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Research Article

The Effectiveness of a Comprehensive Intervention on Word Problem Solving for Elementary School Students with ADHD: POVM+ Schema Based Instruction

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Abstract

This study aimed to extend the use of video-based Instructions (VBI) by using point-of-view video modeling (POVM), schema based-word problem solving method and peer tutoring to teach addition-subtraction word problem solving to students with ADHD. When core mathematic instruction is not enough to address skill deficits of students with ADHD, more intensive interventions are required to support student learning and comprehensive interventions with strong instructional components may use to help improve achievement of students with mathematics difficulties. The video presentation of the instruction via POVM allows for development of procedural knowledge as participants can view instruction of problem-solving steps. A single-case multiple probe across participants, experimental design was used with three participants. As shown on the single subject graphic all three participants not only demonstrated mastery of the skill, but also maintained the skill several weeks after the intervention ended and they were able to teach the skill to their tutees. This means participants completed the three different types of word addition and subtraction problems independently. All participants were successful and shared that they enjoyed learning about word problem solving using the video instruction, supporting the social validity of this intervention.

Keywords:

comprehensive interventions, ADHD, POVM, schema based instruction

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Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a heterogeneous group of behavioral disorders affecting between 2% and 12% of school children (Swanson et al. 1998; Taylor 1998). Among children with ADHD poor mathematical competencies are common and difficulties in many daily skills and activities and these poor mathematical competencies may result in employment difficulties in their adulthood. In fact, poorly developed mathematical skills in the modern world, may have social and individual costs associated with poor reading skills. The insufficient quantitative knowledge may have adverse effects on many jobs (Bynner, 1997; Parsons S, Bynner, 1997).

Poor mathematical competencies can be accompanied by having significant homework difficulties in students with ADHD (Epstein, Polloway, Foley, & Patton, 1993; Power, Karustis, & Habboushe, 2001; Lahey et al., 1994). Homework has been defined as tasks assigned by teachers to be completed during non-instructional periods of the day and that it has positive effects on academic performance (Cooper, 1989; Cooper, Lindsay, Nye, & Greathouse, 1998). In children with ADHD, deficits in nonverbal working memory have been clearly documented (Barkley et al., 1992). Accordingly, forgetfulness may result some difficulty planning, organization and completing homework or projects. Several studies have shown that children with ADHD demonstrate less coping, persistence, less enjoyment of learning and a preference for easy over challenging work (Carlson et al., 2002; Hoza et al., 2001) display greater difficulties in the development of steps of goal-directed behavior (Mash and Barkley, 2003). Simply, inattention, learning or motivation problems may contribute to a wide range of homework difficulties. Some of the homework related problems can be failure to accurately record homework assignments, rushing through homework, and accordingly a tendency to make careless mistakes and failure to remain on task with additional increased procrastination. Research has confirmed that compared with their peer's children with ADHD have significantly more homework problems (Epstein et aI., 1993; Lahey et al., 1994; Olympia, Jenson, & Hepworth-Neville, 1996; Power, Karustis, & Habboushe, 2001). Even, analysis of the items on Homework Problem Checklist (HPC; Anesko, Schoiock, Ramirez, & Levine, 1987), a parent-report instrument may provide useful information in identifying success of intervention used (Epstein et al., 1993). So that we have to make use of special interventions in order to form memory representations of basic arithmetic facts decrease the effect of deficits in the ability to form representations of numerical magnitude. For this reason, research is needed to identify interventions appropriate for ADHD students with poor mathematical competencies.

Current literature states that ADHD students who have trouble with mathematics as an academic skill need proficiency in mathematics is an essential in academic as well as in real-world success. However, ADHD students can't be

successful by inefficient drill and practices. The aim of this study was to close that gap by making use of a comprehensive intervention for students with ADHD. For the required proficiency outcomes, educators need to find evidence-based techniques and strategies that can be used with efficient instructional time. Video-based instructions are one of the evidence-based practices. Video-based instructions are promising teaching tools for many students as well as schema based word problem solving and (reverse) peer tutoring where participants were the tutors.

Video-based Instructions (VBI)

VBI is used as an umbrella term that encompasses variations of video modeling, where a skill or behavior is taught via video demonstration. Unlike instruction in real time, video of instruction can be edited for instructional precision, paused for learner processing time, and re-watched for consistent demonstration of a skill, thus allowing the intensity of the intervention to be differentiated according to the individual learning needs. One of the advantages of the video-based instruction is to provide a permanent resource that can be used over and over and to address needs of multiple students at the same time and reused to provide conspicuous review of skills. Moreover, VBIs have evidence supporting use to teach mathematics with various exceptionalities (Gökalp, 2018).

While different types of VBI like video modeling, self-video modeling, video prompting, have demonstrated to be effective, point-of-view video modeling (POVM) may lend itself to effectively teaching mathematics skills (Yakubova, Hughes, & Shinaberry, 2016). In the focal point of the video there is an exemplary performance of the targeted skill. In POVM, the video is recorded from first-person point of view and usually shows a model's hands performing the skill accompanied by audio of explicit and metacognitive instruction. POVM is a technique that uses videotapes for the child to observe, and accordingly gather attention on the stimulus. This type of video-based instruction aims to minimize external stimuli that interfere with instruction (Yakubova, Hughes, & Hornberger, 2015)

Word problems require skillful mapping of text input onto the reader's knowledge base if proper comprehension is to be achieved otherwise they are notoriously difficult to solve. Many word problems are difficult to solve according to their linguistic forms that do not readily map onto children's existing conceptual knowledge structures. Because of that we have to use a schematic representation of the word problem (Riley, Greene, & Heller, 1983). Distribution of addition and subtraction word problems across the various problem types is possible like; so that the identification and representation of the problem turned up to be easy.

School-age children with mathematical learning difficulties show some impairments in executive functions (Clark, Pritchard, Woodward, 2010) and moreover, these children may demonstrate meta-cognitive discrepancies,

informational processing challenges, and weaknesses with self-regulation that may negatively impact mathematics performance. In order to solve word problems with ease these children may need a cognitive structure that specifies both the category to which a problem belongs and includes problem states, mathematical problem-solving operators, and relations between them. Memory span was significantly correlated with children's representation of problem schemata (Swanson, 1990). However, this correlation may be related to working memory in which remembering arithmetic information is critical to solution and not associated with a general deficit in working memory (Siegel, & Ryan, 1989). Indeed, in the poor problem solvers, working memory deficit is common and this is because inefficiency in ignoring irrelevant information (Bjorklund & Harnishfeger, 1990; Chiappe, Hasher, & Siegel, 2000; Gernsbacher, 1993; Gernsbacher, & Faust, 1991). However, we have to keep in mind that each student must be seen as a vibrant and adaptable being capable of wondrous change and growth.

Impairments in executive function includes organizational skills and the fact that medication does not normalize organizational skills related problems (Abikoff et al., 2009), and keeping in mind the association between organizational skills and academic performance (Langberg, J.M., Vaughn, A.J., Williamson, P. et al., 2011), additional treatments can be beneficial. Organizational skills treatments have typically focused on academic aspects of organization, such as classroom preparation, including the physical organization of school materials, management of homework, and time before, during as well as after school periods. One of the most defining characteristics of childhood and adolescence is the neuro-plasticity found within their central nervous system which means that the young brain can change, adapt and grow in response to their environment. This includes their home life, emotional support, intellectual stimulation, social supports, spiritual path and academic fit among others. Therefore, we must support the child as needed but fully embrace their ability to grow and change in a positive manner.

Rather than considering ADHD as a negative psychiatric illness, researchers of this article have chosen to see that this concern comes with many strengths and possibilities like being mostly a visual learner or like to be a hero so that they can help other children. Because of that a comprehensive intervention can be a promising intervention which contains POVM, schema based-word problem solving method and peer tutoring.

In the class, a single common instructional method such as a lecture may not efficiently meet the academic requirements of individual students for this reason modifying instructional techniques or using comprehensive instructional techniques (combining POVM, schema based-word problem solving method and peer tutoring) depending upon the particular requirements and deficits, can be a solution. Moreover, novice math learners should be provided with direct instructional guidance on the concepts and procedures required by a particular

discipline and should not be left to discover those procedures by themselves (Mayer, 2004; Sweller, 2003). Providing information that fully explains the concepts and procedures that is compatible with human cognitive architecture is defined as direct instructional guidance. Similarly, schematic diagrams are suitable for cognitive architecture and may help some students organize and then handle their word-problem work with a schematic diagram.

Peer Tutoring

Peer tutoring reported a large effect size for interventions to promote cognitive growth in primary education (Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003). Peer tutoring involves the structuring of the environment so that pairs of similar age students team up to practice basic skills and a component of cooperative learning (Gök, 2018; Slavin, 1995). Students may participate in one-way peer tutoring in which one student teaches the skill to a recipient (Eiserman, 1988). Instructional procedures were involved in peer tutoring procedures like immediate and frequent feedback which showed successful results for children with ADHD. The implementation of peer tutoring with ADHD student is described in a study, with results indicating significant improvements in attention to instruction, task-irrelevant activity level, and acquisition of mathematics skills and researchers conclude that peer tutoring may be a viable adjunct and/or alternative to teacher-mediated interventions for ADHD (DuPaul, and Henningson, 1993). In a same-age tutoring procedure on the academic and social behavior performance resulted in increased correct rates and decreased incorrect rates on tutors' and tutees' math worksheets, minimal changes on sociometric measures for tutors and tutees, small positive changes in self-concept scores for tutors, but no differences for tutees, improvement in attitudes toward math for both tutors and tutees, a significant increase in positive social interactions between the tutor and tutee (Franca, Kerr, Reitz, & Lambert, 1990). Additionally, results from 13 studies on tutorial programs for social acceptance and academic achievement showed significant gains when involving educable mentally retarded, learning disabled, and behaviorally disordered elementary students as tutors. The bulk of the research on the efficacy of peer tutoring has been conducted and reported in the literature include improved academics skills like mathematics, reading and comprehension, with increased desirable behaviors like on-task and motivation related behaviors (Brady, 1997; Mastropieri et al., 2006).

The Present Study

This study aimed to extend the use of VBI by using POVM, schema based-word problem solving method and peer tutoring to teach addition-subtraction word problem solving to students with ADHD. The instruction was anchored in use of concrete representations of schema to model conceptual understanding of word problem solving. The video presentation of the instruction via POVM allows for

development of procedural knowledge as participant's view instruction of problem-solving steps. Several questions guided the design of the present study, including: (a) Will this intervention improve the ability to solve word problems (addition and subtraction, and if so, (b) Will this acquired skill also be maintained? Secondarily, (c) Could word problem solving turn into a volitional action in homework management? And (d) Will participants enjoy this kind of intervention and judge it to be of value for learning mathematics?

Method

Research Design

In this study in order to evaluate the effectiveness of a point-of-view video modeling intervention to teach word problem solving skills to students with ADHD impacting mathematics a single-case multiple probe across subject's experimental design was used. A number of important studies dating back to the 1960s and 1970s investigated fluency treatments using single-subject experimental designs (SSED) approaches (e.g., Hanson, 1978; Haroldson, Martin, & Starr, 1968; Reed & Godden, 1977). Multiple probe (MP) across participants design is ideally suited to evaluate the effectiveness of a particular intervention for a specific difficulty. This involves replicating the finding with multiple participants, with a repeated effect for at least three participants. Data collection within a MP design classically occurs concurrently in the same or similar settings. This concurrent data collection reduces the influence of history effect on the data and enhances experimental control (Kazdin & Kopel, 1975). Data were collected accordingly to evaluate acquisition and maintenance of targeted skills as well as generalization to word problems. This particular design allowed the possibility of determining a functional relation between the independent and dependent variables (Gast & Ledford, 2018).

Setting and Participants

The study took place in a private clinic for students with disabilities in Ankara. To participate in the study, the author contacted the class teachers at one of the nearby schools to identify students who may need additional mathematics instruction to support learning and achievement for students with ADHD. In this study, students with ADHD are defined as students who require more specialized and intensive interventions in mathematics according to the class teachers. According to the class teacher these students were displayed a wide range of problems including inattentiveness, aggressive and/or oppositional behavior toward adults-peers, and difficulty with academic subjects. The first author sent letters home to parents of students with ADHD identified as needing additional mathematics academic support. Instructions embodied took place in the afterschool program of the clinic. Students were kept actively participating in the study, the author tutored the participants by including them in a peer tutor

program where they can have the chance to help their peers in the same school who may need additional mathematics instruction. This served an additional purpose like keeping participants' motivation high. Three participants were identified and initially had permission to participate in the study and additionally; three students were identified for peer tutoring as a tutee. Peer tutoring sections of the comprehensive program were conducted in the resource room. The resource room was arranged traditionally, with each student occupying a single desk. During the peer tutoring section, the tutors and tutees placed the desk adjacent to class teacher's desk.

Prior to baseline data collection, the researcher assessed current performance in mathematics to target grade-level skills that the participants and the three students (for peer tutoring) had not yet mastered. All three participants and all three students demonstrated significant deficits with addition/subtraction word problem solving, therefore, it was determined that it was an appropriate skill to target. Three participants continued to participate in the research. Additionally, participants' homework problems, assessed by parent reports on the Homework Problem Checklist (HPC).

Ali. Ali (pseudonym) was a Caucasian male fourth grader who has an ADHD prognosis and he is on a stimulant medication. He was 10 years old at the time of the research. He disliked mathematics and was unsure of his mathematics abilities and never motivated to complete his homework. He was having big quarrels with his family about doing his math homework.

Başak. Başak (pseudonym) was a Caucasian female fourth grader and it was noted in her records that she was diagnosed with ADHD and she is on a stimulant medication. Başak can make lots of errors and became frustrated. She was refusing to take the mathematics tests in the class but she seldom entered some of them. After getting low grades she was in the habit of shouting and destroying the exam sheet by tearing it into pieces. She demonstrated signs of frustration and made additional errors during practice time in the class. She was less motivated to complete her homework and most of the time she was forgetting to bring assignment back to class.

Can. Can (pseudonym) was a Caucasian male fourth grader with a diagnosis of ADHD. His performance in mathematics class indicated he had significant gaps in mathematics knowledge. He denied having homework assignments and most of the time he failed to bring home assignment and refuses or easily frustrated to do homework assignment.

Data Collection Tools

Three problem types were chosen on which to base the stories. These included change, group, and compare problems. These problem types were then embedded in rich story contexts. The stories were all five lines long, and their propositional

content varied from 15 to 30 propositions, with a mean of 23.7. There were 80 story problems in all, twenty from each of the four problem types. The numbers embedded in the problems were single digit numbers but the answers single and double digit numbers (Jitendra, 2002; Jitendra, DiPipi, & Grasso, 2001; Jitendra, DiPipi, & Perron-Jones, 2002).

Strategy for Change Problems

In this change story, (a) there is a beginning amount, a change, and an ending amount (point to the diagram), (b) we began with pillows in a pillow party and ended with pillows. The change also involved pillows (point to the diagram), and (c) both the beginning and ending states cannot occur at the same time. That is, Ayşe began with 4 pillows and ended with 7 pillows to tell us about a change in time from past (i.e., Ayşe had) to present (Ayşe now has).

Strategy for Group Problems

In this group story, (a) two small groups (3 apples and 2 oranges) combine to make a large group (5 fruits) and (b) the whole (fruit) is equal to the sum of the parts (apples and oranges).

Strategy for Compare Problems

In this compare story, (a) there is a compared, a referent, and a difference amount (point to the diagram) and (b) we are comparing Can's age in years to Caner's age in years.

In the peer tutoring section where participants were the tutors, the area of the schematic diagram is left blank and then tutees learn how to solve this blank space in the diagram by calculating word problem answers.

Independent Variable

This independent variable was POVM+schema-based word problem solving procedures, where the model's hands were visible completing the targeted task while the model narrated the video by explicitly annotating the instruction. During instruction time, the narrator demonstrated how to use schema for solving 3 different types of word addition and subtraction problems.

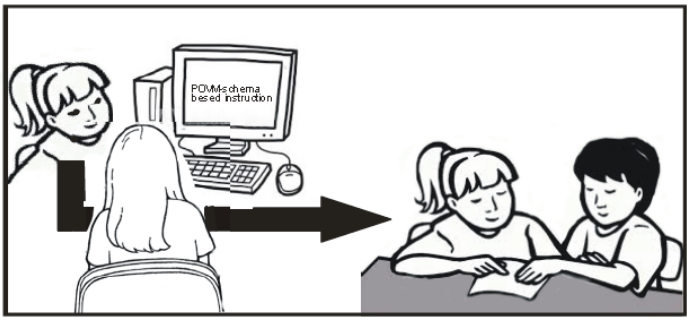


Figure 1.

Representation of Schema-based Word Problem Solving Procedures Embedded in POVM was Used in the Form of Comprehensive Intervention by Combining with Peer Tutoring as a Motivating Agent

The POVM demonstrated the correct way to do the word problem by using a schema-based problem solving model that entails both conceptual and procedural knowledge. The first stage of the problem solving process is associated with the identification/recognition of problem schemata using schema knowledge and the second stage involves representing the problem or mapping key elements of the problem type and their relation. The third stage refers to planning and selecting an appropriate operation (e.g., addition-subtraction) or setting up a mathematics equation and finally, last stage is to carry out the plan (Marshall, 1995; Riley et al., 1983, Xin, 2003). The video concluded by telling the viewer that the viewer would work on similar problems independently. The related video was lasted three to four minutes and contains all three phases with an addition of an extra one phase which is the "reading a word problem".

Dependent Variable

The dependent variable was the 3 different types of (change, group, and compare) word addition and subtraction word problems.

General Procedures

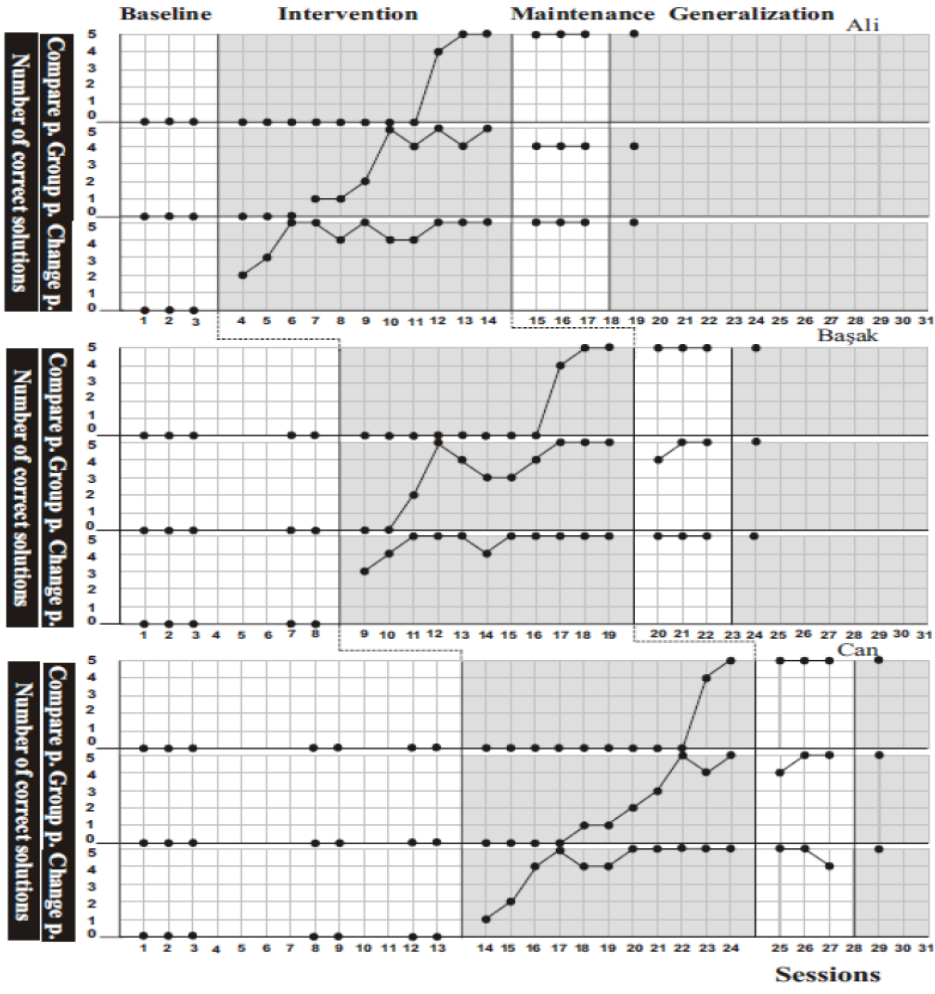
The intervention took place in an hour-long, after-school tutoring program. After time required to complete baseline or intervention activities, the researcher provided help about how to teach addition and subtraction word problems to their tutee.

Baseline. During baseline, participants were given the worksheet with directions to solve word problems and told by the researcher to, "Listen when you are reading the question from your worksheet, you have a pencil and an eraser and please try to solve all the questions." Participants were given unlimited time to complete the baseline assessments. All baseline assessments were completed in less than 15 minutes.

Intervention. Participants were given a laptop connected to headphones. The video was preloaded on the laptop and participants started and stopped the

intervention independently. After watching the video, participants completed the 3 different types of (change, group, and compare) word addition and subtraction problems independently. Sessions were monitored and videotaped by the author to ensure videos were viewed in their entirety.

Maintenance and generalization. At least two weeks after completion of the intervention, participants were given a maintenance assessment. Maintenance assessments were given every few weeks, as time and schedules allowed. Students were given one generalization measure, which required they read and solve word problems involving 3 different types of (change, group, and compare) addition and subtraction problems with the existence of the second author. Additionally, participants' peer tutoring part of the intervention where all had a single tutee took place in maintenance phase of the research.



Graphic 1.

Number of Correct Solutions for PAVM+Schema Based Instruction

Interrater Agreement

Dependent variable measures were rescored (80%) by a research assistant by using video recordings. The dependent variable was scored item-by-item. Agreement was calculated as number of responses agreed upon divided by the number of responses agreed upon and disagreed upon. Interrater agreement was determined to be > 99%. Intervention notes taken by the researcher day by day and video recordings were evaluated for fidelity of treatment. In order to determine if the intervention protocol were implemented in the intended setting with fidelity and produce clinically significant improvements in participant functioning, the intervention is tested. Assessment of treatment fidelity has been performed when the intervention is disseminated, by typically using randomized trial methodology because assessment of treatment fidelity is a critical component of effectiveness research.

Additionally, due to the need to support evidence-based interventions with an "effect size" or index of amount of improvement by the client (Odom, 2009), PAND index can be used and this index is conceptualized as the percentage of data remaining after removing the fewest data points that would eliminate all overlap (Parker et al., 2007).

Social Validity

Upon conclusion of the intervention phase, participants responded to a semi-structured interview. As part of the interview, the researcher asked pre-formulated questions, which included (a) did you like watching the video to learn how to solve 3 different types of (change, group, and compare) word addition and subtraction problems (b) would you want to use videos to help you learn math in the future? and (c) what didn't you like about the video instruction? (d) did you like to teach to your tutees how to solve 3 different types of (change, group, and compare) word addition and subtraction problems Based on their responses, the researcher asked follow-up questions for more information or clarification of the original response.

Discussion

When core instruction is not enough to address skill deficits of students with ADHD, more intensive interventions are required to support student learning (Fuchs et al., 2017). Comprehensive interventions with strong instructional components may use to help improve achievement of students with mathematics difficulties (Shin & Bryant, 2015). The intervention evaluated in this study combined video-based (POVM) explicit instruction with peer tutoring to teach concepts and procedures for solving 3 different types of (change, group, and compare) word addition and subtraction problems. Non-existence of the overlapping data (PAND index:1) indicated that the intervention was indeed effective. Participants gained the skill within 11 sessions. However, not all the word problem types' degree of difficulty was not the same.

Ali gained the skill for compare type of word problem solving within 3 sessions, group type within 4 sessions and change type of word problem solving within 2 sessions. Ali has full performance in maintenance-generalization phase for compare and change type of word problem solving skill and he has 4/5 success in group type in maintenance-generalization phase.

Başak gained the skill for compare type of word problem solving within 3 sessions, group type within 4 sessions and change type of word problem solving within 2 sessions. Ali has full performance in maintenance-generalization phase for compare, group and change type of word problem solving skill apart from the first session in the maintenance phase, she has 4/5 success in group type of problems.

Can gained the skill for compare type of word problem solving within 4 sessions, group type within 5 sessions and change type of word problem solving within 2 sessions. Ali has full performance in maintenance-generalization phase for compare type of word problem solving skill and he has 4/5 success in group type in the first session of maintenance phase. He has 4/5 success in change type in the last session of generalization phase. All participants have successfully performed tutee instruction starting just after maintenance sessions. Social validity related data were collected in a semi-structured interview. First, participants were asked if they liked watching the videos to learn how to solve 3 different types of (change, group, and compare) word addition and subtraction problems. All three participants communicated that they liked the intervention. When asked why, they shared that the video was "organized," "easy to understand," and presented and explained in a way that "was easy to learn." These elements are not surprisingly characteristic of explicit instruction expressed in their own words. All three participants communicated that, if given the opportunity, they would like to use videos again to help them learn math. When asked what they didn't like about the video or intervention, all of the participants agreed that they felt like they had to watch the video too many times. During the interview, second participant shared that she liked watching the video because, now she knows how to solve 3 different types of (change, group, and compare) word addition and subtraction problems, at which point the other two chimed in with agreement. Additionally, all participants agree that the most difficult part of the study was the peer tutoring section as they all afraid of making mistakes as a tutor like misreading the question, making mistakes in calculation or not able to teach their tutees. All participants communicated that they study the teaching material over and over again with their parents (after maintenance sessions) not to make any mistakes during tutoring and they all agreed that teaching word problem solving skills was a great mission for them and they all proud of their tutees and themselves as well in the end of the study. All the participants agree that they will be willing to teach other word problems to their tutees in the future.

In the end of the intervention all three participants not only demonstrated mastery of the skill, but also maintained the skill several weeks after the intervention ended and they were able to teach the skill to their tutees. As mentioned before consistent mastery performance on delayed outcomes are important, as understanding word problem solving is foundational for future success in mathematics (Siegler et al., 2012). These findings suggest that participants mastered the skill and teaching the skill to their tutees which supported them for the long-term understanding of solving 3 different types of (change, group, and compare) word addition and subtraction problems.

Researcher school notes about peer tutoring indicate all participants self-initiated schema-based word problem solving step by drawing the schema first then explaining the procedure. These actions were unprompted by the researcher, and school notes documented that all participants were highly motivated by using the worksheets containing the word problems as well as dry erase boards and markers provide by the researcher, which might have contributed to this natural bridge, as they wanted to draw the schemas easily.

Visual analysis and PAND communicated the impact and collective effects of the comprehensive intervention on mathematics performance. While the intervention has evidence to support effects across participants, participants responded to the intervention in different ways. Attentive behaviors uniquely contribute to participants' success learning word problem solving, and the academic-focused instruction was not enough for one participant (i.e., Başak). A self-regulation component needed to be added to the peer tutoring since she was extremely shy as a tutor. Because of that by adding self-regulation component as a tutor, she gained self-confidence enough to continue teaching procedures successfully. This self-regulation component took extra 3 sessions for teaching how to teach word problem solving to her tutee.

Conclusion

The behavioral manifestations of inattention in ADHD include making careless mistakes, being easily distracted, and having a difficult time completing projects, difficulty listening, difficulty following directions, and difficulty with organization like losing homework. In ADHD impulsive behaviors are another factor that may have a negative impact on individuals' functioning (Lee et al. 2011; Owens et al. 2009). However, findings from this work may function by replacing disabilities with abilities via creating "heroes or super helpers" may generating interventions aimed at reducing specific symptoms and consequences of ADHD.

Mathematics is a strong predictor of later academic achievement, financial success, and future career options (Duncan, 2011). The importance of understanding word problem solving, coupled with awareness that students with ADHD who have low grades in mathematics present additional challenges to

acquisition and mastery of word problem solving, emphasize the need for targeted interventions aimed to improve conceptual understanding and mastery achievement. In this research POVM was used with a schema-based problem-solving model in the form of a comprehensive intervention by combining with peer tutoring as a motivating agent and for increasing feelings of self-worth. Accordingly, primary questions which were guided the design of the present study, included "Will *this intervention improve the ability to solve word problems (addition and subtraction, and will this acquired skill also be maintained?*". If we examine schema studies, the number of instructional sessions varied from 13 to 45 sessions and students were taught or tutored multiple times each week, and students demonstrated significant gains from the schema instruction only if the instruction occur multiple times each week with a suitable duration (Fuchs, Fuchs, Prentice, Hamlett, Finelli, Courey, 2004; Jitendra, Griffin, Haria, Leh, Adams, Kaduvettoor, 2007). In this research all the participants successfully learned how to solve three different kinds of addition and subtraction word problems within 11 sessions (Graphic 1). This special result can be related to the peer tutoring part of the research where they are all willing to be a tutor. Additionally, all the participants maintained the skill and successfully able to teach the skill to their tutee. Researchers have showed influence that teaching experiences among peers have on student academic motivation and achievement (Light & Littleton, 1999; Steinberg et al., 1992).

Secondarily, "(c) Could word problem solving turn into a volitional action in homework management? And (d) Will participants enjoy this kind of intervention and judge it to be of value for learning mathematics?" question can be answered accordingly; all the participants were having problems about homework before the intervention. Ali was never motivated to complete his homework. He was having big quarrels with his family about doing his math homework. Başak was less motivated to complete her homework and most of the time she was forgetting to bring assignment back to class. Can denied having homework assignments and most of the time he failed to bring home assignment and refuses or easily frustrated to do homework assignment. In the post intervention period all families communicate about ending quarrels related to completing homework related word problem solving but it is too early to say problem solving turn into a volitional action. If we limit the homework content with compare, group and change type word problem solving with a single digit numbers then the results give the impression that all the participants are highly motivated to complete their homework without any frustration. Moreover, data from the social validity showed that participants enjoy this kind of intervention and judge it to be of value for learning mathematics.

POVMcan be individualized based on student need to master requisite skills or core mathematic skills and students can access video instruction independently and

repeatedly as needed. Findings from this study add to evidence for use to support learning in academic areas (e.g., Decker & Buggey, 2014) including specifically to teach mathematics (e.g., Cihak & Bowlin, 2009). Moreover, the ease to create the video and make it accessible to students with relatively basic technology may make it accessible to teachers. As mathematical teachers have students with individual learning needs, but similar skill gaps, it is important for teachers to have access to interventions that meet the instructional needs across individual learners. The intervention incorporated three evidence-based instructional components that have history of evidence for students with disabilities in a comprehensive intervention that is versatile, practical, and utilizable in heterogeneous educational settings. This research demonstrates that students with ADHD may benefit from explicit word-problem instruction that incorporates schemas via PAVM+peer tutoring. Evidence shows that with comprehensive interventions and with maximum student participation play a major role for showing a great impact on neuro-plasticity system of the brain cells so that they can change the functioning of the brain, adapt and grow in response to their environment

Limitations and Future Directions

Limitations of single subject research are inevitable in clinic-based instruction. Within this context, understanding the reality of implementation allows researchers to better understand bridging the research to practice. Several limitations of this study are mostly related to the sample size and comprehensive intervention where there were three components PAVM+ schema based word problem solving+ peer tutoring in the comprehensive intervention. So it is hard to decide which component of the intervention played the major role for the learning achievement. So that for the future examining each individual component one by one to determine the relative benefits of each can be a solution.

In order to bridging the research to practice, some important points should be added; this research took place in an afterschool program and as a positive point this allowed the researcher to provided supplemental intervention support without taking away precious instructional time during the standard academic day. There were some days when a participants get cold or allergy and went home instead of going to the scheduled session in the clinic. This presented situations when there may be unscheduled gaps in the intervention; however, the success of the intervention suggests that the occasional interference of attendance did not impact the overall findings since missing sessions were compensated as soon as possible within related week accordingly and fidelity data stayed constant. Another reality of this intervention is that schools are busy and it's hard to occupy resource rooms for long periods of intervention time. Additionally, if there were outdoor activities then participants had the potential to prefer the activities and this created challenges because participants may have the possibility to refuse going to the clinic. This situation happened during the participant selection in the resource

room, before starting intervention. Although all the participants were willing to work with the researcher, they wanted to join outdoor activities with their class. So researchers had a conclusion to overcome this drawback by performing intervention in a private clinic.

Given the significant and ADHD manifest, it is likely that comprehensive interventions will be most effective in the amelioration of wide-ranging academic deficits including math skills in ADHD. Finally, in order to assess true utility of PAVM+ schema based word problem solving+peer tutoring as a comprehensive intervention to teach mathematics, it is important that future research evaluate effects of the intervention when implemented by the classroom teacher. This would allow researchers to evaluate utility and further examine social validity, especially in inclusion settings.

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