

Assistive Tool for Attention Deficit Hyperactivity Disorder Children in Classroom

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Abstract:

ADHD children have a difficult time focusing on one thing at one time, especially when listening to the lecture. Moreover, they disrupt their teachers and classmates. This research aims to develop an assistive tool that can help ADHD perform better in the classroom learning. The study starts from focus group of parents and teachers involving observation in classroom learning. Two seven-year-old ADHD children in grade one are hyperactivity and inattentiveness types. They are diagnosed by using DSM-IV. The assistive tool facilitates the communication between ADHD children and teachers both listening and responding. To support the learning ability, threshold of sound stimulus is adjusted to maintain attention from distracting from the environment surrounding in the classroom. The tool of this research is conducted in order to compare the performances of each child with and without using the wireless listening device in mathematics and music class. Then, the behaviour is analyzed by using the behavioural software in conjunction with teachers' rating scale. The result showed that subjects with hyperactivity and attentive types improve their attention, participation and self-control.

Keywords: ADHD, Communication Tool, Assistive Technology, Classroom learning

1. Introduction

The American Psychiatric Association described Attention Deficits Hyperactivity Disorder(ADHD) children to manifest the following characteristics: 1) inattention and/or 2) hyperactivity and/or 3) impulsivity. ADHD may occur in as many as 3% to 5% of school-age children. In Bangkok, ADHD in primary school is around 6.5% (Benjasuwantep et al, 2002). They interrupt both teachers and their friends in classroom. More than 30% of them repeat a year in school and 56% require remedial tutoring. Approximately 70% of ADHD children continue to have behavioral problems in adolescence (C Keith Conners, 2004). Currently, there are several tools and programs that are designed for diagnosis, therapeutic tool, intervention program and assistive technology. The example of diagnostic tool is DSM-IV(Sadock, 1998). This tool requires psychology skill to analyze the child's behavior. The therapeutic tool can be classified into two types. One is for activity monitoring such as Actigraph TM (Tryon et al, 2006) and Gordon Diagnostic systems(Mayes and Calhoun, 2002). The second type is for training the brain such as Play attention game(Ashton, 2001), Miracle Belt™(Original Diamond Design, 2003) and Interactive Metronome(Burpee et al, 2001). They are used in the laboratory and clinic but may not used in the daily activity. As a result, this research focuses on Assistive Technology (AT), since it can utilize in the context of classroom learning. It promotes a greater independence for people with disabilities by enabling them to perform tasks and providing enhancements for changed method of interacting with the technology needed to accomplish tasks. The existing assistive tools are PEAT palm PC and watch minder. These are useful for both children and care giver for organizing life. Nowadays, there is no assistive technology that can be used into the context of classroom learning. Therefore, the advantage of using assistive tool in

the classroom can thoroughly facilitate ADHD children in both concentration and performance aspects.

1.1 Objectives

From the problems mentioned above, two objectives are explicitly shown. The researching tool has been newly created to assist the ADHD children in maintaining attention or adjusting threshold of sensory stimuli during learning in the classroom, and to reduce behavioural problems of the ADHD children that affect other students and teachers. The study primarily covers the communication tool-aided-learning in the classroom rather than a therapeutic tool. The tool can be applied for 7 years old ADHD children. The study will not cover the learning assessment since it depends on the intelligent skill of each child rather than efficiency of the tool.

2. Method and tool

This research consists of a preliminary study through a focused group and observation on the real situation of ADHD's learning to address the problem. The study was conducted in a child-centered school in Bangkok. The curriculum of this school is project-based learning so the furniture in the room is free style arrangement. For all classes, two teachers were provided to facilitate the learning activity. Both mathematics and music class had the same structure of learning. The first part of the class was a lecture and the second part was the practice or workshop. Since ADHD children had the severe problem in listening teacher's lecture more than self-practice of their works, the study took place only in the lecture session. When teachers gave a lecture, students sat on the floor as a group rather than on the chair. As observed, many ADHD students may be easily distracted from their friends and environment.

A new tool was designed to solve the subjects' behaviour. From the focus group, many teachers said that ADHD students did not have much attention to listen to the lecture carefully. They preferred to sit far away and disturbed their friends. Moreover, they could be easily distracted from the environment. According to the multiple resources theory, human perception can be divided into auditory and visual(Wicken et all, 1999). As a result, a new tool can be designed for visual and auditory modalities. The auditory modality is selected to be a solution, since it is easy to implement and fit to the subjects. By increasing the stimuli and reducing the arousal, teachers' voice increase and environment sound were reduced. Subjects could listen to teacher's lecture, but they could still hear their friends as background noise. At the end of the class, the researcher gave teachers a form of rating scale to rank their students' performance. The result of rating scale is an average of two teachers in mathematics and music class.



Figure 1 : a) Receiver and Sender module b) Using the tool in the class

The sampling of two ADHD children(male) were used the tool in two classes : mathematics and music class. Both of the subjects were diagnosed by physician in Development of children learning activity and participation(CLAP) of Mahidol University. In reference to International Classification of Functioning Disability and Health - ICF (WHO, 2001), all profiles of two subjects are presented in the table 1. They have different types of symptom. One is hyperactivity and another is inattentiveness.

The tool was modified from wireless transmitter to FM transmitter and receiver (see figure 1a). The teachers were assigned to use the small microphone and transmitter while they gave the lecture(see figure 1b). The ADHD children carried a bag of ear phone and receiver. The analysis is a comparison of behaviour when using and without using the tool. After recording both subjects' behaviour, the data was coded and analyzed by behavioural analysis software called the Observer 8 from Noldus Information Technology. The coding scheme was classified into three parts – attention, participation, and self-control as seen in table 2. To prevent the interference of testing, the tool was used for one subject at a time only. The tool cannot be used for many subjects at the same time, since they are playing with the tools instead of listening to their teachers. Subjects spent time to familiar with the tool for a while before they are willing to use the tool.

Table 1. Profile of two ADHD children

| Profile | Subject1 | Subject 2 |
|---------------------------------|------------------------------------|----------------------------------|
| Age, gender | 7, male | 7, male |
| ADHD predominant performed | - Hyperactivity - Impulsiveness | - Blurt out - Inattentiveness |
| Reading skill | Mild | Mild |
| Writing skill | Mild | Severe |
| Problem solving/decision making | Moderate | Severe |
| Focus /maintain attention | Severe | Moderate |
| Purposeful sensory | Moderate | Severe |

Table 2. Coding scheme of behaviour coding

| Attention | Participation | Self-control | |
|---------------------------------------|---------------------------|--------------------------|------------------|
| Listen to teacher without eye contact | Not follow command | Body fidget | Disturb friend |
| Listen to teacher with eye contact | Not interact with teacher | Leave a group of friend | Talk with friend |
| Ignore teacher | Not join activity | Distract friend and talk | Blurt out |
| | | Leave classroom | |

3. Results

After using the tool, the subjects changed their behaviour of learning. For example, they did not sit behind the class. Teachers' sound could call their attention. The following results show the three aspects: attention, participation and self-control same as the coding scheme.

3.1.1 Attention

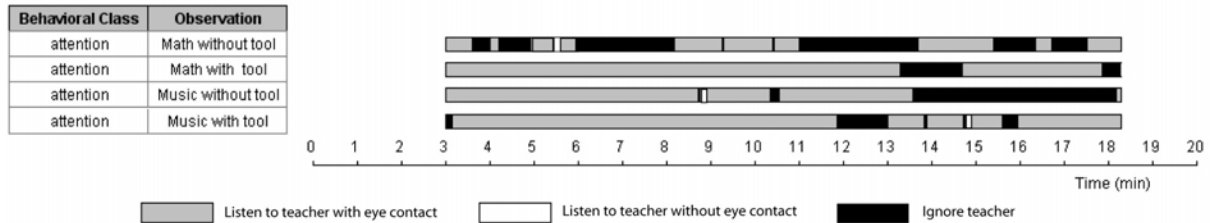


Figure 2 : Time-event plot of mathematics and music class without tool and with tool in the subject 1

Figure 2 is a time-event plot of the duration which started from 3 minutes to 18.10 minutes. The graph shows the behaviour of listening to the teacher with and without eye contact and ignoring teacher. In mathematics class, the subject 1's behaviour was not stable. In mathematics, the duration in listening to the teacher was long at 57.15% when using the tool while the duration was short at 17.94% without the tool. On the other hand, the duration of ignoring teacher was shortening when using the tool around 7.54% and without using the tool at 20.75%. In music class, the duration of listening at the teacher was already high without using the tool at 55.65%. Then there is no significant difference when using the tool at 40.98%. Similar to the mathematics class, ignoring teacher's lecture was longer at 24.96% when not using the tool comparing with using tool at 4.9%. Subject 1 listened to the teacher's lecture more than not using the tool. He listened to the lecture in mathematic more than music class.



Figure 3 : Time-event plot of mathematics and music class without tool and with tool in subject 2

Figure 3 presents the time duration of behaviour which is 20 minutes and 11.5 minutes when using the tool and without using the tool respectively. The total time duration was shorter than subject 1, since the teacher had finished the lecture earlier. In mathematics class, the subject 2 had longer attention span (94.06%), when he used the tool. When not using the tool, the duration of listening to the lecture was low at 2.65%. Subject paid attention by listening a little in music class from 34.94% to 52.26%. The duration of ignoring lesson was significantly lowered down from 52.93% and 63.99% to 5.44% and 0.93% of both mathematics and music classes respectively when using the tool.

3.1.2 Participation

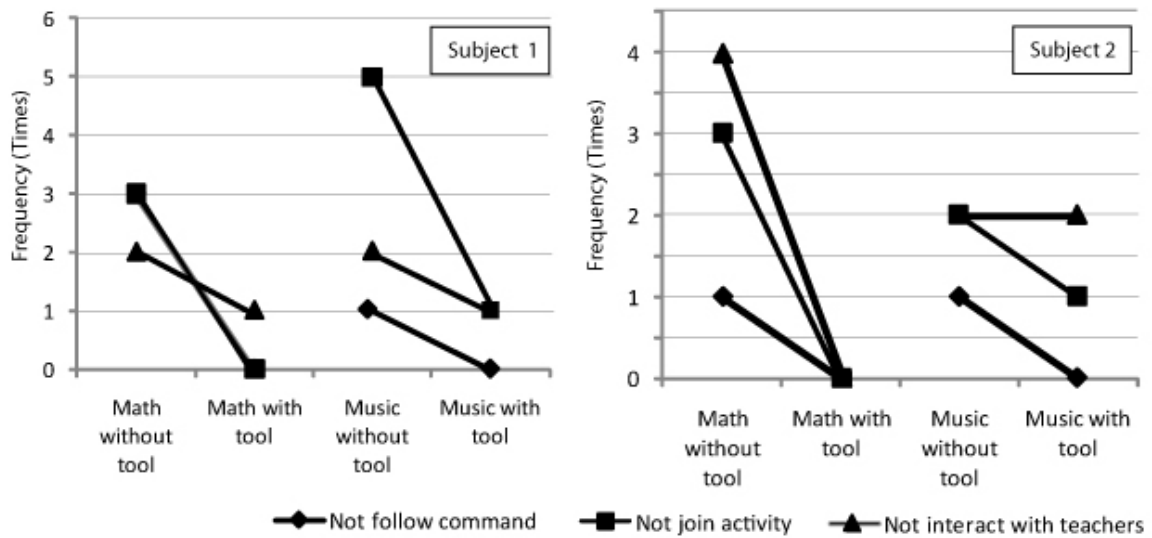


Figure 4 : Number of lacking of participation in two subjects using tool and without tool

The result in figure 4 shows that subject 1 lacks of participation in music class, especially by not joining the activity. On the other hand, subject 2 lacks of interaction with teachers in mathematics class the most. After using the tool, both subjects improved their performance. The behavior of not joining activity disappears in subject 1. The result shows that the tool did not obstruct the class participation. The behavior of not interacting with teachers and joining activity in music class by subject 1 and 2 still remained.

3.1.3 Self-control

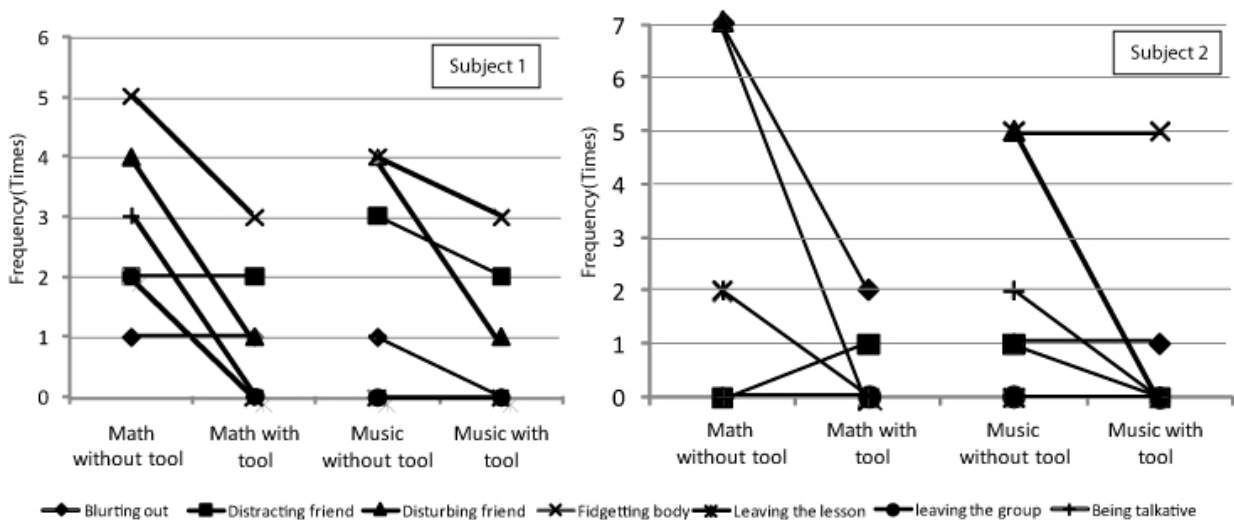


Figure 5 : Number of lacking of self-control in both subjects using tool and without tool

Without using tool, subject 1 had a high frequency in body fidgeting, disturbing friend, being talkative, distracting friend, leaving the group and blurring out respectively in mathematics class as shown in figure 5. This result is similar to music class. After using the tool, all behaviors decreased in both classes. Some behaviors disappeared such as leaving the group and talkativeness in both classes.

Subjects had high concentration on the lesson. In comparison with the subject 2, disturbing friend and blurting out were evidently when not using the tool. This is similar to the result of psychological diagnostic. After using the tool, the behavior decreased significantly. Disturbing friend in the class disappeared since subjects did not pay attention to the surrounding noise. From the observation, subject 1 kept calm even though he was teased by his friend.

3.2 Rating scale

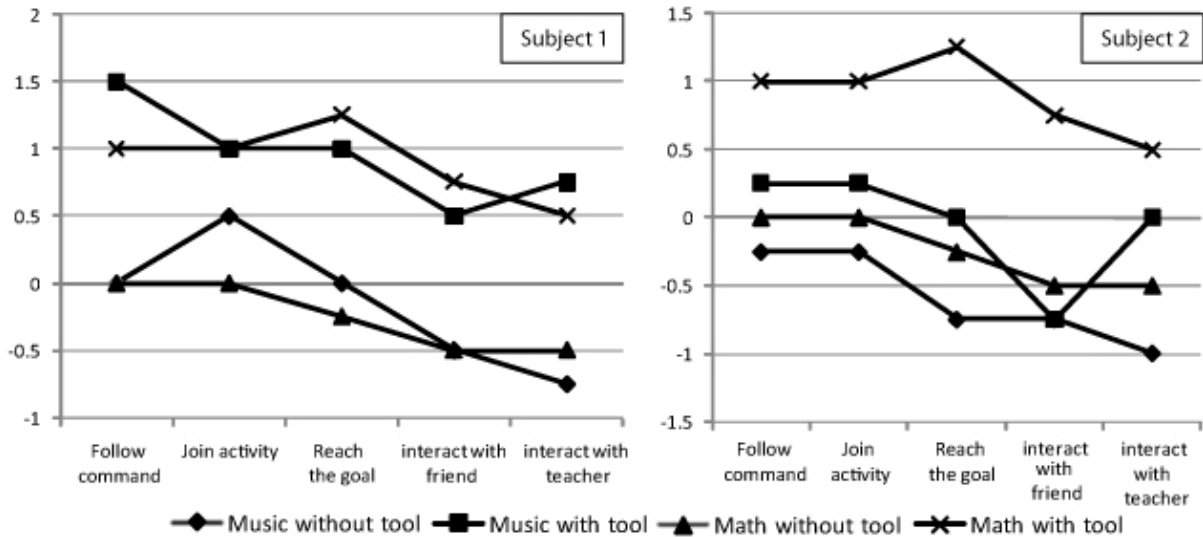


Figure 6 : Average score of learning participation of subjects 1 and 2

Figure 6 is an average rating scale from mathematics and music teachers on two subjects. Before using the tool, learning participation of subject 1 in both mathematics and music was similar and tended to have negative behavior. After using the tool, teachers rated them with more positive behavior especially in mathematics class.

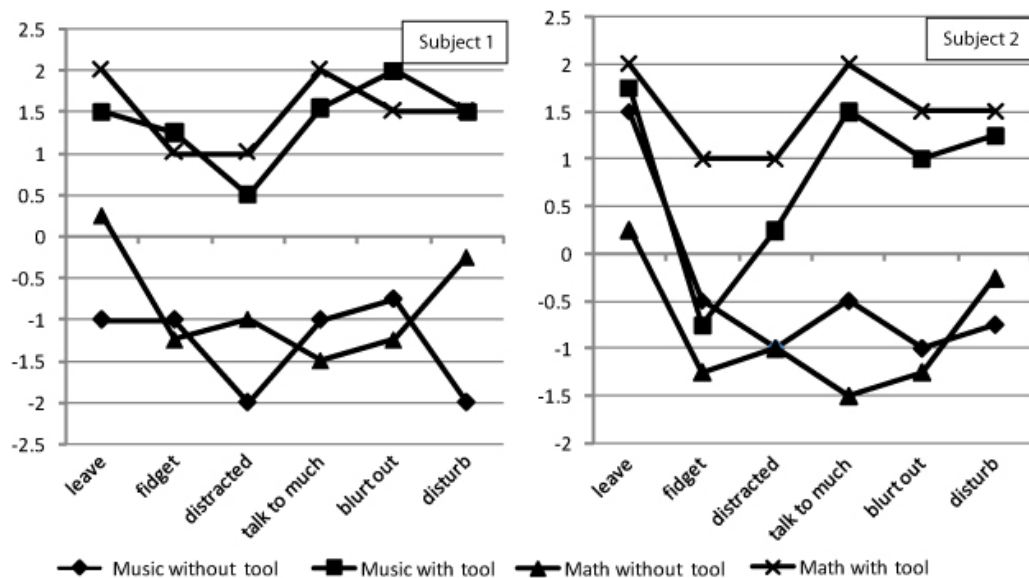


Figure 7 : Average score of self control of subjects 1 and 2

Figure 7 presents the rating scale of both subjects. Subject 1 was clearly rated distinguishably in both classes. He performed positive behavior after using the tool. For subject 2, the fidget behavior was not improved much, but other behaviors were positive. Thus, the result is similar to the behavior analysis from the Observer.

4. Conclusion

After using the tool, both subjects increased their attention in term of listening to the teacher in mathematics and less ignoring teachers of both mathematics and music class. For participation, subject with hyperactivity type decreased his behavior in joining activity in both music and mathematics class. Subject with inattentive type decreased all behavior in mathematics class. For self-control, subject with hyperactivity decreased all behavior in both classes. Subject with inattentive type decreased the disturbing friends and blurt out.

In conclusion, the tool can improve learning participation and performance of ADHD children and can create positive environment including social support from anyone in their classrooms. For the future development, it will be possible to check the brain activity in conjunction with ADHD behavior. Technological modification will be required for this tool utilized in a wider population.

5. Reference

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