The Effects Of Combining Direct Instruction And Precision Teaching To Teach Phonological Awareness Skills To Children With ASD In Inclusion Classroom

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Abstract

Evidencing the effectiveness of combining direct instruction and precision teaching for children with autism are rare and has been recently evolving. The aim was to investigate effects of combining direct instruction and precision teaching to teach phonological awareness skills to children with ASD in inclusion classroom. It is assumed that combining direct instruction and precision teaching will improve phonological awareness skills of children with ASD. The participants of the study were three male children diagnosed with autism attending a primary school for inclusion. Multiple-probe design with probe conditions across subjects was used in the study to test the effectiveness of combining direct instruction and precision teaching on phonological awareness skills to children with ASD in inclusion classroom. All three participants were found to be successful at the end of the teaching session, compared to the baseline. In other words, there is a positive difference between the data obtained in the first and last teaching sessions for each child.

Keywords: direct instruction and precision teaching • phonological awareness skills • Children with Autism• inclusion classroom

INTRODUCTION

Autism is characterized by persistent deficits in social communication and interaction across multiple contexts(Abdullah, 2014; Ahmed, 2014; Ebrahim, 2019; Mahmoud , 2015; Mahmoud ,2015; Mohammed , 2016), as well as patterns of behavior, interests, or repetitive restrictive activities (Mortada, 2017;Mostafa , 2018; Mourad,2016). These deficits exist in early childhood and lead to significant functional impairment. There is also a type of Autism called "gifted syndrome", in which a child can display his outstanding skills in music, art, and numbers without training(Mourad,2017 a;Mourad,2017 b; Mourad, 2018a, Mourad, 2018b; Mourad and Borowska-Beszta, 2019).

The ability to read is an area of difficulty, particularly for many students with ASD. The most effective reading instruction is breaking words into their component sounds and letters, and concentrate on directly teaching students the sounding out of letters, that is, by using phonics(Eissa, 2013; Khalik,2014;Sawi,2013).

There is now a growing body of evidence to support the need for directly teaching phonics to children who are having significant reading problems(Ragnarsdóttir,2007).

Direct Instruction (DI) as a curriculum has been used for a long time in education, and is highly supported empirically . It has been "designed to teach complex language skills to children with disabilities" (Shillingsburg et al., 2015, p. 44). Additionally, this type of instruction integrates behavioral principles, which are known to include "short, clear and sequenced instructions, immediate reinforcement, and error correction procedures to enhance learning outcomes" (Shillingsburg et al., 2015, pp. 44-45).

This type of instruction uses a combination of behavioural techniques (e.g. reinforcement principles and task analysis). Accordingly its programmes teach learners skills in a sequential, explicit and scaffolded order (Owen, Watkins, Beverley, and Hughes, 2020). Programmes designed according to DI aim to supplement classroom teaching rather than replacing it by focusing on children's skill deficits(Owen et al.,2020). That is why they are "useful for both mainstream learners who have fallen behind age-expected norms and those with additional learning needs"(Owen et al.,2020, P. 13).

Waldron-Soler et al. (2002) implemented DI Language for Learning with 16 preschool children, including four with developmental delays (DD), and compared them to a control group of 20 preschoolers, including four with DD. They found that the children with DD in the Language for learning group had more growth in receptive and expressive language skills and greater reduction in behavior problems than children in the control group.

Humphries et al. (2005) investigated the use of several DI programs, including Language for Learning, with 55 children with epilepsy and significant academic deficits.

The participants demonstrated significant improvement in most areas of academic instruction, including language. Language for Learning also resulted in significant gains in receptive language when implemented with typically-developing kindergarteners in comparison with a control group.

A study conducted by Zayac (2009) indicated that pre-k students with autism were able to learn can learn letter-sound correspondences, blending, segmenting, and word reading

through the implementation of Reading Mastery Plus.

Stockard(2011) examined the development occurring in reading skills subsequent to using the Direct Instruction Reading Mastery program for 1600 students attending schools in rural Midwestern districts. The study compared students who received the DI curriculum from the beginning of kindergarten (full exposure cohorts) to students who followed this discipline in later grades. Those in the full exposure cohorts demonstrated significantly higher reading skills than students in the other cohorts. Furthermore, DI students' scores were at or above national averages. In the one district where statewide reading achievement scores were available, the percentage of students scoring at a high level went from well below the state average to above the state average in the five years of the study (effect size=.31).

Stockard et al. (2018), in meta-analysis demonstrated that DI programmes can significantly improve academic outcomes across the curriculum. Analysis of 328 studies across a sixty-year period revealed that DI approaches consistently yield positive effect sizes, with most estimates falling within the range of medium or large.

Precision teaching is an experimental approach to assessment and decision making. This type of teaching precisely defines behaviors or skills for intervention, records the results of intervention, changes instruction and practice to promote continued gains in frequency, and tries new or altered procedures when needed(Datchuk,2017) . Teachers can use precision teaching to prepare children to be successful in the school-based subjects of reading and arithmetic/mathematics(Johnson and Street,2020).

The method had five steps: (1) Teachers defined a learning objective, which Lindsley named a pinpoint because, as he saw it, it provided a precise definition—a pinpoint—of a skill, fact, concept, or principle to learn. (2) Teachers arranged materials and procedures for learners and directed them to practice their individual pinpoints during a specified time period, which could range from 10 seconds to 15 minutes or more. (3) The learner worked at as fast a pace as possible to correctly complete the tasks during the timing period, then counted the number of tasks they had performed correctly and incorrectly. (4) The learner and teacher charted each learner's performance on the Standard Celeration Chart. (5) The learner and teacher reviewed trends of performance on the chart and decided on an intervention that was likely to lead to the most growth(Johnson and Street,2020) .

Ramey et al. (2016) published a literature review of studies which evaluated PT as an approach for learners with developmental disabilities. The aim of this review was to evaluate the effectiveness of PT in this context and the results indicated that there was emerging evidence for the approach.

The outcomes reported by studies included in Aoife et al.'s meta analysis (2021)were predominantly positive with an improvement in the targeted academic skill demonstrated in most. Such findings indicate the value of using PT to improve academic skills and provide a good basis for the recommendation of this approach in practice.

PURPOSE

The aim was to investigate effects of combining direct instruction and precision teaching to teach phonological awareness skills to children with ASD in inclusion classroom. It is assumed that combining direct instruction and precision teaching will improve phonological awareness skills of children with ASD.

PROBLEM STATEMENT

ID has been extensively researched with students in special education settings. For example, Flores and Ganz (2007) studied the effects of DI for students with autism and with developmental disabilities. Kinder et al. (2005) reviewed 45 studies, which were published between 1975 and 2005, and investigated DI used with students with special needs. Among the 45 studies, almost all studies documented positive outcomes of DI programs. Decades of research demonstrate the effectiveness of DI, which includes its effectiveness as an intervention for students from low socioeconomic backgrounds (Torgesen et al., 2001), students at-risk for academic failure (Carlson & Francis, 2002; Frederick, Keel, & Neel, 2002; Grossen, 2004; Shippen, Houchins, Steventon, & Sartor, 2005), students with learning disabilities (Swanson, 1999), students with limited English proficiency (Carlson & Francis, 2002), and students with cognitive deficits (Bradford, Shippen, Alberto, Houchins, & Flores, 2006). However, evidencing the effectiveness of DI for children with autism has been recently evolving.

Method

Participants

The participants of the study were three male children diagnosed with autism attending a primary school for inclusion in Makka. The inclusion criteria were that :a) diagnosed by the school licensed psychologist as having ASD, based on the DSM-5 (APA, 2013), 2)the participant can recognize written words ,3) he/she can read them aloud. Exclusion criteria included :1)the presence of comorbid conditions (i.e. ADHD, or seizures), 2) a diagnose of any psychiatric illness, 3) an IQ below 70 (On Wechsler Intelligence scales for children (two subtests were used : vocabulary and matrix reasoning, Albeheri,2017). three cases were excluded due to these criteria,(one had seizures, and two had IQ below 70).Demographic information was obtained from school records and as reported by families(see table 1).

During the selection of participants, pre-interviews were conducted with the classroom teachers to inform them about the prerequisites for inclusion in the study . The students were also observed individually inside the classroom to determine if they could recognize written words and read them aloud. when observation period was over, each child was interviewed in an empty room and asked to recognize certain written words and read them aloud. There were six children , however, three only met the criteria for inclusion and thus involved in the study. Prior to the study, the parents of those included were provided with information about the aim of the study and they were asked to sign written consent. Worth mentioning is that Pseudonyms were used for those involved in the study.

Table 1

Demographic Features of the Participants

Participants	Sex	Age	Period of Attendance at primary school for inclusion	Diagnosis
Essam	M	7	1	Autism
Radwan	M	7.3	1	Autism
Said	M	7.2	1	Autism

Essam is 7 years old male student. He is diagnosed with autism and does not have any other disability. Before going to the primary school for inclusion, he received preschool education as an inclusive student as well. He is also a first grade inclusive student. Essam has all the prerequisite skills required for the study. In other words, he can recognize written words and read them aloud . Essam spoke spontaneously and initiated conversations. He can also follow instructions such as look, tell, and write.

Radwan is 7.3 years old male student. He is diagnosed with autism and does not have

any other disability. Before going to the primary school for inclusion, he received preschool education as an inclusive student as well. He is also a first grade inclusive student. Radwan has all the prerequisite skills required for the study. In other words, he can recognize written words and read them aloud . Radwan spoke spontaneously and initiated conversations. He can also follow instructions such as look, tell, and write.

Said is 7.2 years old male student. He is diagnosed with autism and does not have any other disability. Before going to the primary school for inclusion, he received

preschool education as an inclusive student as well. He is also a first grade inclusive student. Said has all the prerequisite skills required for the study. In other words, he can recognize written words and read them aloud . Said spoke spontaneously and initiated conversations. He can also follow instructions such as look, tell, and write.

Practitioner. The practitioner who is a classroom teacher in primary school for inclusion is a master candidate in Special Education and is in a master program in the same field. He has worked as an instructor in this same school with students with ASD for three years. Moreover, he presented teaching with direct instruction and precision teaching as a research paper.

Observer. Reliability data on dependent and interdependent variables (interobserver reliability and intervention reliability data) were obtained by two primary school teachers who held bachelor's degree in education of ASD . The two teachers received a 1.5-hour training by the researcher prior to the experimental study. The researcher provided the observers with information about the study and about teaching with direct instruction and precision teaching.

Environment

The probe, teaching, and maintenance sessions of the study were held in a separate classroom. This classroom sized 5X4 metres . It had three desks , one table, one chair , a whiteboard, and a bookshelf. During the instruction session, the practitioner and the child were only there. Generalization sessions were held in another classroom. During the instruction session, the practitioner and the child sat face-to-face at the table. A camera was used to record the data.

Materials

The technology teacher in the school was recruited to use his mobile camera to record teaching and assessment processes. During the instruction session, teaching and assessment worksheets based on direct instruction and precision teaching were used. An assessment worksheet covering Rhyme Recognition (RR), Blending Phonemes (BP), Phoneme substitution—Beginning Sounds (BS), Phoneme Substitution—Ending Sounds (ES), and Phoneme Substitution—Middle Sounds (MS)(Eissa,2014)was developed to be used in the assessment sessions.

An agreement was reached between the practitioner, the school principal, and the parent regarding the types of reinforcements(foods, such as chocolate and biscuits, and objects such as small toys) that are provided to children during the sessions, especially when providing the correct answers.

A variety of fun, play-based phonological activities were used with the class that incorporated the spectrum of PA skills (Eissa,2014). Sound Addition or Substitution Activities, Rhyming Activities, Sound/Syllable Segmentation Activities and Sound Matching/Sound Identification were addressed during training sessions.

Variables

Dependent variable. The dependent variable of this study is phonological activities: Rhyme Recognition (RR), Blending Phonemes (BP), Phoneme substitution—Beginning Sounds (BS), Phoneme Substitution—Ending Sounds (ES), and Phoneme Substitution—Middle Sounds .The dependent variable is considered significant as it constitutes a prerequisite for the subsequent reading skills(Mourad,2017b).

Independent variable. The independent variable of this study is teaching through

the combination of direct instruction and precision teaching.

Possible child responses. Possible child responses are divided into three parts: correct response, no response, and incorrect response.

Design

Multiple-probe design with probe conditions across subjects was used in the study to test the effectiveness of combining direct instruction and precision teaching on phonological awareness skills to children with ASD in inclusion classroom. In this type of design, three independent participants that can learn phonological awareness skills through the use of same method are chosen. It comprises two phases: baseline (A) and intervention phase (B).

Probe Sessions

Baseline probe sessions. Before introducing the instructional procedures based on combining direct instruction and precision teaching, baseline data was collected for each child to determine the performance levels of the participants on phonological awareness skills. Baseline data was collected on a one-to-one basis using assessment worksheets that included examples differ from those ones used by teachers in the regular classroom. Each instructional session lasted for 20 to 25 minutes.

Instructional sessions. During the instructional sessions, Rhyme Recognition (RR), Blending Phonemes (BP), Phoneme substitution—Beginning Sounds (BS), Phoneme Substitution—Ending Sounds (ES), and Phoneme Substitution—Middle Sounds prepared using combining direct instruction and precision teaching were presented to the children. Three sessions a week on an individual basis were introduced. During these sessions, the

child's attention was directed to the skill introduced. The instructional session ended with the child achieving all the trials correctly. During these sessions, a variety of fun, play-based phonological activities were used with the class that incorporated the spectrum of PA skills (e.g., rhyming, sound/syllable matching, sound/syllable isolation, sound/syllable blending, sound/syllable addition or substitution, and sound/syllable segmentation).

Maintenance sessions. Maintenance sessions, on a one-to-one basis in the classroom, were held for all children on the 6th, 11th, and 16st days after introducing instruction combining direct instruction and precision teaching. Each session lasted for 20 minutes.

Generalization sessions. Data in generalization session which was run as one session for each child was collected in another classroom before introducing instruction and 10 ten after. More activities were presented to the children. Each session lasted for 20 minutes.

Reliability

Interobserver reliability. Two independent observers(classroom teachers) recorded sessions and data from all phases of the experimental study. Reliability results after calculation: [(agreement) / (agreement + disagreement)] X 100, was 96% .

Intervention reliability. This data was collected to assess the effectiveness of the intervention combining direct instruction and precision teaching. Reliability results after calculation: (observed practitioner behavior/planned practitioner behavior) X 100, was found to be 98%.

Results

Figure 1 shows how successful were the three children from the baseline, to intervention, and maintenance sessions,

throughout which their performance were measured for Rhyme Recognition (RR), Blending Phonemes (BP), Phoneme substitution—Beginning Sounds (BS), Phoneme Substitution—Ending Sounds (ES), and Phoneme Substitution—Middle Sounds.

Baseline

Essam: During the baseline , Essam 's scores for Rhyme Recognition ranged from 0-1 for the first five sessions. He got zero in all five days for Blending Phonemes. However, for Phoneme substitution—Beginning Sounds, his scores increased from zero during the first three days, to one point during the fourth and fifth baseline sessions. As for Phoneme Substitution—Ending Sounds, he got no point in all five baseline sessions. However, for Phoneme Substitution—Middle Sounds, his scores increased from zero during the first three days, to one point during the fourth and fifth baseline sessions.

Radwan: During the baseline , Radwan 's scores for Rhyme Recognition ranged from 0-1 for the first five sessions. He got zero in four baseline session before getting one point in the fifth session for Blending Phonemes. Also he got zero in four baseline session before getting one point in the fifth session for Phoneme substitution—Beginning Sounds. As for Phoneme Substitution—Ending Sounds, he got no point in all five baseline sessions. However, for Phoneme Substitution—Middle Sounds, his scores increased from zero during the first four days, to one point during the fifth baseline sessions.

Said: During the baseline , Said 's scores for Rhyme Recognition ranged from 0-1 for the first five sessions. He got zero in

four baseline session before getting one point in the fifth session for Blending Phonemes. Also he got zero in four baseline session before getting one point in the fifth session for Phoneme substitution—Beginning Sounds. As for Phoneme Substitution—Ending Sounds, he got no point in all five baseline sessions. Also for Phoneme Substitution—Middle Sounds, he got no point in all five baseline sessions.

Intervention and maintenance

Essam: Essam 's success rate increased from 0-20% (during the baseline) to 60-100% at the end of sixteen teaching sessions, and stability (at the beginning of the seventeenth till the final session, that is session 24 session) was maintained. Given the findings, one can say that teaching using direct instruction and precision teaching with regard to phonological awareness skills for Essam.

Radwan: Radwan 's success rate increased from 0-20% (during the baseline) to 60-100% at the end of sixteen teaching sessions, and stability (at the beginning of the seventeenth till the final session, that is session 24 session) was maintained. Given the findings, one can say that teaching using direct instruction and precision teaching with regard to phonological awareness skills for Radwan.

Said: Said 's success rate increased from 0-20% (during the baseline) to 60-100% at the end of sixteen teaching sessions, and stability (at the beginning of the seventeenth till the final session, that is session 24 session) was maintained. Given the findings, one can say that teaching using direct instruction and precision teaching with regard to phonological awareness skills for Said.
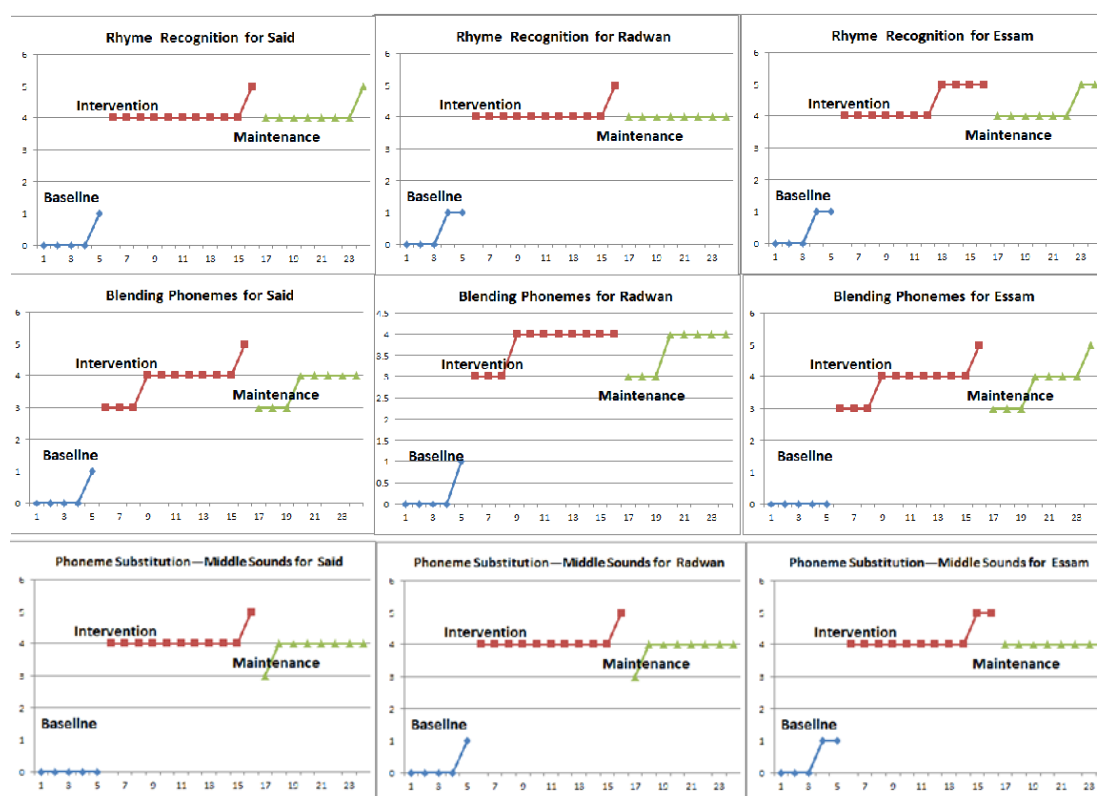
Figure 1. Rhyme Recognition (RR), Blending Phonemes (BP), Phoneme substitution—Beginning Sounds (BS), Phoneme Substitution—Ending Sounds (ES), and Phoneme Substitution—Middle Sounds (MS) during the baseline (B), intervention (I), and maintenance (M) sessions for all children.

Discussion

The present results support the general experimental prediction: combining direct instruction and precision teaching will reveal group differences, suggesting that students in the experimental group will outperform those in the control groups in all phonological awareness tasks . This study extends the line of research in include students with ASD. Furthermore, the students in the current study maintained their performance after instruction ceased. There is a strong evidence-base supporting the use of DI to teach children literacy (Przychodzin-Havis et al., 2005; Simonsen and Gunter, 2001).

DI is comprised of a set of directions for implementing instruction so that students acquire, maintain, and generalize skills, ideas, and concepts (Yaghmourand

Obaidat, 2022). Instruction is designed so that the curriculum is divided into strands and students engage in learning tasks from several different strands within the same lesson (Ganz and Flores,2009). Moreover, practitioners have used PT methods to record and monitor performance for many academic skills, among them was reading skills in second-language (Beverley et al. 2016). That is, PT can offer a structure within which any professional can track the success of their teaching and the learning process for the individual(Ken, Philomena & Claire 2003).These results lend additional support to the evidence which indicates that combining DI and PT techniques when teaching reading skills is effective (Johnson and Street, 2004; Maloney, Brearley and Preece, 2001)

Skill deficits common among persons with developmental and intellectual disabilities

include impairments in language, reading, writing, math, social skills, self-management, and personal care(Mourad,2017b). However, when taught using a combination of both direct instruction and precision , all their phonological awareness skills improved. What distinguishes this study from others is that the students in the current study maintained their performance after instruction ceased.

Moreover, The instructional procedures were modified based on the students' individual needs. Initially, the students had difficulty manipulating different phonological tasks; this difficulty is consistent with the characteristics of individuals with ASD(Mourad,2017b). During sessions, the researcher used multiple and varied phonological tasks and objects made until the students demonstrated mastery during daily instruction.

Conclusion

An intervention framework combining direct instruction and precision teaching has promise to help students with ASD improve their PA skills. The student's phonological awareness skills improved on the composite level when trained through the DI/PT technique. The current data demonstrate the effectiveness of DI/PT procedures for children with ASD. This research is important for educators to consider when they are working with students with ASD and suggests an effective technique for instruction of phonological awareness skills for students with ASD. Therefore, this study sets an example for future studies in combining direct instruction and precision teaching. Moreover, other potential contributions to the effectiveness of combining direct instruction and precision teaching may be

the practitioner's previous experience in teaching children with autism.

Implications and Future Research

Findings from some studies(e.g. Fleury and Lease, 2018; Hudson et al., 2017; Westerveld et al., 2017; Westerveld, Trembath, Shellshear, and Paynter, 2016) indicate poorer PA performance in students with ASD. The current study provides initial evidence as to direct instruction and precision teaching's efficacy with regard to increasing phonological awareness skills.

In order to make this a reality, more research is needed in order to investigate the efficacy of direct instruction and precision teaching with regard to phonological awareness skills. Finally, to bridge the gap between research and practice, future implementations of direct instruction and precision teaching should involve typical both typical students as well as those with developmental disabilities.

Disclosure statement

No potential conflict of interest was reported by the authors.

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