The Case for 1:1 Remote Peer Learning Models in Individuals with Developmental Disabilities

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Abstract

Research has shown that children with developmental disabilities benefit from inclusion in mainstream curriculum with gains made in academic skills as well improvement in self-esteem, behavior, and social skills. With the ease of videoconferencing, low-cost and easily accessible platforms have made remote peer learning— where neurotypical peer can work with children with developmental disabilities in a 1:1 or similar capacity – broadly accessible to augment academic and social skills. In this review, we examine studies evaluating the impact of peer learning models in children with developmental disabilities. Because of the lack of studies evaluating these peer interventions are delivered remotely, we also review existing studies where tutoring or mentoring was delivered remotely in broader populations. Existing studies indicate the efficacy of tutoring are attributable to factors such as session length, frequency, the qualifications of tutors, amongst others. Given the promise of 1:1 remote learning to help bolster academic achievement and social-emotional development in individuals with developmental disabilities and the existing research suggesting the intervention would be beneficial, it is critical to conduct large-scale, randomized, controlled studies to evaluate the manner to implement such learning to achieve maximize gains.

Keywords

Behavioral and Social Sciences; Clinical and Developmental Psychology; Peer Learning; Remote Learning; Children with Developmental Disabilities

Introduction

According to the United States Center for Disease Control (CDC), in 2021, approximately 8.56 percent of children aged 3-17 were diagnosed with a developmental disability, increasing from prior years.[1] The CDC defines developmental disability to include autism spectrum disorder (ASD), intellectual disability and any other developmental delay[(1)]. However, the term is often used more broadly to include attention deficit hyperactivity disorder (ADHD) as well. Children with developmental disabilities often struggle with academic performance skills and some conditions may have associated behavioral challenges. With truncated school hours and isolation caused by the Coronavirus disease (COVID-19), many students experienced declined academic performance, while students with disabilities were most significantly impacted.[2]

Inclusion of children with developmental disabilities in the general education school setting have been shown to improve both academic performance as well as social skills. Given the benefit of interactions between neurotypical and neurodiverse peers, low-cost or no-cost remote and in person peer learning models (e.g., where a peer volunteer provides tutoring or mentoring to peers with developmental disabilities 1:1) have been implemented through various programs with the goal of improving academic

and social skills. This article will review the existing research that evaluate the efficacy of such neurotypical-neurodiverse peer interactions on academic achievement and/or social emotional behavior as well as the effectiveness of remote peer learning models in broader populations.

There is a lack of large, randomized and controlled evaluating remote peer learning models in individuals with developmental disabilities. Because remote peer learning programs are more accessible and cost-effective to support individuals with developmental disabilities, it is critical to research the extent of its efficacy, including learning the specific conditions and factors that maximalize potential academic or social gains in individuals.

Discussion

Overview

Children with developmental disabilities often have academic and social delays and some have behavioral challenges. With respect to children with disabilities, research has shown the inclusion of students with disabilities in general education classroom settings have significant benefits, including higher academic performance, higher rates of grade progression and on-time graduation, and higher rates of college attendance and employment.[3] In addition, studies show that students who are included in mainstream classroom have a positive relationship on self-esteem, behavior, and social skill.[4] If a child believes she can succeed, she will work harder to reach to reach the goal.[4] The conclusive amount of research demonstrating the benefit of inclusion led to the adoption of the Individuals with Disabilities Education Act (IDEA) which requires "to the maximum extent appropriate, children with disabilities . . . are educated with children who are non disabled."[5]

In addition, competent communication and social skills in individuals have been shown to be especially important to individuals with developmental for several reasons. For example, a longitudinal study evaluated the continuity and change in the social competence of 70 children with ASD, 93 with Down syndrome, 59 with developmental delays and 108 neurotypical children found that improvements in early communication and play skills may correlate to later language and social competence in these children.[6] The results suggest families should prioritize working on social and communication skills in younger children. Therefore, programs to bolster communications skills, especially in younger populations, which can be gained using remote peer learning should be encouraged. Further, while appropriate behavioral and communication skills can aid individuals with disabilities to succeed in academics and the work force, data suggests having certain developmental disabilities such as Down syndrome may put adolescents at risk for peer victimization, but having relatively good language and communication skills may be a protective factor.[7] This suggest effective communication skills can help ward off potential negative bullying behavior.

Finally, peer tutoring in general student populations has been shown to improve student motivation, learning and persistence, including having a positive effect on student to student interaction.[8] Given the heightened need for intervention in children with developmental disabilities, remote peer learning models presents as a promising intervention because it can overcome many barriers to tutoring presented by traditional in-person tutoring models. For example, it is low cost, requires no transportation and can be done conveniently from one's home. Further, for those individuals who are medically fragile, remote peer learning models also limit interactions in the public where there is a risk of exposure to contaminants or infection. There is a dearth of research evaluating the impact of remote peer learning on individuals with developmental disabilities. However, results from studies evaluating peer learning models in the developmentally disabled population as well as from remote tutoring and mentoring programs delivered to children with disadvantaged backgrounds or those lagging academically can help support the case for why gains can be similarly expected in children with developmental disabilities.

Findings from Existing Studies

Peer Tutoring to Improve Academic Skills

The following studies involve peer tutoring with individuals with developmental disabilities aimed at improving academic skills. Studies where the sample size was two or smaller were excluded.

Peer Tutoring of Children with ADHD by General Education Class Peers. In a classroom setting, a study evaluated whether academic performance improved in 18 children with ADHD in the first through fifth grades when they received peer tutoring 15 to 20 minutes per day for 3 to 4 days a week in addition to typical instructional activities. Results were compared 10 peer comparison students attending general education classes.[9] The children with ADHD selected for the study were academically achieving in the low average range and exhibited inattention and impulsive behavior. [9] In this study, peer tutoring was implemented in a class wide basis, and during the peer mentoring sessions, the tutor and tutee were paired to work together and then the roles reversed. The study found that over 50 percent of the students with ADHD who received peer tutoring exhibited improvements in academic performance in math or spelling and there were also reductions in off-task behavior for most participants.[9] In addition, the students who received peer tutoring exhibited increased active engagement and reduced off task behavior.[9] Overall, students reported a high level of satisfaction with the intervention procedures[9], suggesting that peer tutoring may be an effective strategy for addressing academic and behavioral difficulties associated with ADHD in general education modeling settings.

The limitations of this study include the small sample size, pre-and post-tests were not collected during the first year of the study so only 14 children with ADHD were included in the analyses of the data for these dependent measures. While the results are encouraging, the study included reversing roles of the tutor-tutee pairs, which would likely not be applicable in a peer to peer remote learning model where a neurotypical peer tutored a peer with developmental disabilities. It is unclear how the impact of reversing the role had on the results. It is also unclear if the intervention would be less effective if delivered remotely.

Peer Tutoring of Children with High Functioning ASD by General Education Classroom Peers. In a small study, traditional reading instruction was compared to the effects of class wide peer tutoring on reading skills and social interactions for 3 high functioning boys with ASD (between years 8 to 9) and their typical peers in a general education classroom.[10] Class-wide peer tutoring consisted of 25 to 30 minutes of specified instruction in which tutor and tutee pairs worked together on a class wide basis. The tutor tutee roles were reversed in the exercise. The students also participated in 15 to 20 minutes of unstructured free-time activities following reading instruction. The reading assessment demonstrated that class wide peer tutoring increased reading fluency and reading comprehension accuracy for students with ASD and their peers.[10]

Limitation of the study include its small sample size, the lack of data collection for treatment fidelity and whether elements such as praise or study materials may have impacted results. The children in the study also reversed roles in the exercise, which likely would not occur in a remote 1:1 peer to peer tutoring model where a neurotypical peer tutored a peer with developmental disabilities. It is unclear how the impact of reversing the role had on the results. It is also unclear if the intervention would be less effective if delivered remotely.

Pearl Learning to Enhance Social Skills

Social competence is critically important for individuals with neurodevelopmental disorders, such as ASD, Down syndrome and ADHD, as it helps determine the extent to which

these individuals are able live independently or semi-independently. This is because many vocational and living settings depend on one's social skills and ability to get along with others.

Observational studies have indicated that children with Down syndrome have less well-developed peer networks even in comparison to a mental age matched group of typically developing children.[11] ASD is believed to occur more commonly in individuals with Down syndrome than the general population with a 37 percent occurrence.[12] Individuals with Down syndrome who have ASD may exhibit even greater social skill challenges. There are very limited studies evaluating the effectiveness of interventions in this population with both diagnoses.

Adults with Down syndrome and ASD Mediated by Peers with Down Syndrome. In a small multi-probe study, peer-mediators with Down syndrome and intellectual disability were used to teach social skills to three adults with intellectual disability and a dual diagnosis of Down Syndrome and ASD with small (Tau Weighted = .55, 90 percent CI [.29, .82]) to medium effects (Tau Weighted = .75, 90 percent CI [.44, 1879]).[12] The peer mediators in the study were selected based on strengths in social skills and communication and were trained to provide certain prompts and reinforcement in a 1:1 setting, although a researcher was present.[12]

The results of the study suggest the benefits of a potential intervention that could be implemented in this population, demonstrating a need for a larger randomized and controlled study. There are inherent limitations given the multi-probe study (e.g., there could be a greater likelihood of behavioral covariance) as well as the potential for researcher bias. Other limitations of the study include the small sample size as well as the high variability in the conditions in which the tutoring was administered. It is also unclear if the intervention would be less effective if delivered remotely.

Peer Mentoring of Children with ASD aged 4-12. In a randomized, single blind, parallel-controlled study evaluating fifty-five children with ASD aged 4-12, the effect of peer mediated intervention was evaluated in a hospital setting.[13] The control group utilized behavioral therapy based on applied behavior analysis (ABA). Before the training, sixteen peers received training in the conduct of simple games, including teaching them to provide visual and physical prompts and positive verbal feedback to children with ASD. The study was conducted for approximately a 3 month period. Using the Social Responsiveness Scale (SRS) to evaluate the social performance of autistic children prior to and after the intervention, the experimental group's SRS score fell significantly more than the control group's (t=-3.918, P=0.000), d=-1.043; the mild to moderate subgroup experienced the same situation (H=17.811, P=0.009), d=-1.642.[13] However, there here was no significant difference in SRS score reduction between the experimental group's severe subgroup and the control group (H=10.127, P=0.838).[13]

The data from this study suggests that children with mild-to-moderate ASD in the peer mediated intervention group had greater improvements in overall social skills than in the control group where ABA was utilized. The data showing the effectiveness of peer mediated intervention in prior studies in a school setting and here in a non-school setting suggests the general utility of peer mediated intervention, especially where positive feedback was provided by peers. Despite the positive results from the study, evaluating a larger sample size would better investigate the impact of peer mediated intervention on children with ASD. In addition, some of the indicators used in the study are semi-quantitative and may be insufficiently objective. Further, the study duration was limited, while ASD requires long-term intervention. It is also unclear if the intervention would be less effective if delivered remotely.

Children with Attention Deficit Hyperactivity Disorder (ADHD) aged 5 to 11. ADHD is one of the most prevalent developmental disorders and children with ADHD have social difficulties that are profoundly greater than those experienced by neurotypical peers.[14] In a randomized controlled trial, children with ADHD aged 5 to 11 years were placed in an intervention arm (n=15) or a waitlist control-first arm (n-14).[14] Participants in the control group received a 10-week play-based intervention with neurotypical playmates, while the control group received no treatment for 10 weeks after which they also received 10 weeks of play-based intervention. The control-first group did not change during the wait period, whereas the change in the intervention-first group was significantly greater than the change in the control-first group (during the wait period).[14] When the data of the two groups receiving play-based intervention were combined, using the Test of Playfulness (ToP) assessment tool, the mean ToP scores of the children with ADHD (n=29) improved significantly following intervention.[14] The study also found that lower baseline ToP scores predicted greater intervention change, demonstrating that children with severe social skills deficits benefited most from the intervention.[14]

Although the participants in the study are small, the findings from the study helps support the use of play involving peer mediated components to enhance the social play skills of children with ADHD in a non-academic setting. It is unclear if the intervention would be less effective.

Remote Learning Programs

There is a lack of studies evaluating the efficacy of remote peer tutoring solely in children with developmental disabilities. Therefore, the following include large randomized, controlled studies where remote learning or mentoring efficacy was evaluated. Three of the studies below evaluated include children from disadvantaged backgrounds, including those with academic skill gaps and learning challenges.

Remote Early Literacy Program. In a randomized controlled study of virtual tutoring for 2,000 students in grades K-2 delivered.[15] The tutoring was delivered in either 1:1 or 2:1 sessions embedded in the school day and students were paired with a consistent tutor during the program. Tutors received training and the program sought to pair students with a consistent tutor for the duration of the program. Findings from the study showed that the virtual tutoring improved early literacy skills by 0.05-SD for all students and 0.08-SD for a sample that excluded English learners and students with disabilities (i.e., students not eligible for additional support services)[15], suggesting the tutoring may have benefited the general education population more significantly than the combined population. Although these effects are smaller than what usually is seen from in-person early literacy tutoring programs, the results are still positive and significantly significant.

The large study size of the study supports the efficacy of remote tutoring, even in the young K-2 population, suggesting it may be even more beneficial in older children who are better able to attend and focus. The study notes that English learners and students with disabilities in the treatment group were disproportionately withdrawn from tutoring over the course of the year, potentially contributing to the lower combined improvement score. Further, because English learners and students with disabilities in the control group received additional services as part of the school year separate from the literacy program, these students likely experienced a weakened treatment-control contrast. Therefore, it is unclear if the general population benefited from the tutoring to a greater extent than those students with disabilities.

Remote Tutoring of Middle School Students. A randomized controlled trial evaluated the effectiveness of free tutoring to targeted middle school students (grade 6 to 8) from

disadvantaged background in terms of socioeconomic status, linguistic barriers, or learning difficulties.[16] These students who were identified by school administrator as lagging academically during distance learning. Tutors were trained volunteer college students who provided tutoring virtually for three to six hours per week for an average of five weeks. 530 of the 1,059 applicants were randomly assigned tutors and results from the study indicated significant improvement in both academic achievement (ES = 0.26), with the strongest improvement in math.[16] There were also positive gains in social-emotional outcomes.[16]

The improvement in both academic achievement and social-emotional outcomes is compelling, especially given the large size of the study. This is significant as the tutoring was administered by volunteer college students who were not paraprofessionals or professional educators, suggesting the promise of remote learning models where volunteers can be trained to effectively provide tutoring to children with disadvantaged backgrounds or learning challenges. This seems to suggest that remote tutoring can be effectively delivered online to middle school students who are behind academically.

Remote Tutoring of Children from Disadvantaged Backgrounds aged 12 to 15 by Paid Teachers. A study in Spain evaluated the impact of an intensive, eight-week tutoring program on academic and socio-emotional outcomes of 375 secondary school children.[17] The remote tutoring program occurred after school and was administered to students aged 12 to 15 from disadvantaged backgrounds. Tutoring was carried out by qualified and paid math teachers. The sessions were conducted in groups of two students per tutor and focused on math and social-emotional support (motivation, well-being and work routines). The study showed a positive and significant effect of program assignment on end-of-year math grades (+0.48 SD), equivalent to about six months of learning.[17] Further, the study found a significant increase of about 32 percent with respect to the control group mean in the likelihood of passing the subject. Using a standardized math test, the study found an increase in the test score by 26.2 SD (equivalent to about three months of learning).[17] The study found the tutoring program decreased the likelihood of repeating the school year by 9.4 percentage points, equivalent to a 78 percent decrease with respect to the control group, which had a repetition rate of 12 percent.[17]

The results from the study showed tutoring had positive socio-emotional outcomes as well. For example, students who received tutoring were 13.6 percentage points more likely to state that they would like to go onto the academic track after high school, equivalent to a 33.2 percent increase compared to the control group mean.[17] The students receiving tutoring were also 11.6 percentage points more likely to state that they exerted high effort always or most of the time at school, which corresponds to an increase by 21.5 percent when compared to the control group mean.[17]

The significant effects obtained in this relatively large study demonstrate the promise of remote tutoring in math for children aged 12 to 15. Factors that may have contributed to high level of achievement include the intensity of the sessions (three sessions per week), which is more frequent than traditional tutoring programs or many available peer tutoring programs. In addition, because the teaching was done by paid and experienced math teachers instead of volunteer peers, this may have also contributed to the improved results.

Peer Mentoring of Undergraduate Students. A randomized trial studied the effects of peer mentoring at a German university that, due to the COVID-19 pandemic, switched to online teaching.[18] The sample comprised of 691 second term students and the mentoring program focused on students' general study skills, such as self-organization and study techniques. Mentors and mentees met 1:1 online. The program consisted of five meetings of around 40 minutes each that took place around every two weeks. The students hired as

mentors were from a more advanced term in the same study program. The students in the control group did not receive any mentoring but were given general information on working from home and the online implementation of courses. The results from the study suggest that the peer mentoring program improved students' motivation and study behavior although it did not shift earned credits on average.[18]

The study suggests that peer mentoring can be effectively delivered online with relatively few touch points to improve student motivation and study behavior. Because the goal of the study was to help students' general study skills, it is not surprising that there was not a change in academic performance or a shift in credit earned.

The Promise of 1:1 Remote Peer Learning Models for Individuals with Developmental Disabilities and the Need for Additional Studies

There are numerous barriers to accessing effective tutoring. Families may not be able to afford the cost of tutoring or have the time to transport children to the tutors. In addition, there may be a lack of qualified tutors in certain geographies. The prevalence of Internet access and the ability to conduct tutoring via videoconferencing platforms have led to the launch of various peer to peer tutoring programs, many of which are entirely free of cost or of a nominal cost and run by volunteers. Volunteers may experience less burnout or fatigue that is sometimes seen with professional educators and tutors. Given that remote tutoring can be conducted anywhere from one's home, finding qualified tutors are less of an issue with remote tutoring, as the geographic range of tutors is significantly broadened and programs can draw from motivated peer tutors from a diverge range of locations. Further, for those individuals who are medically fragile, remote learning models also limit interactions in the public where there is a risk of exposure to contaminants or infection. In fact, for the general education population, the promise of peer tutoring models has been proposed as a blueprint for launching broadly across the U.S. public school system. Some have proposed a tiered model, with high school serving as tutors/mentors in elementary schools and college students in middle schools, and 2- and 4-year college graduates in high schools via AmeriCorps.[19]

Existing research on the effectiveness of various tutoring practices has shown that positive, caring relationships with adults or older near-peers can support students' social–emotional development, enhance their attachment to school.[19] Additionally, 1:1 tutoring has been shown to be the most effective.[19] Other practices include individualized tutoring programs where the same tutor/tutee pair work together throughout a program to foster familiarity.[19] Additionally, while peer tutors may not have extensive or any experience providing instruction, studies have shown that when tutors are provided some additional content training, 1:1 peer tutoring can be as effective as professional group tutoring.[20] Studies have also attempted to examine the effectiveness of the tutoring based on length and frequency of the session.[21]

The existing research knowledge suggest that remote peer learning models to support individuals with developmental disabilities can be delivered in a cost-effective and efficient way, while providing academic and social-emotional gains. The factors have helped make traditional tutoring more effective can be applied to remote learning models. For example, many peer learning models for individuals with developmental disabilities are delivered in 1:1 format, allowing the peer tutor and tutee to build a positive relationship over time. This allows the peer teacher to understand the learning style of the tutee, navigating their strengths and weaknesses over time. In addition, in programs where the peer tutor is a volunteer, there may be more intrinsic motivation to help rather than an individual who is assigned the task or otherwise compelled to provide the service. Of course, given that the volunteer tutors are not professional educators or paraprofessionals, it would be important to train the peer tutors to be patient and empathetic while providing positive reinforcement and facilitation. With the prevalence of low-cost, high-quality online learning platforms for both English language arts and mathematics as well as online reading resources, volunteer tutors can easily utilize these platforms

during the session to build on foundational skills without needing to create any new curriculum. Screen share, white boarding and other videoconferencing features can all help make the instruction and learning interactive. Remote tutoring also allows both tutor-tutee pairs to work when mutually convenient, ideally at a regular cadence (e.g., once or twice a week) that fosters effective learning and retention.

Both anecdotal evidence and existing research support the use of remote peer learning programs in individuals with developmental disabilities. Therefore, it would be beneficial to conduct a large, randomized, controlled study to evaluate the extent of any positive impact, including the optimal cadence, duration, and other factors that would help improve the gains. Further, because of the numerous types of developmental disabilities, each presenting with its unique strengths and challenges, it would be important to assess the impact of remote peer learning programs on various subpopulations as one would expect different factors would contribute to a more productive session considering the learners' unique profile.

Conclusion

Inclusion of children with developmental disabilities in the general education classroom setting have been shown to improve both academic and social emotional skills. A review of existing research suggests increased academic performance as well as decreased behavioral issues may occur from peer-mediated intervention in children with developmental disabilities. In addition, existing studies suggest that learning models can be delivered remotely effectively in broader populations, including in children as young as K-2. With the ease of videoconferencing and widespread Internet access, motivated neurotypical peers can deliver free or low-cost remote instruction and mentoring to children with developmental disabilities who are underachieving academically or struggling socially. Studies evaluating traditional peer interactions in individuals with developmental disabilities coupled with studies evaluating the effectiveness of remote learning in broader populations hint at the promise of remote peer learning models in this population. Given the promise of remote peer tutoring and mentoring with children with developmental disabilities, there is a need for large, controlled and randomized studies that evaluate its effectiveness, including assessing what conditions and factors can help strengthen its efficacy in various subpopulations.

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