# Effect of Discrete Trial Training Intervention on Social Skills Development of Children with Autism Spectrum Disorder

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**Abstract**
The present study examined the effect of Discreet Trail Training (DTT) intervention on improving social skills of children with Autism Spectrum Disorder (ASD). Autism Social Skill Profile (ASSP) was adapted and used as an instrument for identifying the children and a DTT based intervention package was developed. The study participants consisted of six children with ASD aged 11-17 year. All the children received pre-test and post-test to examine the effect of the intervention. The results showed a statistically significant difference at the level of significance (.004) between the pre-test and post-test scores in social skills profile. The finding showed that DTT based intervention can improve social skills (self-control, communication and playing or working with others) of children with ASD.  The DTT based intervention programs need to be used in the schools, this will maximize the benefits for children with ASD Finally, the study suggested the importance of large-scale intervention studies with larger sample size and diverse settings.
**Keywords:** Autism Spectrum Disorder; Discrete Trial Training; Pre-test, Post-test experimental design, Social Skills

## Introduction

Children with Autism Spectrum Disorder (ASD) are characterized by persistent deficits in the areas of social, communication and interaction; and manifest restricted, repetitive behaviors (American Psychiatric Association & Association, 2013). People with ASDs frequently have co-occurring conditions, such as intellectual disability, seizures, psychiatric co-morbidities (e.g., attention deficit hyperactivity disorder (ADHD), anxiety), gastrointestinal conditions, and sleep trouble. Furthermore, ASD manifest itself in early life of child (three years of age) and the disorder stays for life-long. However, severity and the impact of the disorder varies based on treatment provided and time of diagnosis (Rice, Rosanoff, Dawson, Durkin, Croen, Singer & Yeargin-Allsopp, 2012)

According to Zeidan, et al. (2022) it is estimated that globally about one in 100 children has autism spectrum disorder. This estimate denotes an average figure, and reported prevalence varies considerably across studies. Some well-controlled studies however, reported figures that are significantly higher than the reports. The prevalence of autism in many low- and middle-income countries is unknown.

Parents, guardians and professionals of children with ASD face challenges to find effective interventions that can improve the lives of individuals with autism spectrum disorders. Due to the difficulty in finding interventions that work and that are readily available regardless of geographic location or financial resources, the field has nurtured many popular interventions that lack support from scientific research. Nevertheless, the call for the use of interventions that have proven their effectiveness is particularly important for the autism spectrum disorders (ASD) community, which has long been plagued by the use of unsupported and often controversial interventions (Weiss, Fiske,  & Ferraioli,  2008).

The major challenges students with ASD experience include social interaction behaviors; establishing and maintaining relationships, reciprocating social interaction, and communicating with others (APA, 2013). Lack of social skills may have lifelong implications for children with ASD, affecting their interactions with family members, academic skills, self-worth, and independence. Reports on social skills in ASD indicate that these skills are extremely difficult to learn (Gillies, Carroll, & Loos, 2013) and that educational objectives should focus on developing social skills because they have lifelong implications (Walton & Ingersoll, 2013). Therefore, there is a need for effective interventions targeting social outcomes in children with ASD who have differing levels of functioning and abilities.

Social skills interventions typically comprise of a number of features or categories of interventions. In other words, different teaching strategies are used to promote acquisition of social behaviors. Despite these differences,

there are categories of interventions that are universal. Across both group design studies (Vaughn & Fuchs, 2003) and single subject design studies (based upon the current review), these include categories of reinforcement, prompting, and modeling. These three categories are conceptually intuitive considering the learning styles of individuals with ASD. Social skills are impaired in children with ASD and are a priority in most children's individualized educational plans or individualized intervention programs. Therefore, increased attention to all the components of social skills interventions will be important to identify strategies that work best for children who present with different skill levels.

According to Segal (2010), social impairments includes a range difficulties. It manifest itself deficits in nonverbal behaviors (e.g., eye-to-eye gaze, recognition of facial expressions, use of gestures to regulate social interaction). Also, known by failure to develop peer relationships appropriate to the child's developmental level and they lack of spontaneous seeking to share enjoyment and interests (e.g., failure to show, bring, or point out objects of interest). Furthermore, social impairment characterized by lack of social or emotional reciprocity (e.g., unable to or does not respond to emotions or social interactions from others).

ASD is a heterogeneous disorder, meaning that one individual with ASD may have differing areas of social impairment with differing levels of severity from another individual with ASD. Poor motivation to learn social behaviors or to engage in social activities is also commonly observed in children with ASD. These comprise only a fraction of social skills observed in individuals with ASD (Kasari & Patterson, 2012).

The extant literature suggests that early social impairments greatly affect future relationships, employment, independent living, and other mental health issues (e.g., anxiety, depression) (Bellini, 2004). Thus, there should be an emphasis for intervention to occur early and to focus on the development of social skills in order to build social interactions and relationships. Unfortunately, it remains unclear as to which social skills are important to teach that will lead to better outcomes in areas related to social impairment for children with ASD. An issue that remains elusive and is of equal importance is to determine the specific types of interventions that effectively teach social skills.

**Intervention**
Discrete trial training (DTT) is commonly used today and the well-known type of ABA. In this approach the child receives ABA services at school, or from an interventionist, they are through using DTT techniques for the sessions. It is common that younger children start with a more structured and repetition DTT style, and eventually over time or as the child develops, they transition to a more naturalistic learning style. DTT as a teaching methodology because it gives me the ability suit teaching or intervention down to exactly what the learner needs to be successful (Gresham & MacMillar, 1998).

Applied behavior analysis (ABA) is an intervention based on the principles of operant conditioning and is applied in a systematic and measurable manner to increase, reduced, maintain, or generalize target behaviors. ABA reinforces the positive behaviors and discourages maladaptive behaviors. Since each autistic child exhibits different behavior problems, he/she receives individualized therapies for different target behaviors. Numerous studies during the past 5 decades have shown that ABA successfully yields substantial improvements in patients with ASD in terms of IQ, language, social and academic performance, and adaptive behavior compared with children with ASD in the control groups (Miltenberger, Valbuena, & Sanchez, 2021). ASD children who received intensive early ABA had outcomes similar to normally developing peers, and recent studies concluded that ABA is superior to other intervention strategies (Larsson, & LP, 013).

ABA based interventions focus on altering the environmental variables through antecedent-behavior-consequence (ABC) contingencies. Antecedent cues behaviors, which is prompted by the behavior therapist. Consequence is reinforcement that can increase and sustain the desired behaviors and remove maladaptive ones. In order to help children, learn through ABC contingencies, it is important to follow certain rules that make behavior interventions effective. Behavior interventions should be applied to children as early as possible and address the main problems of autism in a predictable setting. These personally tailored therapies are more effective in a low teacher to student ratio, environment, and the family involvement (Scott & Bennett, 2012). Therefore, children with ASD should be able to apply the learned lessons to more generalized situations. Otherwise, the child will not be able to utilize the learned skills in an unexpected environment and will exhibit maladaptive and repetitive behaviors again. Learning appropriate behaviors as well as making those behaviors sustainable over time is crucial. Because the learned skills may be lost over time, it is important to assess the child's behavior patterns repeatedly (Rosenwasser & Axelrod, 2001).

The success of ABA has led to the emergence of many different forms of training. One of the earliest forms of behavior interventions developed based on ABA is the discrete trial training (DTT), also referred to as early intensive behavioral intervention and is conducted in classroom-like settings. DTT is now the most widely recognized form of ABA, where the teacher sits down with the child with ASD and follows well-scripted tasks. DTT refers to a technique based on breaking down specific skills into small discrete components, and then teaching them in a graduated fashion, with reinforcement of correct responses and negative feedback to incorrect

responses (Gitimoghaddam, Chichkine, McArthur, Sangha & Symington, 2022).

In other words, DTT relies on highly structured, teacher-directed, one-on-one interactions between the teacher and student. In these interactions, the teacher initiates a specific stimulus to evoke the child's response, generally a discrete skill, which is an element of a larger behavioral repertoire (Smith, 2001). In the process of DTT implementation, each discrete trial only lasts about 2 to 5 minutes for better concentration and more learning opportunities in a given time. Second, teachers work one-on-one with the child, and the child receives tailored learning sessions that can be altered depending on the child's performance. Third, DTT has a definite model, so it clarifies the teaching situation for the child.

The process also needs the interventionists' skills to play their role appropriately including; gaining the student's attention, choosing appropriate target skills, using clear and appropriate cues, using accurate prompting strategies, providing clear and correct consequences, using appropriate inter-trial intervals, and utilizing error correction procedures effectively (Ferraioli, Hughes, & Smith, 2005).

The implementation of DTT has four instructional components 1) presentation of a discriminative stimulus, 2) occurrence or approximation of the targeted response, 3) delivery of a reinforcing consequence, and 4) a specified intertribal interval. The first part (presentation of a discriminative stimulus) can be divided into two different steps, cue and prompt, and some researchers consider DTT as having five components cue, prompt, response, consequence, and intertribal interval. Cue is presenting a stimulus and prompt is assisting the child to answer the question correctly. Prompt usually accompanies or immediately follows cues (Hamdan, 2018). Moreover, the implementation will encompass; breaking the skills into smaller components, teaching until mastery achieved, intensive teaching sessions, and use of prompts is introduced, and then faded as required, reinforcement strategies is used for skill improvement and increases (Park, Kim, Kim, Park, Yang, Lee, & Kim, 2015).

More specifically various studies showed the effectiveness of DTT programs in reducing social skill deficit children with ASD. According to (Weiss, Hilton, & Russo, 2017), DTT is effective approaches to improving social skill deficits in individuals with autism by itself and combining with other evidence-based approaches. Similarly, another inquiry on DTT illustrates that the effectiveness of the approach through making fun and interactive approach (Geiger, Carr, LeBlanc, Hanney, Polick, & Heinicke, 2012).

Finally, DTT is based on the principle of Applied Behavioral Analysis (ABA) theory, and it includes breaking skills down to their best basic segments and teaching those skills repeatedly, step by step. In the meantime, children acquire reinforcements for all of their accomplishments, which inspires them to learn new behavior (Smith, 2001). DTT can play effective role in teaching social skills, in addressing skill acquisition in this area, as it enables the trainer to arrange carefully the instructional context (Weiss et al., 2017).

According to literatures, there are numerous treatment strategies identified for intervention of ASD and many of the techniques guaranteed notable improvement including DTT (Sanford School of Medicine, 2006). But, in Ethiopia implementation evidence-based intervention for children with ASD is very limited in number and quality. Therefore, these children were not getting appropriate treatment from professionals and autism centers (Zeleke, Chitiyo, & Hughes, 2018). Similarly, the researcher observed children with ASD in Burka Bekumsa primary school were not receiving intervention that can positive improvement in social, communication and academic development. Without the appropriate early interventions, it will limit the opportunity for the child to develop a meaningful participation in adulthood. Also, the researcher noticed a great need from the school to improve children with ASD enrolled in school in social skills and in other areas. Thus, the researcher focused on implementing DTT intervention in order to improve social skill of children with ASD in this school.

**Theoretical Framework**
Instrumental/Operant Conditioning: instrumental learning emphasizes on concepts of reinforcement and schedules of reinforcement and number of training trials (Murphy & Lupfer, 2014). DTT follows the procedure of providing antecedent, trial learning and reinforcement. Also, it is the most commonly supported therapy for autism, ABA is founded by evidence-based practices such as operant conditioning. Similarly, in ABA, reinforcement is used to increase target behaviors, and punishment and extinction to reduce behaviors that are not functional or helpful for children. Reinforcement may be as given to a child for positive responses (Staddon & Cerutti, 2003).

**Research Question**
Is there statistically significant difference in social skills development among children with ASD before and after Discrete Trial Training Intervention?

## Method and Materials
### Design
The study employed a single subject design to examine the effect of DTT based intervention on the social skill development of children with ASD.  The design includes pretest, intervention and post-test. The effect of the treatment was determined by calculating the difference between the pre-test and post-test scores.

### Setting
For the purpose of this study, the researchers purposively selected Burka Bekumsa Primary School which is located in Nekemte city, East Wallaga, Ethiopia. The school was selected because it was the only school in the city that offers education for students with ASD in a separate special unit within regular school compound.

### Participants
The study included all six (N=6) grade 1and grade 2 children with ASD (4 male, 2 female) with age range from 11-17 years from Burka Bekusa Primary School those attending their education. All participants in the study were identified to be with ASD by the school screening team.

### Data Collection
The scale developed by Bellini (2006), known as Autism Social Skill Profile (ASSP) was adapted and used to measure social skills of children with ASD. In the process of adapting the instrument, similar items were and words were modified without missing their original meaning. Experts and specialists working in the field of Special Needs and Inclusive Education and Psychology were consulted and they offered comments on the content, language, and appropriateness of the alternatives in the instrument. The instrument includes (22) items that measure children's social skills (i.e. self-control 6 items, communication with others 9 items and playing and working with others 7 items). The scale used an interval Likert-type scale (never, sometimes, often, and very often).

### Data Analysis
The intention of the study was to examine the effect of DTT on children with ASD social skill development of children with ASD. Therefore, in order to achieve this objective the study compared pre-test and post-test score and employed paired sample t-test. This enabled the researchers to compare mean difference between the two scores.

### Procedures
The current study passed through three major steps in the intervention process. First, pre-test was conducted with all participants who were selected for study. The researchers employed the aforementioned instrument (ASSP) to collect pre-test scores. Second, in order to implement the intervention, DTT based intervention package was designed through reviewing previous literatures. The program adopted the principles and foundations of this type of intervention (individual teaching, providing discriminatory stimuli, using the cues and prompting, reinforcement, feedback, generalization, etc.). After designing the program, two teachers from the school received training on how to implement the intervention package with ASD children.  The program included 24 training sessions, 2 sessions a week, 40 minutes for each session. The sessions included preparation at the beginning of the session; focused on selecting and creating the session place, sitting with the child in the place and on the table of training, welcoming to the child and talking to him about his activities and daily life, and revising the child goals acquired in the training previous sessions. The program also followed the actual procedures in each training session, focused on directing the child attention, and providing the educational objective using the principles based on the training program and method of intervention. Finally, the same instrument was used to collect post-test scores from the same group of children involved in pre-test and intervention. Then, data was analyzed using SPSS.

### Results
The purpose of the study was to measure the effect of DTT on children's social skill development of children with ASD.

**Table 1. Demographic Information of Participants in the Intervention**

|  |  | **Frequency** | **Percent** |
|---|---|---|---|
| Sex | Male | 4 | 66.7 |
|  | Female | 2 | 33.3 |
|  | Total | 6 | 100.0 |
| Age | 11.00 | 1 | 16.7 |
|  | 13.00 | 1 | 16.7 |
|  | 14.00 | 1 | 16.7 |
|  | 15.00 | 2 | 33.3 |
|  | 17.00 | 1 | 16.7 |
|  | Total | 6 | 100.0 |
| Child Lives with | Mother and Father | 3 | 50.0 |
|  | Mother | 1 | 16.7 |
|  | Father | 1 | 16.7 |
|  | Not with both | 1 | 16.7 |
|  | Total | 6 | 100.0 |
| Grade | 1.00 | 4 | 66.7 |
|  | 2.00 | 2 | 33.3 |
|  | Total | 6 | 100.0 |

According to table 1, majority of the participants involved in the intervention were Male 4(66.7%). The age range of the children with ASD participated in the intervention was from 11-17 years. Even if they were over-aged for the grade level, they were attending in lower grades; four (66.7%) of them first grade, while the rest were grade two. For the question with whom these children were living, three (50%) them were living with their biological mother and father, while the rest were living with single-headed families like with father/mother/with other guardians.

Mean and standard deviation were computed to compare the performance of the study sample enrolled in the training program on DTT program.

**Table2. Means and standard deviations of pre-test and post-test scores**

|  | Mean | N | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|
| Pre-test Scores | 1.6061 | 6 | .15920 | .06499 |
| Post-test Scores | 2.6136 | 6 | .64331 | .26263 |

Table 2 shows that the means of the pre-test (1.61) and (2.61) on the post-test. These results indicate that there are apparent differences in social skills between pre-test and post-test, so the mean of the pre-test was higher than the post-test.

**Table 3. Mean Difference**

|  | Paired Differences | | | | | t | df | Sig. (2 tailed) |
|---|---|---|---|---|---|---|---|---|
|  | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
|  |  |  |  | Lower | Upper | | | |
| Pre-test Scores - Post-test Scores | -1.00758 | .49745 | .20308 | -1.52961 | -.48554 | -4.961 | 5 | .004 |

*(\*)* statistically significant differences at p<.05

Table 3 shows that there was statistically significant differences at the level of (p<.05) between pre-test (before intervention) and post-test (after intervention) on the social skills. The mean difference is M=-1.007 and while standard deviation is Sd=.497. The result indicates that the DTT based intervention impacted positively on social skill (self-control, communication with others and playing and working with others) development of children with autism spectrum disorder.

**Discussion**

The current study aimed to assess the effect of DTT training on social skill (self-control, communication with others and playing and working with others) development in children with ASD. The results indicated statistically significant differences at the level of (p<.05) between the pre-test and the post-test measures in social skills, implying a positive impact of the training program on social skill development. The results also indicated higher mean score for the post-test (2.61) compared to the mean score for the pre-test (1.60).

The findings showed that the intervention in DTT resulted in improvement of social skills in children with ASD and the role and usefulness of the training program. The program worked on improving the skills of

interaction with peers in one to one, in a group and with teachers. The results showed that the skills of children during pre-test the children were unable to develop such skills effectively before involving in the training program. However, after receiving the training program they were able to perform those skills in a significant manner. The result of the study confirms that the intervention method based on DTT was operative. The method also focuses on task analysis which uses small instruction units and elements, one by one (1:1) style and make use of instructional methods and procedures based on prompting (Smith, 2001). Moreover, this technique focuses on using thorough behavioral interventions (Gupta, 2004). Likewise, it uses methods of repetition and positive reinforcement, which usually result to acquire the skill inevitably (Anwar, Sutadi, & Miranda, 2022).

Consistent with the findings from the present study, for instance Weiss et al. (2017) found that intervention in DTT had positive effect in improving social skill deficits in individuals with autism by itself and combining with other evidence-based approaches. Additionally, another investigation on DTT proves the effectiveness of the approach through making fun and interactive approach (Geiger et al., 2012). This verifies that the DTT has a great instructional usefulness when it was provided for children with ASD, also has the likelihood to be used efficiently and professionally with other children with developmental disabilities.

## Recommendations

The current study came up with positive effect of DTT intervention approach in improving social skill (self-control, communication with others and playing and working with others).of children with ASD. Still, it is difficult to generalize with this small portion of participants, and with this single-subject design study. Future studies also have to investigate the effectiveness of intervention with different setting, with age categories and with other developmental disorders, with inclusion of other important variables and with other intervention designs with experimental groups and repeated measures with ABAB design.

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