expression

The child will be able to detect facial expression of "happiness" in an unfamiliar book with IR during 90% of opportunities across three consecutive teaching sessions. Mastery for each step is set at 90% correct independent responses during three consecutive teaching periods.

Task objective 2 based on core area of deficit 2: Developing recognition and detection of angry facial expression

The child will be able to detect facial expression of "angriness" in an unfamiliar book with IR during 90% of opportunities across three consecutive teaching sessions. Mastery for each step is set at 90% correct independent responses during three consecutive teaching periods.

Steps for lesson progression

At third step, the researchers followed steps for lesson progression as given below:

Steps for lesson progression for developing coordinated proximity with eye contact

Step 1: Stop distance at three steps straight from the fixated point to conversational/communicative partnerduring 90% correct responding across 3 consecutive DTT sessions

Step 2: Stop distance at four steps straight from the fixated point and look three times at the eyes of conversational/communicative partner with FP OR locate visual space/spatial location of conversation partner/ conversational/ communicative partner/ input with FP/locate subjective counterpart in space OR Imitate two facial expressions during 90% correct responding across 3 consecutive DTT sessions

Step 3: Stop distance at five steps straight from the fixated point and do not look five times at the eyes of conversational/communicative partner during 90% correct responding across 3 consecutive DTT sessions

Steps for lesson progression for coordinating proximity with gestures

Step 1: Stop distance at three steps straight from the fixated point to conversational/communicative partner during 90% correct responding across 3 consecutive DTT sessions

Step 2: Stop distance at four steps straight from the fixated point and locate visual space/spatial location of conversation partner/ conversational/ communicative partner/input with FP/locate subjective counterpart in space OR Imitate two descriptive gestures with during 90% correct responding across 3 consecutive DTT sessions

Step 3: Stop distance at five steps straight from the fixated point and execute relevant gesture/inhibiting irrelevant gesture during 90% correct responding across 3 consecutive DTT sessions

Steps for lesson progression for coordinating proximity with facial expressions

Step 1: Stop distance at three steps straight from the fixated point to conversational/communicative partner during 90% correct responding across 3 consecutive DTT sessions

Step 2: Stop distance at four steps straight from the fixated point and locate visual space/spatial location of conversation partner/ conversational/ communicative partner/input with FP/locate subjective counterpart in space OR Imitate two facial expressions during 90% correct responding across 3 consecutive DTT sessions

Step 3: Stop distance at five steps straight from the fixated point and execute relevant facial expression/inhibiting irrelevant gesture during 90% correct responding across 3 consecutive DTT sessions

Steps for lesson progression for recognizing and detecting happy facial expression

Step 1: Recognize facial expression of "happiness" amongst multi facial expressions on flash card (happiness, anger, surprise) with 90% correct responding across 3 consecutive DTT sessions (discrimination skill)

Step 2: Detect facial expression of "happiness" in a familiar book within thirty seconds with 90% correct responding across 3 consecutive DTT sessions

Step 3: Detect facial expression of "happiness" in an unfamiliar book within thirty seconds with 90% correct responding across 3 consecutive DTT sessions

Steps for lesson progression for recognizing and detecting angry facial expression

Step 1: Recognize facial expression of "angriness" amongst multi facial expressions on flash card (happiness, anger, surprise) with 90% correct responding across 3 consecutive DTT sessions (discrimination skill)

Step 2: Detect facial expression of "angriness" in a familiar book within thirty seconds with 90% correct responding across 3 consecutive DTT sessions

Step 3: Detect facial expression of "angriness" in an unfamiliar book within thirty seconds with 90% correct responding across 3 consecutive DTT sessions

Time allocation

At fourth step, the researchers allocated time. Cue was taken 10 seconds to present piece of instruction. Each of the other parts was taken 5 seconds consequently.

Number of trials

At fifth step, the researchers allocated trials in a DTT session. Maximum total trials in a DTT session were 10, while, less than 10 numbers of delivered trials were tolerated depending upon the level of acquiring skill.

Number of discrete trial training sessions

At sixth step, the researchers allocated number of DTT sessions in each experimental session. Total number of DTT sessions was 3 with maximum 30 trials in each experimental session for the early childhood child of the study in a day.

Data Recording

At seventh step, the researchers recorded data by using self-developed DTT data recording sheets.

Results and discussion

Descriptive statistics supported the researchers to describe the features of the obtained data of the study.

Table 1
Skill Development of Coordinating Proximity with Eye Contact across Four Treatment Conditions

Treatment Conditions	Skill Development
1	56.2962%
2	57.7777%
3	55.2777%

4	63.6842%

This table shows skill development in percentage across four treatment conditions. The researchers measured 56.2962%, 57.7777, 55.2777% and 63.6842% skill development across BCDE phases respectively. Generally, the researchers recorded a distinctive skill development in PA's responding over coordinating proximity with eye contact across BCDE phases as compare to the performance level recorded at baseline. This achievement may be attributed to the DTT sessions.

Table 2
Skill Development of Coordinating Proximity with Gestures across Four Treatment Conditions

Treatment Conditions	Skill Development
1	52.6315%
2	58.75%
3	52.5490%
4	54.2424%

This table shows kill development in percentage across four treatment conditions. The researchers measured 52.6315%, 58.75%, 52.5490%, and 54.2424% skill development across BCDE phases respectively. Generally, the researchers recorded a distinctive skill development in PA's responding over coordinating proximity with gestures BCDE phases as compare to the performance level recorded at baseline. This achievement may be attributed to the DTT sessions.

Table 3
Skill Development of Coordinating Proximity with Facial Expressions across Four Treatment Conditions

Treatment Condition	Skill Development
1	57.4358%
2	59.4444%
3	59.2592%
4	61.0416%

This table shows skill development in percentage across four treatment conditions. The researchers measured 57.4358%, 59.4444%, 59.2592% and 61.0416% skill development across BCDE phases, respectively. Generally, the researchers recorded a distinctive skill development in PA's responding over coordinating proximity with facial expressions across BCDE phases as compared to the performance level recorded at baseline. This achievement may be attributed to the DTT sessions.

Table 4
Skill Development of Recognizing and Detecting Happy Facial Expressions across Four Treatment Conditions

Treatment Conditions	Skill Development
1	47.0175%
2	59.00%

3	41.7647%
4	77.6666%

This table shows skill development in percentage across four treatment conditions. The researchers measured 47.0175%, 59.00%, 41.7647%, and 77.6666% skill development across BCDE phases respectively. Generally, the researchers recorded a distinctive skill development in PA's responding over recognizing and detecting happy facial expression across BCDE phases as compared to the performance level recorded at baseline. This achievement may be attributed to the DTT sessions.

Table 5
Skill Development of Recognizing and Detecting Angry Facial Expressions across Four Treatment Conditions

Treatment Conditions	Skill Development
1	56.00%
2	49.3939%
3	40.4166%
4	55.9259%

Note. This table shows skill development in percentage across four treatment conditions. The researchers measured 56.00%, 49.3939%, 40.4166%, and 55.9259% skill development across BCDE phases respectively. Generally, the researchers recorded a distinctive skill development in PA's responding over recognizing and detecting angry facial expression across BCDE phases as compared to the performance level recorded at baseline. This achievement may be attributed to the DTT sessions.

Discussion

Children with ASD have deficits to interact and communicate with others as defined in the diagnostic and statistical manual of mental disorders (DSM-5, 2013). However, as a result of DTT program, the participants in this research developed a variety of appropriate social communication skills. The DTT program provided maximum opportunities to develop these skills. All the participants showed interest with the materials and procedures to learn these skills. Consequently, the findings of the study revealed distinctive skill development in the form of a greater number of correct responses till reaching mastery criteria. The researchers discussed findings of the study in the light of the literature.

Participant of the study developed coordinated/integratednon-verbal communication as a result of the DTT program. The development of this social communication skill is generally supported by the findings of (Hamdan, 2018). Only one research study mentioned here targeted impaired non-verbal communication skills among the segment of population with ASD. This shows that developing coordinated/integratednon-verbal communication within the framework of DTT program among the segment of population with ASD was not the target of the researchers in the past. That is why; the particular perspective in which the current

study was carried out across four comparative components to investigate the optimal efficacy of DTT program in Pakistani society was not supported by literature.

Participant of the study developed detection of facial expression as a result of DTT program. The development of this social communication skill is generally supported by the findings of (Gena et al., 2005; and DeQuinzio, 2007). Only two research studies mentioned here targeted impaired detection of facial expressions among the segment of population with ASD. This shows that developing facial expressions within the framework of DTT program among the segment of population with ASD was not the target of the researchers in the past. That is why; the particular perspective in which the current study was carried out across four comparative components to investigate the optimal efficacy of DTT program in Pakistani society was not supported by literature.

Efficacy of developing coordinated/integrated non-verbal communication is generally supported by literature e.g. (Hamdan, 2018). The researchers put an effort and established its efficacy across this target specifically in Pakistani society as well.

Efficacy of developing facial expressions is generally supported by literature e.g. (Gena et al., 2005; and DeQuinzio, 2007). The researcherstried to develop its efficacy across this target specifically in Pakistani society as well.

Comparative Findings over Achieving Task Objectives across Treatment Phases

1. Task objective 1 was developed at higher percentage during phase E.
2. Task objective 2 was developed at higher percentage during phase C.
3. Task objective 3 was developed at higher percentage during phase E.
4. Task objective 4 was developed at higher percentage during phase E.
5. Task objective 5 was developed at higher percentage during phase E.

Conclusion

The researchers concluded that phase E is supportive to develop social skills in a boy with autism spectrum disorder in Pakistani society.

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