The Investigation of the Learning Style Preferences and Academic Performance of Elementary Students with ADHD

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Abstract

This study investigated the learning style preferences of students with ADHD in elementary schools and how these preferences affect their academic performance, as measured by the Elementary Learning Styles Assessment Tools (Dunn, Rundle, & Burke, 2007). The results showed that students with ADHD in this study prefer a quiet and warm classroom with traditional furniture. In addition, results also showed that when students with ADHD are taught using their learning preferences, they tend to make academic gains. A three month follow-up assessment showed that academic performance improved for students whose teachers incorporated students' learning preferences into their teaching. Curriculum implications for practice are discussed.

Keywords: Learning style preferences, academic performance, ADHD

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Traditionally, successful students earn good grades, perform well on standardized tests, complete classwork and homework promptly, tend to have fewer disciplinary problems and are less likely to repeat grade levels (Loe & Feldman, 2006). Over the years, studies have shown that there is a correlation between early academic success in elementary school and future academic success in higher grade levels (Mullis & Jenkins, 1990). Yet, some studies on academic achievement in Language Arts and Mathematics have shown that some students are not appropriately internalizing the necessary skills to be successful in the school setting (McClelland, Morrison & Holmes, 2000). The majority of the students who struggle with internalizing the skills needed to be successful in schools are students with Attention Deficit and Hyperactivity Disorder (ADHD). Identifying each student's learning style preferences and tailoring instruction to those preferences may be one way to strengthen academic success of students with ADHD.

Literature Review

ADHD and Academic Performance

There have been many studies suggesting that students with ADHD often experience academic difficulties in spite of having average to above average intelligence (Hinshaw, 1992a; Semrud-Clikeman, Biederman, Sprich-Buckminister, Lehman, Faraone, & Norman, 1992). In fact, as many as 80% of students with ADHD show some sign of academic performance difficulties (Harris, Friedlander, Saddler, Frizzelle & Graham, 2005). Some examples of these difficulties, as presented by Harris and colleagues, include inconsistent classwork and homework completion, poorer quality work, and not following through with instructions; often these difficulties result in lower grades.

In 2011, the Centers for Disease Control and Prevention (CDC) stated that approximately

one out of ten students (ages 4 to 17) in the US were diagnosed with ADHD. This is a big problem and requires professionals to explore many options that can help these students to be successful. Many studies on students with ADHD have focused on stimulant medication as a form of treatment that could aid in focusing them and positively influence their academic and social outcomes (Ritchers, Arnold, Jensen, Abikoff, Conners, Greenhill, Hechtman, Hinshaw, Pelham & Swanson, 1995). Pelham, Wheeler and Chronis (1998) noted that though 70% to 80% of students with ADHD respond positively to stimulant medication, the positive effects are related more to calming students' impulsivity and inattention and not in fostering academic achievement. Many of these authors have argued that although stimulant medication can enhance productivity, it often does not necessarily have great effect on the cognitive abilities needed for academic success. Very few studies have been done to examine other options to support students with ADHD and specifically research is lacking as to whether using learning style preferences in instructing students with ADHD would improve their academic preformace.

Learning Style Preferences and ADHD

Dunn and Dunn (1990) define learning style as "the way in which individuals begin to concentrate, internalize, and retain new and difficult information" (p. 353). Research has shown that when school-age students are taught in their preferred learning styles, attitude towards school improves and academic achievement often increases while discipline problems decrease (Carruthers & Young, 1980; Dunn, 1981; Hodges, 1982; Hodges, 1983, and Lynch, 1981). Zapalska and Dabb (2002) noted that how well a person learns new information is impacted greatly by how the information is presented and thus internalized. A study by Pizzo (1981) on 64 sixth graders showed that when students were matched to their learning style preferences, they showed higher reading scores at the statistically significant level of .01. Findings from a study by Brand, Dunn and Greb (2002) on elementary students with ADHD, in grades three through

six, showed that younger elementary students (third and fourth grades) seemed to prefer bright lighting and earlier in the day for learning while older elementary students (fifth and sixth grades) prefer lower lighting and the afternoon for learning.

The Learning Style Preferences provided by Dunn and Dunn (1990) and used in this study, have five main stimuli; each of these stimuli has its elements that affect learning. The five stimuli of learning style are: Environmental, Emotional, Sociological, Physiological and Psychological Processing.

Environmental stimuli focus on the senses with the elements of sound, light, temperature and design. For example, some students prefer quiet in order to learn, while others may prefer some type of background noise. Some students prefer bright light to concentrate, while others may prefer a softer or more focused light. Emotional stimuli focus on the students' mental state with the elements of motivation, persistence, responsibility and structure. For example, some students are motivated by intrinsic means while others may be motivated by extrinsic factors. Sociological stimuli focus on how students relate to others with the elements of alone, with a friend, in a group, with adults, and a variety of elements. For example, some students prefer to work alone, while other students may prefer to work with others. Physiological stimuli focus on strengths within the student like elements of perceptual mode, mobility, intake, and time of day. For example, perceptual learning relates to how a student prefers to learn (auditory, visual, tactile and/or kinesthetic). Psychological stimuli relate to how students' brains function with elements of global or analytic and impulsive or reflective. For example, some students prefer a summary of material at the beginning of instruction, while other students may prefer a step-by-step sequence of information, building upon each concept as they go (Hawk & Shah, 2007).

The interest for this study originated from the work done by Loe and Feldman (2006). Loe and Feldman suggested that students with ADHD showed significant academic

underachievement, poor academic performance, and educational difficulties. Though there is extensive research indicating that ADHD negatively impacts academic achievement, most of these studies focused on reducing the problematic behaviors within the classroom setting and not on improving academic achievement (Loe & Feldman, 2006). Examining ways to improve academic achievement, such as investigating the role of learning style preferences of students with ADHD is needed to help bridge the gap between these students' intelligence and their academic achievement potential. Since early academic success sets the framework for continued academic success later in life, it is imperative to teach students with ADHD effective techniques in elementary school so that they can use these techniques in future academic endeavors.

Theoretical Framework for the Present Study

We know that students with ADHD often learn differently from their peers without ADHD. In addition, we know that when students with ADHD are actively engaged with the material, they tend to be more interested in what they are learning, which improves their focus, attention, and retention of the skills learned. This in turn is likely to improve academic achievement. Therefore, when teachers deliver instructions using students' preferred learning styles, students would be more likely to actively engage with the material, which could lead to higher academic achievement.

This study was designed to investigate the learning style preferences of students with ADHD in the elementary school and whether these preferences would help with their academic performance. Finding students' preferred learning styles early, during the elementary school years, will provide additional useful tools to teachers to use in preparing these students for the more challenging academic work of secondary and post-secondary institutions.

Method

Participants

Prior to working with students, the signed consents were received from schools and parents/guardians. The schools agreed to participate only if their teachers were given the results of students' learning preferences so that they could incorporate them in their teaching. The consent was given for the six students to participate in this study. However, on the day of data collection, only five of the six students were present. The five participants were all males who were diagnosed with ADHD Combined type. The participants' grades ranged from third through sixth, with the majority (3) in third grade. The other two participants were in fourth and sixth grades. The ages of the participants ranged from eight to eleven years old. The participants attended public school in two school districts. The one school district with three participants is urban and the second district with two participants is suburban. All the participants were required to meet the following criteria: 1. Participants were diagnosed with ADHD with medical records confirming the diagnosis. This was to ensure that all the participants were officially diagnosed with ADHD. 2. Participants had to attend public schools. Students in private schools were not included in this study. This was to ensure that the context of learning was similar across participants.

The three-month follow-up data were only obtained from two of the five participants from the urban school. The teachers of these two participants modified their teaching to address the learning preferences of these students.

Instrumentations and Materials

The materials for this study included the medical records to verify the participants' diagnoses, the academic records to verify the participants' performance, and the three learning style assessments. The three learning style assessments were administered to the participants by

one of the researchers. The three learning style assessments are: The Elementary Learning Style Assessment created by Dunn, Rundle and Burke (2007), The Clue to You assessment created by Burke and Dunn (1998), and What's Your Learning Style assessment by Pennsylvania Higher Education Assistance Agency (2011). The Elementary Learning Style Assessment consists of three sets of 25 questions, which were administered electronically to the third and fourth grade participants. While the Clue to You assessment, consists of five sets of questions with 21 elements of learning, and was administered electronically to the sixth grade participant. The third assessment, What's Your Learning Style, consists of 20 questions, and was administered electronically to all participants.

The online Elementary Learning Style Assessment questions were asked by the researcher in three ways: 1) What is the participants' preferred element? 2) What is the participants' non-preferred element? 3) What element does not matter to the participants? After the participant completes all three sets, a report detailing their preferences is generated at the end. The Clue to You questions were asked in the same manner as Elementary Learning Style Assessment and the report compiles similar data at the end of the assessment. What's Your Learning Style assessment focus on students' different preferred learning modality (auditory, visual, and kinesthetic). At the end of this assessment, a percentage is calculated/generated in each category: visual, auditory and kinesthetic for each student.

Since all the assessments are based on the participants' preferences, there is no right or wrong answer. The Elementary Learning Style Assessment and the Clue to You assessment provide a spectrum scale of preference for each category (strong preference, preference, depends, preference and strong preference). The "What's Your Learning Style"? provides a percentage score for auditory, visual and kinesthetic preferred learning modalities.

Design

This study used online data collection-based tools to assess students with ADHD. This method of data collection was used to ensure that all participants follow similar protocol during assessment. The study involved five participants whose schools and parents gave consent and who were present on the day of the data collection.

All of the participants were assessed individually so that their answers were reflective of their preferences and not influenced by other students' preferences. The majority (3) of the participants were in third grade. One participant was in fourth grade and the fifth participant was in sixth grade. To protect their identity, the participants were assigned letters for identification, such as Student A, Student B, etc. During the data collection, Student A was in 4th grade, Students B, D and E were in 3rd grade, and Student C was in 6th grade. Students A, B, D and E were assessed using the Elementary Learning Style Assessment and Student C was assessed using the Learning Style: The Clue to You, as appropriate to their grade levels.

The final phase of data collection was a three-month follow up review of the two participants' academic performance. This review was done after the teachers modified their teaching to address the learning preferences of these students. The three-month follow up review was conducted to examine the effects of learning preferences on participants' academic performance in Language Arts (LA) and Math. The participants in the three month follow up data collection were Student A and Student C. These students' school requested the results of the study to enable their teachers to incorporate the students' learning preferences in their teaching. The schools for the remaining participants (Student B, Student D, & Student E) requested the results of the study, but did not want their teachers to incorporate the students' learning preferences into their teaching at that time.

Student A was in 4th grade and his learning preference was a structured, warm and quiet

classroom environment, with non-traditional furniture. Student C was in 6th grade and his learning preferences were cooler temperatures with bright lighting in the classroom environment with traditional furniture.

Procedure

Data Collection

All participants were assessed on the What's Your Learning Style tool to determine their preferred learning modality. Four participants in third and fourth grade were assessed on the Elementary Learning Style and the one participant in the sixth grade was assessed on the Learning Styles: The Clue to You.

During the assessment, all participants were interviewed individually in a testing location provided by the individual school and within the school building to avoid distractions. Before the interview and after a brief greeting, each participant was told that the purpose of the interview was to gather information on their preferred learning environment and preferred learning modality (auditory, visual, and kinesthetic). The modality was explained to the participants in the language they would understand. For example, auditory was explained as "a person who likes to learn by hearing", visual was explained as "a person who likes to learn by seeing", and kinesthetic was explained as "a person who likes to learn by moving around." The interviewer followed a scripted protocol provided in Pennsylvania Higher Education Assistance Agency (PHEAA, 2011), What's Your Learning Style survey (http://www.educationplanner.org) and the prescribed guideline provided in Dunn & Dunn Online Assessments (www.learningstyles.net). The interviewer slowly read each of the 75 questions in the Elementary Learning Style Assessment to each student. Students were tested individually and each student was asked to choose between two stories: 1) a circus story, or 2) a pirate story. Once a student chooses a story, that story theme is continued through the next two sections of the

Elementary Learning Style Assessment. Each question is repeated three times throughout the test to assure response consistency. Each student responded to each question using a multiple-choice answer format. Each possible response includes a picture image that is representative of the answer. The use of words and pictures provide response options in the style of individuals' preference and preferred modality.

When a participant finished each of the stories, the interviewer thanked him before moving to the next stories. This format was followed throughout and participants were thanked for their involvement in the study.

Results

The scores for all the three types of assessment used for this study were independently generated upon submission. The scores for the Elementary Learning Style Assessment and The Clue to You ranged from strong preference to no preference in each element. For this study, "it depends" responses are considered as no preference. The modality assessment generated percentage scores in Auditory, Visual and Tactile of each student.

Learning Styles Preference

The results of the Learning Styles Preferences are as follow. Three participants had strong preferences for warm classroom environment and one participant had a strong preference for a cooler classroom environment when learning. Though one participant had a strong preference for bright lighting in the classroom, the majority of the participants (4) did not have a preferred lighting preference in the classroom. Three participants had strong preference on the structure of the classroom. This means that these students strongly prefer structure in order for learning to occur. Four participants had a strong preference for being motivated by others while learning.

All participants had strong preference for learning in pairs/groups. Three participants had

strong preference for learning new materials with an authority figure such as a teacher. Three participants had strong preference for learning material in a variety of ways when learning new materials. However, two participants had no preference on how they learned new materials. Four participants had strong preference in favor of learning new materials in the afternoon, while one participant had mild preference in favor of learning new material in the morning. Four participants had strong preference to be reflective on their answers before they speak. The results are presented in Table 1 below.

Table 1
Percentage of Participants Learning Styles Preference by Stimuli

Learning Styles Preference	Preference	No Preference
Classroom Environment	80	20
Learning Motivation	80	20
Work Preference	90	10
Learning Time Preference	80	20

Note: There were five participants total in this study. Preference is either strongly for or strongly against. No Preference means that it does not matter either way.

Instructional Presentation Preference

The percentages generated for the instructional presentation preference are as follows. Overall, students in this study reported that their instructional presentation preference are Visual and Tactile, with the mean of 34%. Individual score ranges from 20% to 45% for Visual and 25% to 40% for Tactile. The average mean for Auditory is 32% with score ranges from 25% to 40% respectfully. Though the mean scores for visual and tactile learning style is the same (34%), the highest scores are in Visual learning style where two students scored 45% each as their preference for presentation materials. The highest score for tactile learning style is 40% scored by three students. The highest score for auditory learning style is 40% scored by one student. The results are presented in Table 2 below.

Table 2
Percentage of Participants Instructional Presentation Preference by Modalities and Overall

Instructional Presentation	Student A	Student B	Student C	Student D	Student E	Overall
Auditory	25	30	40	35	30	32
Visual	35	45	20	25	45	34
Tactile	40	25	40	40	25	34

Discussion

The findings of this study are discussed in terms of learning preference, modalities, three month follow-up and implications for instruction.

Learning Preference

Overall, the results showed that most (80%) of students with ADHD in this study prefer a quiet and warm classroom with traditional furniture. The majority (80%) of the students prefer to be motivated by others instead of self-motivating. Participants showed a preference that tasks be broken into multiple steps with specific guidelines and/or taking breaks while completing tasks. Afternoon was the preferred time of day (80%) for the participants in this study to learn new material. However, 20% of them favored learning new material in the morning. All (100%) of the participants preferred to work in pairs/groups. In addition, 80% of them had strong preference in working with authority such as teachers and para-educators.

Modalities Preference

The results of this study showed no significant overall differences of instructional presentation modalities for students with ADHD; however, there are individual differences. For example, students B and E favored visual modalities (45%) while students A and D favored tactile (40%) modalities. However, student C has dual modalities of auditory and tactile (40% each).

Three Month Follow-up Gains

The preliminary results of this study were made available to schools that requested them. Two teachers from one school (Urban) who have two students (Student A & Student C) in their classes (in agreement with the school proper authority), decided to differentiate their teaching methods to accommodate these students' learning preferences. Student A's learning preference was a structured classroom environment, with non-traditional furniture and that room was warm and quiet. Student A was motivated by others, preferred to learn in the afternoon, with tasks presented in multiple steps, using hands on approach. Student C's learning preferences was a classroom environment with traditional furniture and cooler temperatures with bright lighting. Student C was motivated by others, preferred to learn in the afternoon, with instruction to be visually presented with images.

The academic performance (in Math and Language Arts) of these two participants improved significantly for the marking period that their learning preferences were considered. The increase in students' grades were as follow: Student A had an average grades of D/D+ in Math and Language Arts (LA) for the first three marking periods. However, after adapting the teaching method to match this student's preferred mode of learning, his grade for the fourth marking period in Math was improved to a B and a C+ in LA. Similarly, Student C was performing below expectation in both Math and LA. His average grades for the first three making periods were F/D-. However, after adapting the teaching method to match Student C's preferred mode of learning, his grade for the fourth marking period in Math was a C+ and C in LA. Though the sample size is small, it is appropriate to suggest and in agreement with the past studies (Harris, Friedlander, Saddler, Frizzelle & Graham, 2005) that when students with ADHD are actively engaged with the material and their learning preferences are addressed, they tend to be more interested in what they are learning, which most likely improves their academic performance.

Implications for Instruction

The literature review for this study shows that some of the students who struggle internalizing the necessary skills to be successful in school settings are students with Attention Deficit and Hyperactivity Disorder (ADHD). It is also evident that students with ADHD often learn differently from their peers without ADHD. Knowing the importance of early academic achievement and how it serves as a predictor of future academic achievement, the professionals need to be more creative in meeting all students' needs in the classrooms.

Results of the current study suggest that the educators need to utilize multiple strategies and varied learning styles in teaching students in their classrooms with different learning needs. Educators can incorporate kinesthetic learning styles that allows students to get up and move around while they learn new information. Students can also be allowed to act out stories as another way of incorporating movement into lessons.

Students with ADHD learn best when they know what to expect and when to expect certain activities. Though changes may occur, it is best to inform students of these changes as far in advance as possible. Another finding for this study was that students with ADHD prefer to be given wait time before having to respond to a demand. Giving the students more time to process the information and think about their answers might help them feel more confident and respond correctly.

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