

Hybrid Algorithm Model for Intervention to Improve Cognitive Ability for Attention Deficit Hyperactivity Disorder (ADHD)

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Abstract:- Attention Deficit Hyperactivity Disorder (ADHD) is childhood's most common neurodevelopmental disorder. ADHD children may have trouble paying attention, controlling impulsive behavior (may act without thinking about the results), or being overly active. ADHD children have behavioral problems in learning at home and at school and lack self-control in their lives. We can take advantage of the evolution of new technologies to develop applications to enhance and stimulate the learning process of children with ADHD. This study focuses on strengthening the skills of patients diagnosed with ADHD. It gives them a free training ground in every cognitive ability they need to balance. It is an online interactive learning platform that will help ADHD patients learn new things. Through our survey, most of the parents of the children with ADHD Agreed that their child forgets to do things even if they constantly remind them, and their child misplaces the things. ADHD Haven is created to have a safe place to remind that you can have the same experience. The memory of children with ADHD is described as "Low," with a general weighted average of 3.56. To Attention majority of the respondents' child has easily distracted by noises or other sounds and has difficulty keeping their Attention when doing a tedious and repetitive task. The Attention of children with ADHD is described as "Low," with a general weighted average of 3.81. And their speed majority of the respondents see their child having difficulty completing a task. Overall, the available weighted mean is 3.59, interpreted as Low. The response inhibition children with ADHD. Most of the respondents' child takes an hour to do an assignment that takes another only for 30 minutes. Response inhibition of children with ADHD is described as "Low," with a general weighted average of 3.50. And lastly, the Reaction time of children with ADHD. The majority of the respondents' children have an unusual reaction to things. The Reaction time of children with ADHD is described as "Average," with a general weighted average of 3.40.

Keywords:- ADHD, Cognitive Training for ADHD, Intervention for ADHD.

I. INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a childhood neurodevelopmental disorder. It includes persistent problems, such as difficulty sustaining attention, hyperactivity, impulsive behavior, and poor academic progress. Most children with ADHD struggle with low self-esteem, troubled-relationship, and impulsive behavior.

ADHD has three significant types: the impulsive/hyperactive type, the inattentive/distractible type, and the combined type of ADHD. As the Philippines belongs to a third-world country, managing children with ADHD needs a lot of patience and financial sacrifices.

In recent studies, psychoeducation and cognitive exercises are the two effective ways to improve these functions in children with ADHD. Hence, analysis shows that one of the leading leisure activities for children is computer games. There are existing developmental benefits or positive effects of computer games used for educational and therapeutic purposes.

Therefore, the researcher designs an online interactive learning platform that can help to enhance the cognitive ability of children with ADHD.

II. LITERATURE REVIEW

This chapter documents previous research and practices regarding ADHD. The literature review attempts to accumulate data and information from other studies compare further apply them to the current research.

Studies have found high levels of psychiatry comorbidity in children diagnosed with Attention- Deficit Hyperactivity Disorder (ADHD). Children with co-morbid ADHD also appear to have poor outcomes (Biederman et al.) and aggressive behavior (Velazquez et al.). These children are associated with reduced health and well-being.

In recent studies, (1) children with ADHD faced increased difficulties in school, having a high risk of school expulsion and dropout, (2) And academic underperformance, (3) socially struggle with both peers (4) more at risk of being bullied. In addition, Borill (2000) acknowledges the kind of

symptoms professionals look for in diagnosing ADHD as "difficulty following instructions or completing tasks, easily distracted and forgetful and restless." Although scientific and technological advances in neurological imaging techniques and genetics promise to clarify this, some cases of ADHD suspect the cause thru the genetic or biological influence of multiple genes and non-inherited factors (Spellings et al.,2008; Thapar et al., 2011).

According to Ocaj (2018), ADHD shows a low frustration tolerance that obstructs them from accomplishing an activity or achieving a specific goal. Attention-Deficit Hyperactivity Disorder (ADHD) belongs to special educational needs. . Due to the pandemic, the postponement of inoculum modifications and educational reforms started to implement. The adaptation of paradigms and barriers to the children's potential learning skills and concepts begin to slow. It is an undefined etiology as a heterogeneous developmental disorder leading to bias and extensive diagnostic evaluations when examining patients through traditional clinical interviews and rating patient behaviors.

As cited by Rapport (2013), cognitive training and exercises like puzzles, memory games, and similar

computer-based games improve academic performances, complex reason skills, attention impulsecontrol, and even the social functioning of children with ADHD.

According to Burns (2010), most children who have ADHD get knowledge on things based on personal assumptions and social interactions. On the other hand, Lewis (2006) stated that parental reports suggest that their inhibitory abilities are unimpaired when ADHD children play computer games. As stated by Gathercole & Alloway (2008), Poor working memory during development is proven, and it is unassociated both with low academic achievement and attention problems typical of children with ADHD. Play therapy can help the children to be proactive. It is an activity where patients are assigned to express their feelings while playing.

One of the consequences of ADHD is Attention deficiency. It results in a disorganized thought and thinking process—the inability to concentrate leads to muddled thinking. Therefore, the researcher designed this interactive platform for children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) aged 5-25 years old in Metro Manila.

III. METHODOLOGY

This chapter outlined the methodology that was used in conducting he research. The chapter presented the research design, target users and how the research works and completed.



Fig 1 System Integration and Research Methodology

Most often, a person with special needs like Attention Deficit Hyperactivity Disorder (ADHD) goes to the Special Education Institution in the Philippines, but due to the pandemic, schools are closed. Decreased quality of learning may affect many factors such as the attention, environment, and equipment to be used. The learning adaptation of a person with ADHD may be compromised.

- Basic Research- The researchers investigate the demographic profile in terms of the age and gender of persons with ADHD, which needs a helpful intervention to improve their cognitive abilities.
- Descriptive Quantitative Research is the type of research that attempts to collect quantifiable data and information about real-life situations. The researcher tends to gather information regarding ADHD children.
- Software



Fig 2 Visual Studio Code 1.66 x Javascript x HTML x CSS

The developer chooses Visual Studio Code as the developer tool as it supports hundreds of languages. Some studies also cited that Visual Studio Code is a friendly, streamlined code editor which supports developmental operations. Hence, the researcher decided to use it as an advantage of being lightweight and the most competent web-related-developmental tool.

The Programming Language (PL) that the developer used are Javascript, Html, and CSS as their syntax

highlighting, intelligent completions with IntelliSense, and customizable formatting are most prominent.

- 5- Point Likert Scale refers to the point scale, which allows the respondents to express how much they agree or disagree. It is formatted as follows: 5-(Strongly Agree), 4 (Agree), 3 (Neutral), 2 (Disagree), and 1 (Strongly Disagree)

Table 1 The Description Scale for Cognitive area affected by ADHD

SCALE	DESCRIPTION	RANGE SCORE	VERBAL INTERPRETATION
5	Strongly Agree	4.50 - 5.00	Very Low
4	Agree	3.50 – 4.49	Low
3	Neutral	2.50 – 3.49	Average
2	Disagree	1.50 – 2.49	High
1	Strongly Disagree	1.0 1.49	Very High

Table 1 shows the description scale for the cognitive area affected by ADHD. A total of 118 respondents answered the survey. The researcher used purposive sampling to identify the respondents. The survey questionnaire was categorized according to the cognitive area affected, such as follows: a) Memory, b) Attention, c) Reaction Time, d) Speed, and e) Response Inhibition.

- A hybrid Algorithm is an algorithm that consists of two or more other algorithms. The researcher decided to create an interactive learning platform that includes

games such as Sudoku, Piano tiles, Picture Puzzle, Flip the Card, and Guess the Answer. It also has blogs that showcase the successful personalities who have been diagnosed with Attention Deficit Hyperactive Disorder (ADHD). Lastly, the media resources part where the children can watch videos and read articles that can help them understand more about Attention Deficit Hyperactivity Disorder (ADHD).

- The researcher used surveys and limited interviews to gather information for the target clients. It is done from February 15, 2022 to March 15, 2022.

➤ Flowchart

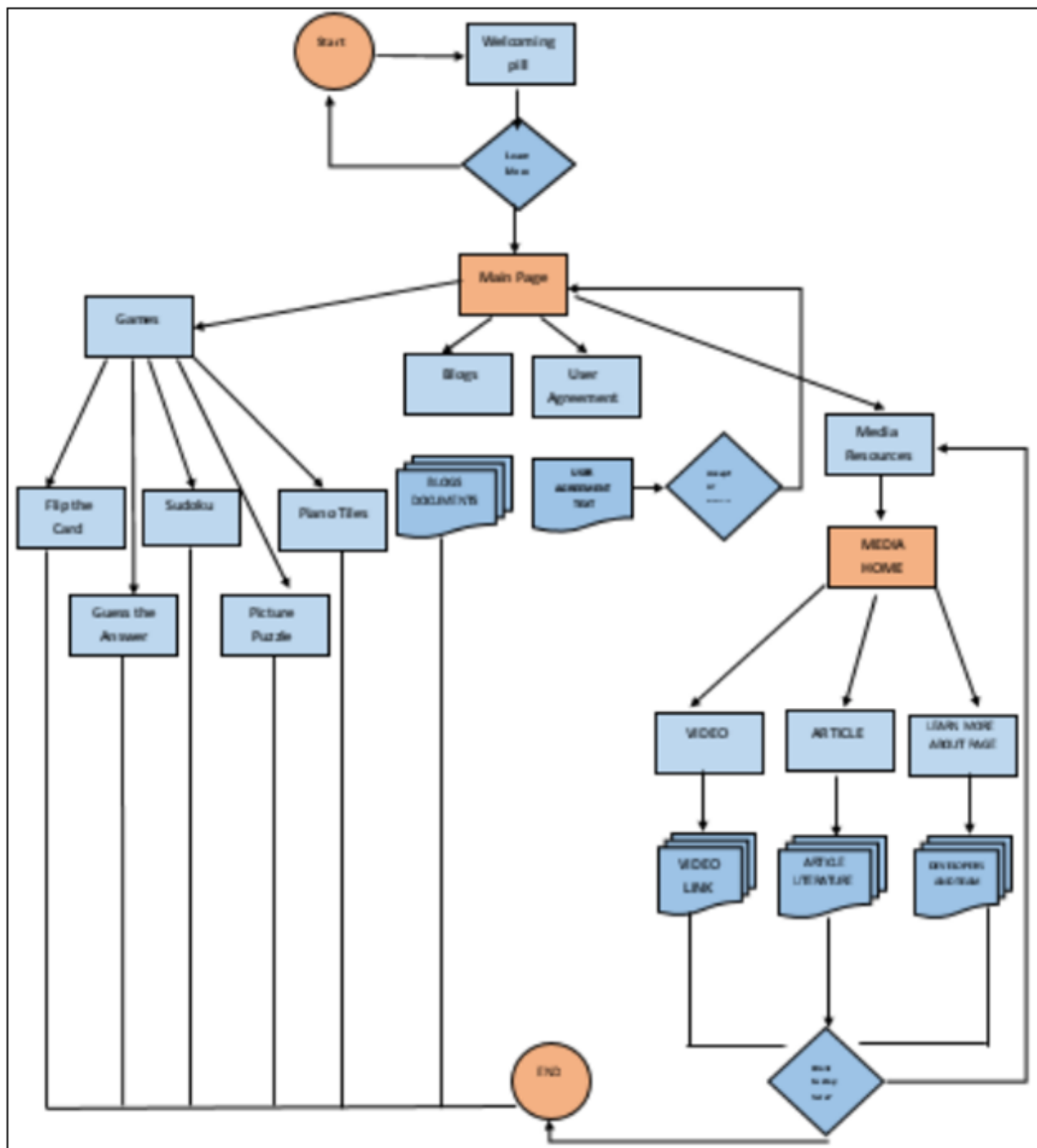


Fig 3 Flowchart of the Study

Figure 3 shows the flow of the System, the main page which welcomes the user. The second page contains the Games, Blogs, User Agreements, and Media Resources. The blog sections include the icons of the personalities with ADHD who succeed in life. User Agreement contains the

terms and conditions of the System. Media resources are the page containing videos, Articles, and About the Developers. This is designed to upgrade their learning about ADHD and the developers.

➤ *Welcome Page of the System*

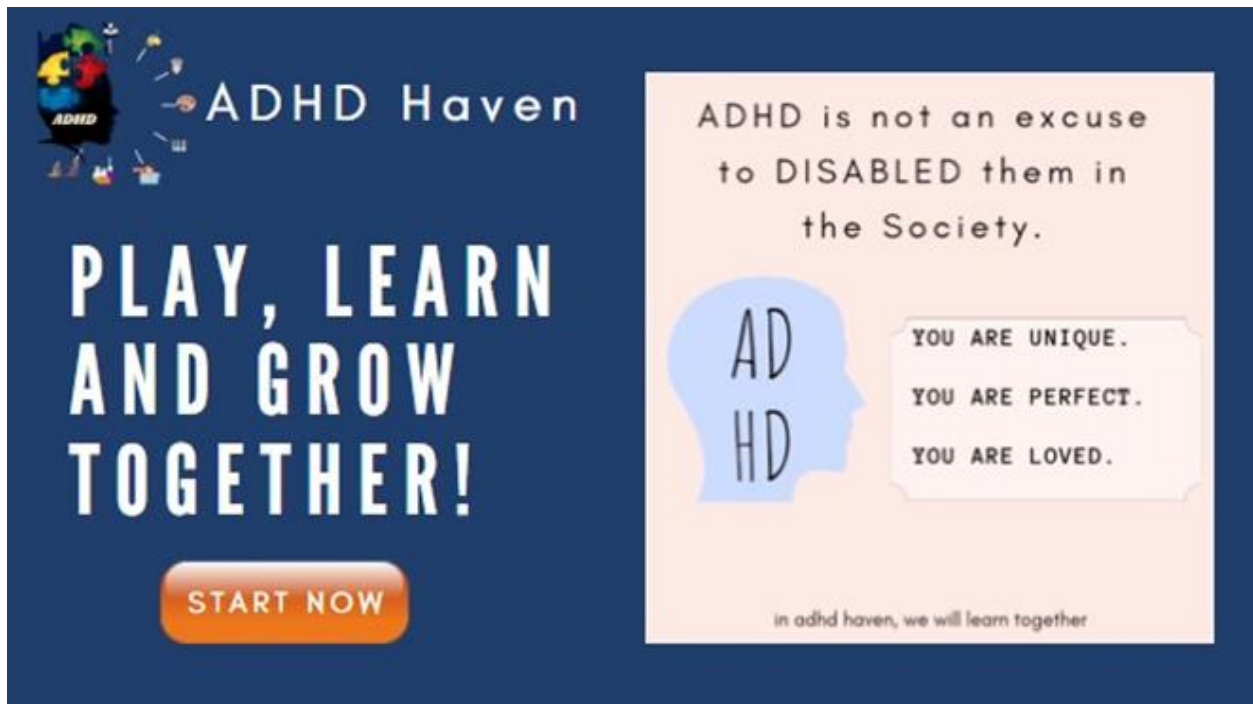


Fig 4 Welcome Page of the Study

This figure shows the introductory greetings to the User. The designers put a saying about ADHD to captivate their interest in using the system.

➤ *Home Page of the System*



Fig 5 Home Page

Figure 5 shows the main page of the system. It consists of games, blogs, user agreements, and Media Resources. This part of the system serves as the main page.

➤ *Game Section of the System*

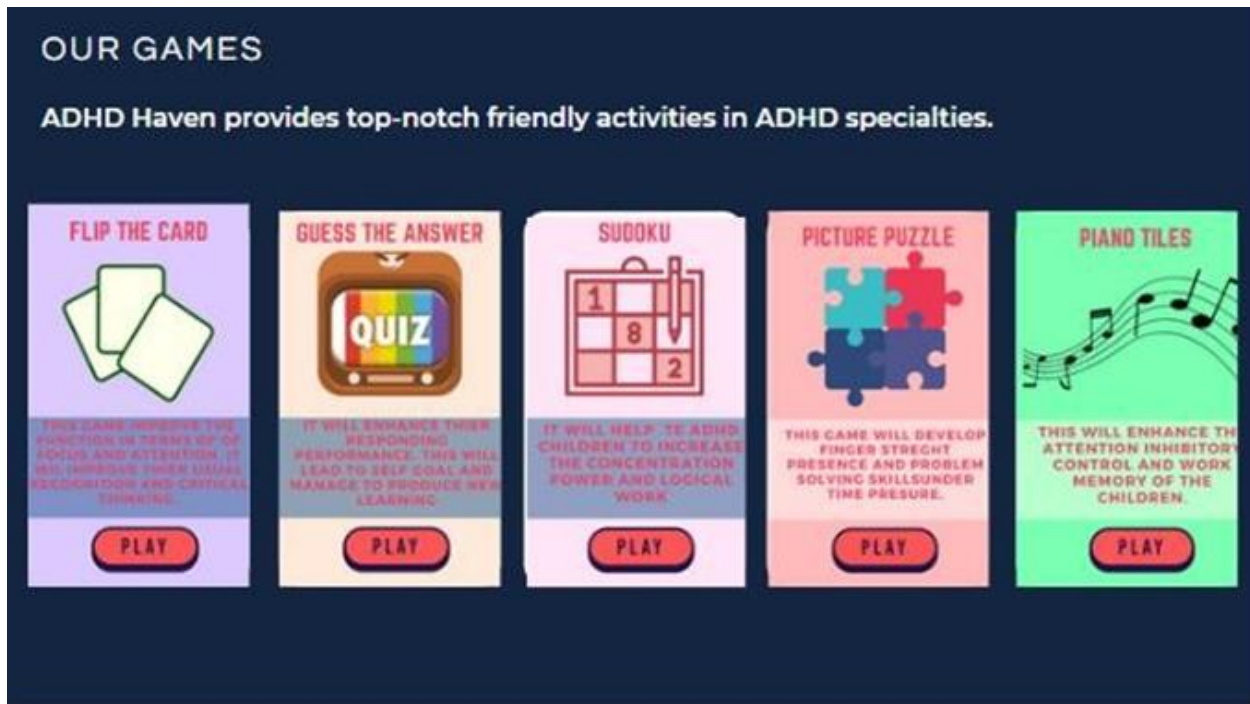


Fig 6 Game Section

Figure 6 presents the different games that the system has. The games such as flip the card, guess the answer, Sudoku, picture puzzle, and piano tiles are the activities that can help the development of the children’s cognitive ability.

➤ *Flip the Card*



Fig 7 Flip the Card

Figure 7 presents the flip the card game. It is a card game that works to continue update the working memory in determining a same symbol match.

➤ *Guess the Answer*

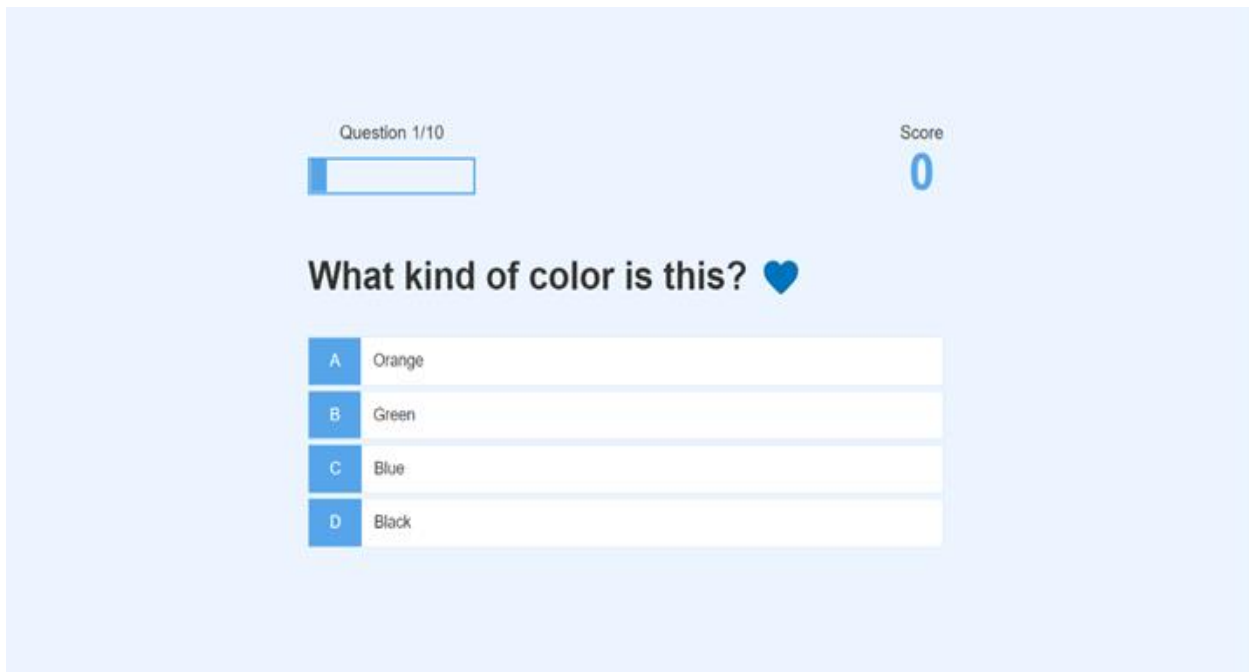


Fig 8 Guess the Answer

Figure 8 presents the Guess the Answer. It is a multiple choices objective game to assess the user to select the best answer.

➤ *Sudoku*

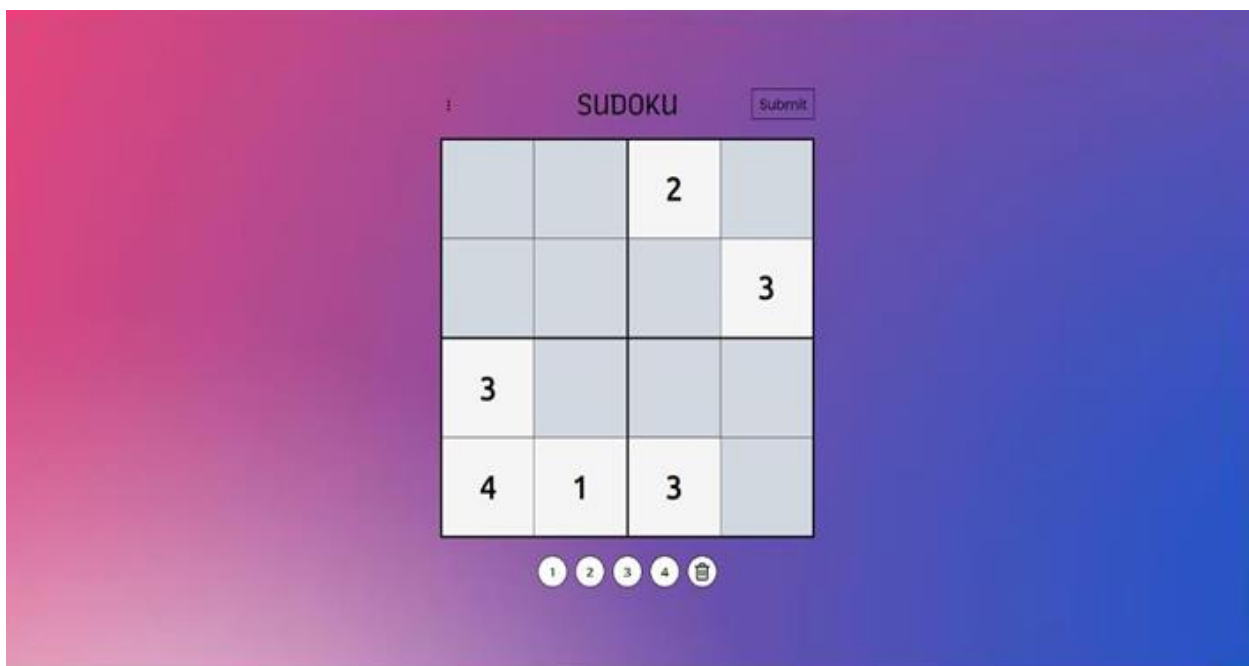


Fig 9 Sudoku

Figure 9 presents the Sudoku. It is a logic-based number placement puzzle. It improves the logical thinking and improves quick thinking skills.

➤ *Picture Puzzle*



Fig 10 Picture Puzzle

Figure 10 presents the Picture Puzzle. It is a set of irregular cut pieces of pictures which form a complete image. It improves cognition and visual spatial.

➤ *Piano Tiles*



Fig 11 Piano Tiles

Figure 11 presents the piano tiles. It is a game where user needs to tap on the black tiles. This improves the hand-eye coordination of children with ADHD,

➤ *Blog Section*



Fig 12 Blog Section

Figure 12 presents the blog section. It contains the different successful personalities with ADHD. This is design to give inspiration for the person with ADHD.

➤ *User Agreement Section*

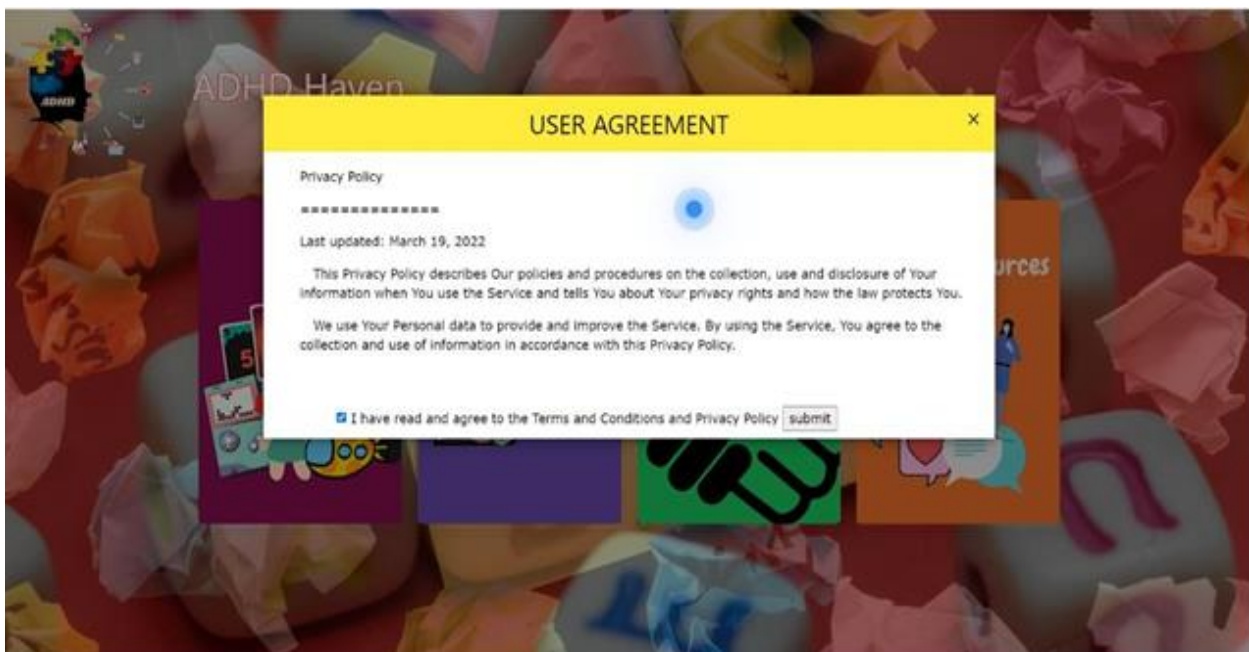


Fig 13 User Agreement Section

This figure represents the term and conditions of the user. It tells about the restriction of use, disclaimers, limiting the developers' liability, termination, and intellectual property. This section is created to protect them from the harm to the user.

➤ *Media Resources Page of the System*

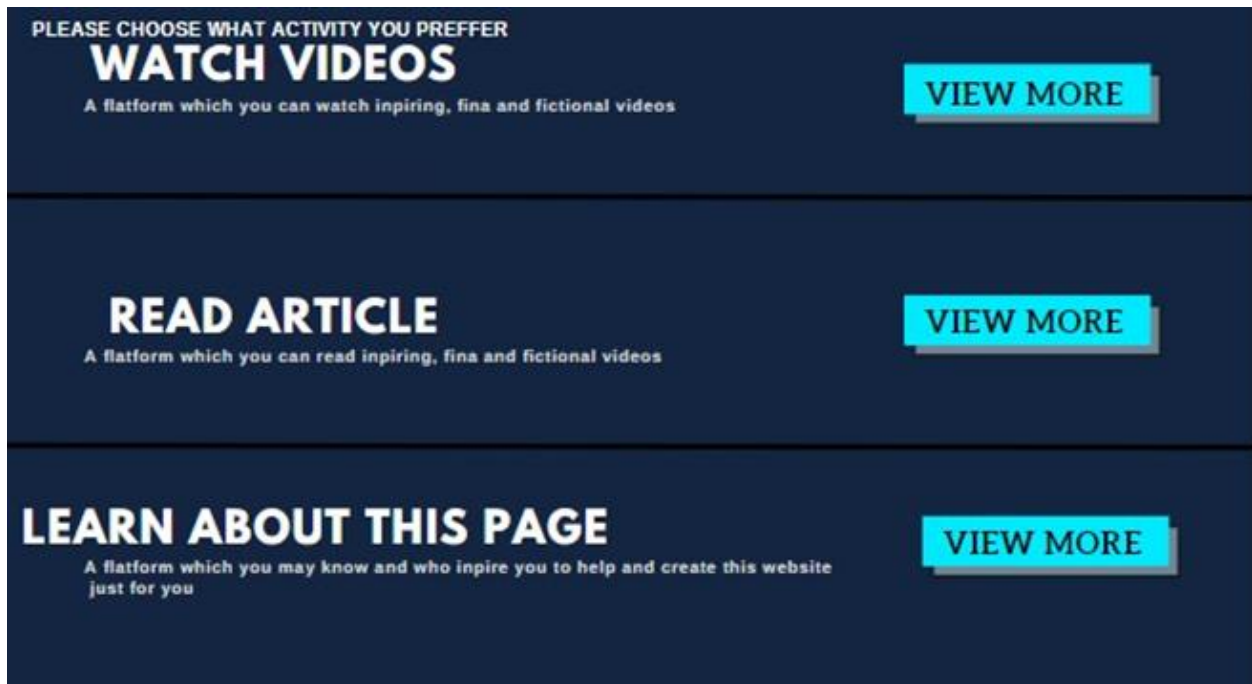


Fig 14 Media Resources Page

Figure 14 user can choose about the activity they prefer to do such as watching videos, read articles and learn about the developer of the page.

➤ *Video Section of the System*



Fig 15 Video Section

This figure showcase different video presentation about ADHD. This is created to give additional information about the real-life scenario of dealing with ADHD. This maximizes their ideas in the situations that will help them understand what ADHD is all about positively and graphically.

➤ Article Section of the System



Fig 16 Article Section

Figure 16 shows different articles that can contribute in updating their knowledge about ADHD. The reading materials can produce new adaptable ideas in dealing with ADHD children.

IV. RESULT AND DISCUSSION

➤ This Chapter Presented and Discuss the Result Concerning the Aim of the Study.

Table 2 The Demographic Profile of ADHD in terms of Gender and Age

N= 118	Frequency	Percentage (%)
Gender		
Male	72	61.02
Female	46	38.98
Age		
5-10	28	23.73
11-15	22	18.64
16-20	24	20.34
21-25	44	37.29
TOTAL	118	100

Table 2 shows that among the 118 respondents, the dominant gender of a person with ADHD is Male, with 72 respondents, while females got 46 which is equivalent to 38.98 percent. In terms of the age of ADHD children, 44 of the respondents, which is similar to 37.29 aged 21-25 years old, are the highest number of persons with ADHD. Followed by the age bracket 5-10 years old, which gathered 23.73.

Table 3 The Cognitive Areas Affected by ADHD

Cognitive Areas	Mean	Sd	Interpretation
Memory	3.56	1.20	Low
Attention	3.81	1.15	Low
Speed	3.59	1.18	Low
Response Inhibition	3.50	1.17	Low
Reaction Time Variability	3.40	1.13	Average

As can be observed in Table 3 data, children with ADHD don't have standard cognitive domains such as Memory, Attention, Speed, and Response Inhibition interpreted as LOW. As cited by Rapport (2013), mental training and exercises like puzzles, memory games, and similar computer-based games improve academic performances, complex reason skills, attention impulse control, and even the social functioning of children with ADHD. Hence, the researcher's designed online learning iterative platform for children with ADHD can contribute to the study's primary objective.

Table 4 Summary of System's Evaluation

CRITERIA	MEAN	VERBAL INTERPRETATION
ACCESSIBILITY	4.5	Excellent
MAINTAINABILITY	4.45	Very Good
FUNCTIONALITY	4.85	Excellent
RELIABILITY	4.2	Very Good
ACCURACY	4.4	Very Good
SPEED	4.2	Very Good
AVERAGE WEIGHTED MEAN	4.43	

The Table compiled summarized results of each category: Accessibility, Maintainability, Functionality, Reliability, Accuracy, and Speed. The average percentage of all the classes' amounts to 78%, with a total mean of 4.43, interpreted as "Very Good."

Table 5 Summary of System's Algorithm

CRITERIA	MEAN	VERBAL INTERPRETATION
FUNCTIONALITY	4.3	VERY GOOD
ACCURACY	4.45	VERY GOOD
AVERAGE WEIGHTED MEAN	4.37	VERY GOOD

The table compiled summarized results of each category: Functionality and Accuracy. The average percentage of all the categories amounts to 76% with a total mean of 4.43 which was verbally interpreted as "Very Good"

V. CONCLUSION AND RECOMMENDATION

A. Conclusion

Having a child with ADHD is a different type of parenting. It can be complex but extraordinary. Both children and adults can have ADHD. Studies show that diagnosed patients have poor social skills, behavioral problems, and concentration. ADHD patients' behavior can affect their daily routines, especially the adults with ADHD living life independently. That's why our parents, teachers, and health providers must have a clear and better understanding of ADHD and the importance of diagnosis and treatments.

The researcher, therefore, concludes that the research is still in progress on improving the system for the diagnosed children and their parents to interact and learn with it. The researcher will surely increase accuracy and add more activity to create a plan to encourage patients to live free and exercise their cognitive ability.

B. Recommendation

The researchers are pleased to write a recommendation for improving the "Hybrid Algorithm Model for Intervention to Improve Cognitive Ability for Attention Deficit Hyperactivity Disorder" system for a better lesson platform for the patients. Although it is good to be done, there are some areas this lacks. There are weaknesses of the system, including the following:

- Lack of communication in this area which the system is programmed to encourage and teach patients communication, is one of the primary sources of this project. This can improve by creating an animated and talking avatar to teach steps of the game, Proper Sounds, kinds of music, and FX in-game. This is for the patient's stay and is in touch with the system.
- System lacks graphical resources; being able to teach ADHD patients, one must need visual aids for the patient to stay on focus. This can improve by Adding videos, creating animated or moving background on the system, enhance slide by slide transitions, and improving color combinations by making this; patients will be amazed by the graphics of the system
- Improving the system's User Interface, this system may be user-friendly. Still, we are talking about ADHD patients that are more mischievous than average this will be improved by creating simple instructions and improving system instructions, lessening text on the system, and improving graphical representation by this act; users gain more trust and reduce their rotations on identifying things. The researcher, therefore pleased to be able to recommend improving the "Hybrid Algorithm Model for Intervention to Improve Cognitive Ability for Attention Deficit Hyperactivity Disorder."

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