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Serious Game to Training Focus for Children with Attention Deficit Hyperactivity Disorder: "Tanji Adventure to the Diamond Temple"

Raden Bagoes Yudha Rangga Sanjaya[1], Rahadian Kurniawan[2], Sri Mulyati[3]*, Kukuh Eka Nugraha Chrisna Putra[4], Restu Rakhmawati[5]

*mulya@uii.ac.id

[1,2,3,4]Department of Informatics, Faculty of Industrial Technology, Universitas Islam Indonesia Yogyakarta, Indonesia

[5]Department of Information Technology, Universitas Amikom Yogyakarta Yogyakarta, Indonesia

Abstract- Attention Deficit Hyperactivity Disorder (ADHD) affects the academic performance of youngsters. Children with ADHD struggle to remain focused during learning due to decreased attention and concentration. They are highly active and have trouble remembering teachers' instructions. Attention difficulties, focus disorders, and hyperactivity might hinder learning. This work aims to observe the impact of serious games with a platformer genre and puzzles titled "Tanji Adventure to the Diamond Temple" on the learning activities of kids with ADHD. The goal is to create a fun and engaging learning environment to boost the motivation and focus of those with ADHD. Game development process utilizes iterative prototyping. Each iteration yields a prototype that refines in the next iteration. The game was tested on children with ADHD by examining their behavior before and after playing to evaluate whether new game mechanics were necessary. The review procedure includes observing youngsters and interviewing teachers and involves specialists to evaluate its contents. The study confirms that the concentration of children with ADHD increase after playing the game. The game incorporates elements that help youngsters with ADHD concentrate and increase their attention span.

Keywords: *ADHD, focus, educational video games, children*

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1. Introduction

ADHD (attention deficit hyperactivity disorder) is one of the most common behavioral disorders in childhood [1],[2]. ADHD is a disorder that makes sufferers very active; other complaints experienced by people with ADHD are restlessness, cannot stay still, and lack of attention to activities or activities being carried out [3], [4]. ADHD may fall into one of three subtypes: ADHD subtype 1 is attention disorder without hyperactivity and impulsivity; ADHD subtype 2 is hyperactivity disorder and impulsivity without attention deficit disorder; and ADHD subtype 3 is a combination of attention deficit disorder, hyperactivity, and impulsivity.

The prevalence of children with ADHD globally ranges from 2% to 7%. Based on the DSM-IV diagnosis, there are 5% to 7% of children with ADHD [5]. According to [6], ADHD is not a rare thing experienced by children. ADHD cases affect up to 6% to 9% of children, and in 60% of cases, significant ADHD symptoms can persist into adulthood. There is no accurate data regarding the prevalence of ADHD in Indonesian children. Based on research [7] in 2016 in Yogyakarta City and Sleman Regency, approximately 8.09% of school-age children with ADHD.

The condition of ADHD in children makes learning performance decline because ADHD also impacts children's memory abilities. Examples include ADHD children who find it challenging to sit still while studying, are very active, and find it difficult to remember instructions from their teachers because of lack of attention [8], [9]. During the learning process, of course, substantial attention is needed to capture and digest the information provided by the teacher [9]. According to [10], the learning ability of children with ADHD lags far behind their peers due to attention and concentration disorders and hyperactivity that can hinder their learning process.

From the problems raised, an idea emerged to develop learning media in serious games for ADHD children with the platformer genre accompanied by puzzles named "Tanji Adventure to The Diamond Temple." The game utilizes platformer and puzzle genres because the puzzle genre is one of the game genres with designs and playing rules proven to improve the player's brain

ability [11]. The platformer and puzzle genres also have mechanisms that can help ADHD children learn to understand and remember shapes, colors, and concepts. In addition, children with ADHD who have trouble focusing on one task at a time may benefit from playing puzzle games because their bright colors and exciting forms are more likely to hold their attention [12], [13].

The purpose of developing a serious game, "Tanji Adventure to The Diamond Temple," for ADHD children is to provide a fun and engaging new way of learning to increase the motivation and attention of ADHD children [14], [15]. Practicing this focus is essential because children with ADHD are too active and cannot stay still [16], causing them to have difficulty concentrating or focusing on the subject. Therefore, the serious game "Tanji Adventure to The Diamond Temple" is designed to train the attention skills of ADHD children because attention skills are the most important thing to improve so that they can study well in school. In addition, video games can be a powerful tool to train ADHD children to focus on daily activities [17], [18]. With the serious game "Tanji Adventure to The Diamond Temple," it is hoped that ADHD children will get exciting, fun, and enjoyable learning with this fun learning; hopefully, it can be a solution to make learning more effective. So that children with ADHD can focus more on learning at school and their daily activities.

The development of learning games for children with special needs is a current trend in education. In addition, to help teachers educate children with special needs, this learning media effectively attracts students' attention. The success of several video games in helping the learning process of children with special needs has caused many developers to start making game applications as educational support. Each piece of teaching media for kids with special needs is made to fit the lessons taught in special schools. Therefore, in addition to creating new applications, developing teaching media is also carried out by developers to improve existing teaching media.

The previous research on developing serious games to increase the focus of ADHD children is COMAC. This serious game is a platformer genre designed to improve the focusing ability of ADHD children [19]. In the development of COMAC, there are six design strategies applied, namely: 1) Clear instructions to players, 2) Positive feedback, 3) Specific goals, 4) Encouraging clear thinking, 5) displaying player statistics on the screen, and 6) encouraging organized behavior in children. The design strategy is implemented in COMAC by providing clear instructions. Giving clear instructions is considered essential to improve the ability to work memory (WM), visual memory (VM), auditory memory (AM), and visual-spatial memory (VSM) [18]. COMAC teaches players to focus on the character being played to pick up bombs according to the orders given to the player. Examples of commands include "Take a bomb with the number 27"; the player will lose one life if one takes the bomb.

The platformer genre game was also developed in [15]. This study developed a game that aims to improve academic ability by applying successive goals and subgoals. The goal is to improve academic ability with repetitive activities, complete levels, collect as many points as possible, and complete tasks to get rewards. Another serious game developed to improve focus in ADHD children is Plan-it Commander [17]. In this game, players take on the role of captain of a spaceship whose job is to collect rare minerals in the universe. Players are given various missions with different criteria. Each mission has a specific learning objective; for example, on a mission to collect minerals, players must stay focused on collecting minerals and avoid the distractions that arise. In addition to training focus, the game also trains the player's time management because the player must complete the mission within the allotted time. Children with ADHD have difficulty organizing the work they must do, so practicing player time management can help ADHD children to encourage organized behavior in children [19].

Previous studies that developed serious games to improve ADHD focus had puzzle and platformer gameplay. Games with puzzle and platformer genres allow players to explore game stages to complete tasks. Players can design the right strategy and take time to achieve goals. By designing the right strategy, this game helps players practice their thinking straight [19]. It aims to train players to stay focused on their goals. Each game developed has a story and missions to complete to advance to the next level. The game can only be continued if the mission has been completed. If the player makes a mistake, the player must repeat the game from the beginning. In addition to being given missions to complete, players are also trained to control themselves from being distracted by game objects that players must avoid. Another element in games included in developing serious games to train ADHD children's focus is the narrative element. The narrative element in the game can make it more visually appealing so that children are interested in completing it [20].

Based on previous studies that developed serious games to train the focus of ADHD children, several features must be in the game. Firstly, the game must provide clear instructions to the player. Instructions can be written or voice-directing the player. Players can improve their organization and attention skills while listening to instructions [18]. Secondly, the game must have clear goals to reach a specific level. For example, to complete level 1, the player must get 100 points and defeat two enemies. Thirdly, the game must show statistics on the player's abilities, such as level, points, and player scores, to know their abilities in the game [19]. Children with ADHD tend to feel insecure when they must complete a job, so displaying players' levels, speed, points, and scores can increase their confidence [21].

The game developed applies these three principles and adds unique mechanics to train the player's focus by combining the player's eye and hand focus. Each game mechanic will involve the player's eye and hand coordination to complete the mission. In addition, the feedback given is positive to increase players' enthusiasm and confidence. Players are also given time to recall what has been achieved and plan strategies for the next level. The games that will be developed will also pay attention to ADHD children who can feel depressed if they find it challenging to complete tasks. In games developed, players will be allowed to try the levels in the game to learn from their mistakes so that players can finish the game well.

2. Methods

The development method used in making this game is using the prototype method. The stages of game development consist of need assessment, design, development, playtesting, and evaluation. The development process is iterative, where after reaching the playtesting stage, it is possible to repeat the Design process. Each first step will generate a prototype, which will improve in the subsequent iteration.

1. Requirement Analysis

The development of learning games to train the focus of ADHD children begins with conducting a requirement analysis to discover the general characteristics of ADHD children to adapt to their learning styles through Literature Studies. Literature studies were carried out to develop focus training games for ADHD children. The literature study was carried out by reviewing previous studies that discussed games used as teaching media for children with ADHD and articles discussing the characteristics of children with ADHD. Literature studies have shown that the platformer genre is in great demand by children with ADHD [22]. In addition to literature studies, needs analysis is also done through interviews. Interviews were conducted with experts to obtain the learning characteristics of ADHD children. The interview process was carried out with two experts through remote discussions using the Zoom application (remote interviews were conducted because it was impossible to have face-to-face meetings during the pandemic). The interview was conducted with an Education for Children with Special Needs (ABK) expert and an Inclusive Media Development Expert. This interview explores the fundamental needs needed to produce learning games for children with ADHD. In addition, this meeting also explored the scope of children with ADHD, such as general characteristics, habits, and several theories about handling children with ADHD.

The observation was also carried out to get a complete picture of children's learning with ADHD. Observations were made to observe the school atmosphere and learning styles of ADHD children. Direct and limited observations with ADHD children were carried out in 2 Public and Inclusive Schools in West Java and Jakarta. In addition, observations were made on 7 ADHD children in the two schools. In this field observation process, interviews were also conducted with teacher educators regarding the obstacles needed to get a complete picture of the behavior and habits of children with ADHD in learning. Observations were carried out for one week in each school. Based on the needs analysis results, some of the primary things used as a reference in developing this game are: a) Ensure that children with ADHD do not have other congenital special needs such as autism or other academic ability barriers. b) ADHD children quickly lose their attention, so avoid using a too-flashy interface. c) Do not use noisy music because it can interfere with focus. d) Provide positive feedback to motivate. e) Use language that is easy to understand. f) Instructions for completing the level should be clear. g) Give variations in giving instructions, for example, using voice instructions.

2. Design

The Design stage is the process of producing designs in the form of concepts, content, and storyboards that describe the game's flow and is developed to plan game implementation procedures—the design stage results from the accumulation and design based on the needs analysis results. Figure 1 shows a high-level outline of the upcoming storyboard. The game begins with a cutscene when Tanji discovers his grandfather's treasure map. The scene then changes to Tanji attempting to locate a secret shrine. In addition, several challenges await within the Tanji temple. This barrier aims to assist youngsters with ADHD in developing their capacity to focus. A Boss defends each level with various skills. Finally, Tanji discovers a DarkerStone prize at the end of the level. Table 1 shows a summary of the resulting design process.

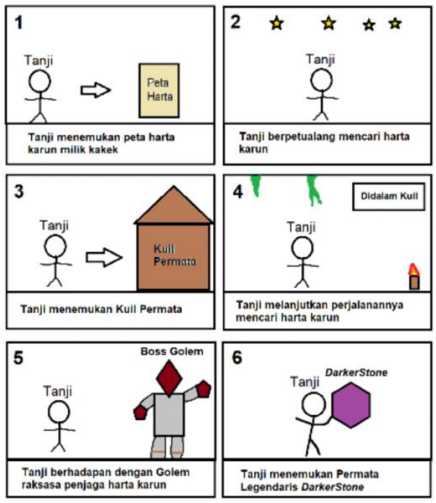

Figure 1. Game Storyboard

3. Development

The Development stage is where primary assets, such as game objects and scripts, are added to the game. Figure 2 shows the game object Tanji (the main character to be played) and the game object as a Temple (temple). In the game "Tanji Adventure to The Diamond Temple," various scripts help control player movements, level changes, enemy movements, object movements, boss movements, etc. After the primary development stage is completed, improvements are made to various aspects of the game, starting from the visuals, such as the background, game objects, and enemy AI, and adding audio.

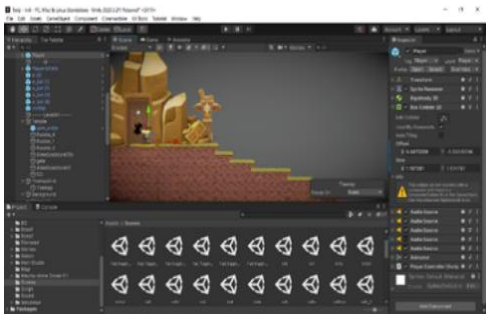

Figure 2. Development of level 14

4. Playtesting

The playtesting stage is the testing stage and the implementation, which is carried out directly by the child. At this stage, children with ADHD are asked to play games developed at the development stage to make observations regarding the game's mechanics and then analyze whether it is necessary to add other mechanics or change the existing mechanics to suit the child's needs. If several needs for improvement are found at this stage, the research stage will return to the design stage. A more detailed explanation regarding the playtesting stage is found in chapter 4.

Figure 3. Some Scenes in the Tanji Game

Table 1. Summary of game design developed

Characteristic		Description
Game Procedure	Targeted age groups	6–12 years of age
	Target Players	Individual (children with ADHD symptoms).
	Targeted Health Behavior	Ability to focus.
	Behavior changes procedures	Carry out multiple missions by understanding the correct instructions via text or voice, remembering locations on the map, avoiding obstacles that require concentration, and giving positive feedback
	Clinical or parental support needed	This game is offered in the home context and can play independently.
	Rules	Limited daily playtime (20-30 min). Complete missions/tasks/levels before moving to the next one.
	Playing Time	2-3 hours
	Game platform	Computer
Game Concept	Game Name	Tanji Adventure to The Diamond Temple
	Game Focus	A serious game that teaches children with ADHD to be more focused on current given tasks.
	How the story relates to targeted behavior change	During their missions' players are confronted with assignments requiring skill to be focused and remember the environment to solve the mission problems.
	Game components Player's game goal/objective(s)	The players aim to collect diamonds and emblems hidden inside treasure boxes. Each mission will ask the players to find specific items to complete the mission and continue to the next level. In addition, two mini-games have specific goals: "Dodge the Trap," motor skill, and "Catch the Diamond," eye coordination.
Game Element	Genre	Adventure, educational, platformer
	Story	The player takes the role of Tanji, the adventurer who continues his grandfather's journey to find the legendary jewel Darkenstone in the mysterious Temple of Diamond. The player will be assigned various missions throughout the epic journey.
	mechanics	Multi-levels, visual guidance to complete a task, audio guidance to complete a task, search the treasure boxes, collect items, and various challenging enemies (artificial intelligence/ AI).
	Setting	A natural atmosphere. The game world with beautiful mountain background and a mysterious temple to be explored.
	Avatar	Adventurer, male, nickname (Tanji), explores the game world, opens the treasure box, and collects items in the game world.

5. Evaluation

The evaluation stage measures the implementation results of the child after the child has played the game that was developed. The evaluation stage involves observing children, interviewing teachers, and evaluating game content experts. A more detailed explanation regarding the evaluation stage is found in chapter 4.

3. Result

In the results section, we will discuss the results of the games that have been completed. This discussion will cover essential game factors to train focus on ADHD children. As shown in Figure 3(a), the player must complete a mission to complete a level. Next is Tanji's gameplay on an adventure to find the eagle emblem hidden in the chest. As the game progresses, the player can distinguish the shape of the right chest with a chest containing traps. Players must focus on finding the appropriate emblem because taking the wrong emblem will cause the cave to collapse. Once the correct emblem is found, the player must return to open the door and proceed to the next level. The gameplay can be seen in Figure 3 (b). Figure 3 (c) is a scene where the player has completed part of the whole level. It can be seen in Figure 3 (c) that this game provides positive feedback to increase the enthusiasm and confidence of players. This "Tanji Adventure to Diamond Temple" game applies a Trial-and-Error system where players must learn from their previous mistakes to complete the game's levels. If the player is not focused and takes the wrong item requested by the game, a page will appear that does not drop the player's morale and gives words to keep trying, an example of which can be seen in Figure 3 (d). The game becomes increasingly difficult as the player advances through its levels. For example, at levels 6 and 7, players will be given a command via voice; for instance, at level 6, it will sound like "Find the Red Gem." Commands such as "Find the Red Gem" will be repeated with a pause of approximately 1-2 minutes until the player finds the requested item, as shown in Figure 3 (e). At Levels 8, 9, and 10, players will only get a one-time command to get the appropriate item to win that level. In Figure 3 (f), the player must find two emblems according to the one on the temple door to complete the level. There is also a different mechanism from the primary game mechanism that aims to train the focus ability of ADHD children.

Table 2. Profile of game respondents in this study

Name	Gender	Age	Academic Ability	Ability to Focus	Hyperactive Behavior
Ad1l0	Male	6	Can understand orders/instructions. Can read and write, although not fluent.	The focus is very easily distracted. Often does not pay attention. Need to repeat the instructions on the given task.	When studying, sometimes climb up to the bench When eating can't stay still, messy
Fr2d0	Male	7	Can understand orders/instructions. Can read and write	The focus is very easily distracted. Very often not paying attention. Need to repeat the instructions on the given task many times.	Super active, running after his friends. Can't queue when checking assignments When sitting can not be still hands and feet. Likes to scream.
Ra6f4	Male	11	Can understand orders/instructions. Can read and write	Focus is easily distracted. Sometimes, you need to be reminded to stay focused. When given the original question answered.	Unable to stay still when sitting. Nosy to his friends. When punished, take a walk to sit next to the teacher's desk/stand in front for 1 minute.

Names were withheld to protect respondents' privacy

The game "Tanji Adventure to Diamond Temple" also has a minigame that teaches hand-eye coordination, where players must avoid traps and catch items that fall from above. The gameplay of the minigame mechanism can be seen in Figures 3 (g) and (h). In addition, this game has a feature that gives players time to breathe to remember what they have done during the game. In Figure 3 (i), the player goes through a long dark alley with no obstacles, either traps or enemies. Long dark path with no barriers aims to make the player feel relaxed without new information. Thus, the player can reflect on the focused training carried out at the previous levels. Figure 3 (j) is a screenshot of the boss battle gameplay in "Tanji Adventure to Diamond Temple." The boss in this game requires players to focus on paying attention to attacks and training eye-hand coordination. Players are asked to respond quickly to avoid boss attacks and counterattacks to defeat the boss.

4. Discussion

The playtesting stage of the educational game "Tanji Adventure to Diamond Temple" to train focus on ADHD children was conducted in inclusive elementary schools that accept children with special needs such as ADHD and autism in West Java. During the Covid-19 pandemic, all academics must wear masks, wash their hands, and comply with other regulations to avoid the spread of Covid-19. Respondents/children with ADHD in this study were identified and selected by the principal. The participants and their parents received an information letter that contained their consent to participate in this study. The inclusion criteria used were (a) having a DSM-V clinical diagnosis of ADHD defined by a certified health professional/institution and (b) having an age between 6 to 12 years. The exclusion criteria chosen were having physical or cognitive disabilities (i.e., deafness, blindness) because they were predicted to have great difficulty playing the resulting game. Playtesting game "Tanji Adventure to Diamond Temple" was carried out by three children with ADHD

(hyperactivity) indications. The profile of the respondents can be seen in Table 2.

The children played playtesting games at school three times in 2 weeks. The school only allows one child per day to participate in the playtesting session. The first and second playtesting were conducted to assess whether mechanics were too tricky for children to understand when playing. Meanwhile, the third playtesting carried out an observation and evaluation process. The children were asked to play the game for 30 to 45 minutes in each playtesting session. This game has three main bosses, each with a different difficulty level. However, playtesting is only played until the second boss because the game still needs to be finished. Some note improvements in the first and second playtesting include lighting improvements, fixing instructions that are not understood, sound enhancements, and adjusting the difficulty level when facing each boss (such as the number of boss attacks and the duration of the boss issuing attacks). When the first and second playtesting occurred, a recording was carried out to observe the respondents' interest in playing games. Before and after playing, respondents must clean their hands using the hand sanitizer provided. Despite wearing a mask, it can be seen the enthusiasm and interest in playing games in respondents Ad1l0 and Fr2d0 (Figure 4).

Table 3. Performance of Each Respondent

Level	Instructions to complete the level	Failure to Follow Instructions. Respondent Ad1l0	Failure to Follow Instructions. Respondent Fr2d0	Failure to Follow Instructions. Respondent Ra6f4
1	Visual instructions throughout the level.	-	-	-
2	Visual instructions throughout the level.	-	-	-
3	Visual instructions throughout the level.	2x. Because the respondent took the wrong object.	7x. Respondents did not pay attention to the instructions at all.	3x. Respondents ignore instructions and are in a hurry.
4	Visual instructions throughout the level.	1x. Because the respondent took the wrong object.	2x. Respondents rushed, causing the wrong object to be picked up.	2x. The respondent hastily caused the wrong object to be picked up.
5	Visual instructions throughout the level.	0x. Respondents were able to pay attention to the visual commands given well.	1x. Respondents were able to pay attention to the visual commands given well.	0x. Respondents were able to pay attention to the visual commands given well.
6	Audio instructions during the level (the distance between instructions is approximately 1-2 minutes).	6x. When there is a change in the order, the respondent has difficulty listening to the command given and forgets the order.	5x. When there is a change in the order, the respondent has difficulty listening to the command given and forgets the order.	2x. When there is a change in orders, respondents have difficulty listening to the commands given.
7	Audio instructions are only found at the beginning of the level.	2x. Respondents can learn from previous mistakes and pay more attention to the voice commands.	2x. Respondents can learn from previous mistakes but rush to take the object wrong.	1x. Respondents have been able to learn from previous mistakes.
8	Visual instructions are only available at the beginning of the level.	5x. When there is a change in the order, the respondent has difficulty because the instruction is only given once.	9x. When there is a change in the order, the respondent has difficulty because the instruction is only given once.	4x. When there is a change in the order, the respondent has difficulty because the instruction is only given once.
9	Visual instructions are only available at the beginning of the level.	5x. When there is a change in the order, the respondent has difficulty because the instruction is only given once.	3x. When there is a change in the order, the respondent has difficulty because the instruction is only given once.	2x. When there is a change in the order, the respondent has difficulty because the instruction is only given once.
10	Visual instructions are only available at the beginning of the level.	1x. Respondents have learned from previous mistakes and are more able to focus on remembering the instructions given.	1x. Respondents have learned from previous mistakes and are more able to focus on remembering the instructions given.	0x, Respondents have learned from previous mistakes and are more able to focus on remembering the instructions given.

Table 4. Questionnaire after playing

No	Questions	(SD)	(D)	(N)	(A)	(SA)	Ad1l0's comments	Fr2d0's comments	Ra6f4's comments
1	Do you like playing video games?					3	Yes (SA)	I love it (SA)	Yes (SA)
2	Do you want to play video games more often?			1	2		I want to learn and be a pilot, but sometimes I want to play too.(N)	I want but have to learn too. (A)	I want but have to learn too. (A)
3	Do you feel happy after successfully completing the game?				2	1	I feel Happy (A)	Im very Happy (SA)	I'm satisfied, finally won. (A)
6	Can you learn anything?				2	1	Learn to focus and don't give up. (A)	Learn to focus, you have to focus if you want to win. (A)	Learn to focus and keep trying. (SA)

5	Does this game help you to focus more?	2	1	Yes (A)	Yes, but sometimes it catches fire. (A)	Focus more when fighting bosses because it's difficult. (SA)
6	Should other kids be able to play this game?	2	1	Yes, let it be more fun. (A)	Only I can play this game (narcissistic). (A)	The game is pretty fun, but FreeFire is more fun. (SA)

SD = Strongly Disagree; D = Disagree; N = Neutral; A = Agree; SA = Strongly Agree.

The behavior of respondent Ra6f4 was notably distinct from that of other respondents. Ra6f4, the first respondent in Figure 5 (left image), lacked the same passion as Ad1l0 and Fr2d0 because Ra6f4 believed that the game's challenges were too easy, underestimated the difficulty of the game (played with one hand), and caused them to be unmotivated to play. However, the disinterest of the respondent Ra6f4 was brief. In the video game "Tanji Adventure to Diamond Temple," when he encounters the first boss, RockGollem, his posture (opening the hoodie, good body, not leaning back, and getting closer to the screen) and the focus of his gaze begins to alter. This initial boss needs precise timing and concentration on avoiding stone-throwing strikes from the RockGollem boss or the previous boss (Figure 5 right).

Figure 4. The enthusiasm of Respondent while Playing

Figure 5. Respondent Ra6f4 while playing (left), Ra6f4 starting to focus and be serious while playing (right)

1. Evaluation of respondents' performance while playing

All game sessions were recorded in the third playtesting and related to the children's performance during play were recorded. Each respondent has a different playing performance and style, and playing speed. Table 3 shows the respondents' performance for each level in the game "Tanji Adventure to Diamond Temple." Table 3 shows that each respondent can adjust to learning from mistakes at each level because they do not focus on the previous level. The ability to adapt at the next level shows that the games developed have mechanics that can motivate children to focus more on instructions.

2. Evaluation of respondents' performance while playing

The perceived playing experience varies from one respondent to another. However, the three respondents showed a sense of pleasure and satisfaction after playing this game. Respondent Ad1l0 had a very expressive reaction indicating that he was happy. This expression can be seen in Figure 6(a), where respondent Ad1l0 smiled and showed joy. Respondent Fr2d0 has a reaction that looks satisfied and happy. This expression can be seen in Figure 6(b), where respondent Ad1l0 smiles behind his mask. Finally, respondent Ra6f4 had a delighted reaction with a satisfied smile. This expression can be seen in Figure 6(c), where respondent Ra6f4 smiled while using a hand sanitizer, seeing his friend trying to play the game, Tanji. In addition to evaluating the respondent's reaction after playing, an assessment was also carried out using a questionnaire to objectively assess the "Tanji Adventure to Diamond Temple" game. Table 4 shows the results of filling out the questionnaire to the respondents selected in this study. The respondents' outcome was different, but overall, Ad1l0, Fr2d0, and Ra6f4 developed positively.

(a) (b) (c)

Figure 6. The satisfied expression of each respondent after successfully completing the game

Ad1l0 development. The development of respondent Ad1l0 can be seen in how he can respond to instructions more quickly, although he still needs to be reminded several times by the teacher. Still, the tasks given by Ad1l0 can focus on completing assignments without having to do homework. Table 5 shows the difference in the ability of Ad1l0 respondents to focus before and after using the game at least three times. The following is the documentation of Ad1l0 activities at school before playtesting. In figure 7 (left), Ad1l0 is running around in place of ablution even though he has been reminded many times. In figure 7 (right), Ad1l0 needs to be more focused while doing the task. Ad110 walked towards his friend even though he was being given writing cursive letters.

Figure 7. Respondent Ad1l0 before playtesting

Table 5. Development of Respondents Ad1l0

No	Focus ability before playtesting	Focus ability after playtesting
1	The focus is easily distracted, hindering the work of the task	Even though they are still not focused, they can complete their assignments at school.
2	Often do not pay attention, cool alone.	He still likes to be alone but can answer the teacher's questions appropriately.
3	Need to repeat the instructions on the given task several times.	Ad1l0 can already do the task without having to be reminded continuously.

The development that can be seen after playing the game "Tanji Adventure to Diamond Temple" is the habit of Ad1l0 respondents to focus on video games which unconsciously gets carried away by getting used to focusing on the real world. It can be seen in the documentation of Ad1l0 activities at school after the test. The picture on the left shows Ad1l0 (batik shirt, red pants) neatly carrying out Duha prayer without being reminded many times. Even Ad1l0 can be neat compared to his friends, who are still tidying the prayer rug. Figure 8 on the right shows an increase in Ad1l0's ability to focus. Respondents pay close attention to the primary ethical material given by their teacher.

Figure 8. Respondent Ad1l0 after playtesting

Figure 9. Respondent Ad1l0 shaking the table

Ad1l0 really cannot focus all the time like children in general. For example, in Figure 9, Ad1l0 loses focus and plays with his study table. However, Ad1l0 is usually reminded to be calm and attend the lesson. There is an increase in the period between 5-10 minutes to focus on the material given. With the development of the ability to focus on AD1l0, respondents are expected to improve their academic achievement at school.

Table 6. Development of Respondents Fr2d0

No	Focus ability before playtesting	Focus ability after playtesting
1	The focus is very easily distracted.	Still not focused but has been able to complete assignments at school.
2	Very often, not paying attention and not paying attention to the lesson.	Although sometimes disturbed by small things, Fr2d0 actively asks about the assignments given at school. Actively asking about assignments indicates that Fr2d0 pays attention to the task given by the teacher.
3	Very indifferent to the task. More attention is needed to repeat the instructions on the given task many times to work on it.	Fr2d0 already wants to do the task without being persuaded and can do the task without being reminded continuously (if there is a new interruption, he must be reminded again).

Fr2d0 development. The development of Fr2d0 respondents is evident significantly because the hyperactivity level of Fr2d0 is noticeably higher than the other two respondents. For example, Fr2d0 often runs without paying attention several times, dropping his friend's drinking bowl and once dropping his study table. When learning occurs, Fr2d0 usually does not pay attention, even to eat, when the lesson has started. His hyperactive behavior in Fr2d0 often punished him for reading Istighfar and Asmaul Husna, accompanied by a religious teacher in the prayer room. When the teacher helped Fr2d0 do a math task on number patterns, Fr2d0 did not listen or fill in the answers. However, during implementation and testing, it turned out that Fr2d0 was enthusiastic about playing the game, Tanji. One of the unique things that made Fr2d0 interested was the design of the enemy sprite in the form of a mouse that Fr2d0 felt was like his cat at home. Starting from the enthusiasm to play the game without giving up even though he fell many times, Fr2d0 kept trying and trying without getting bored. From this uncompromising attitude, Fr2d0 understands that it is necessary to focus on the orders given and cannot do it arbitrarily to win the game. The development of the Fr2d0 focus can be seen in Table 6.

The following is the documentation of Fr2d0 activities in schools before the test. Figure 10 shows the picture on the left of Fr2d0 eating snacks because he did not notice that class had started and received a warning from his class teacher. Figure 10 on the right during class time, Fr2d0 cannot sit still and stands up, walking around his desk.

Figure 10. Respondent Fr2d0 before playtesting

A significant development by respondent Fr2d0 that can be documented after playing the game "Tanji Adventure to Diamond Temple" is the emergence of an attitude of commitment to focus on the given task. Respondent Fr2d0, usually indifferent to his task, concentrates on stringing green beans and coriander to color the turtles (figure 11). This task requires considerable accuracy, focus, and commitment with a time limit of around 30-45 min. However, it is undeniable that Fr2d0 was seen throwing mung bean seeds at his friends several times. However, it is indisputable that Fr2d0 was seen throwing mung bean seeds at his friends several times. Significant developments by respondents Fr2d0 prove that proper training, easy-to-understand instructions, and giving positive feedback in the educational game "Tanji Adventure to Diamond Temple" can build children's mental toughness and commitment to focus on completing their tasks.

Figure 11. Respondent Fr2d0 looks diligent in doing artwork after playtesting

The documentation in Figure 12 shows that Fr2d0 can also focus on doing Islamic religious exam questions. Figure 12 on the left shows Fr2d0 paying attention to the teacher's instructions. While in Figure 12, the right side of Fr2d0 tries his best to do the questions, although sometimes Fr2d0 likes to walk around his desk area and is warned to sit back if confused about his task.

Figure 12. Respondent Fr2d0 before playtesting

Ra6f4 development. The development that can be seen from the last respondent, Ra6f4, after playing the game "Tanji Adventure to Diamond Temple," is that Ra6f4 is less likely to answer questions asked by the teacher at random because Ra6f4 can focus more carefully on what questions are asked. The tendency of respondent Ra6f4 is not to focus because sometimes his hands need help to stay still, teasing his friends. Ra6f4's impulsive behavior often causes Ra6f4 to forget to bring an existing textbook or assignment. Ra6f4's rash behavior is directly proportional to Ra6f4's playing style in the game "Tanji Adventure to Diamond Temple," which rushes, not paying attention to the surroundings. While playing Tanji, this impulsive behavior begins to disappear when Ra6f4 repeats the same level several times for picking up inappropriate items. Ra6f4 begins to show patience which is the key to success when dealing with the first boss, whose way to defeat him is not just to shoot forward, but to defeat the boss must wait for the right time. The table of the development of the Ra6f4 focus can be seen in Table 7.

Table 7. Development of Respondents Ra6f4

No	Focus ability before playtesting	Focus ability after playtesting
1	Focus is easily distracted. Often ignorant.	The focus ability of the Ra6f4 has increased even though it is still mischievous at times.
2	Very often not paying attention and not focused on listening to lessons and questions.	He was sometimes interrupted by friends or the view outside the window. The distraction lessened when Ra6f4 was moved to sit in front of the teacher's desk.
3	Need to repeat the instructions on the given task until due to lack of focus causes failure to understand.	The repetition of instructions by the teacher has decreased. The key is to get Ra6f4's attention first, pay attention to his eye contact, and give clear instructions.

The following is the documentation of Ra6f4 activities in schools before testing (Figures 13 & 14). In Figure 13, respondent Ra6f4, who wears a red short-sleeved Muslim shirt, is sentenced to sit beside the teacher's desk for not paying attention and going around behind the teacher's desk. The development that can be seen after playing the Tanji game is reduced unfocused behavior due to rushing during activities. Respondent Ra6f4 is closest to the teacher, paying close attention to the lesson.

Figure 13. Respondent Ra6f4 before playtesting

Figure 14. Respondent Ra6f4 pays attention to learning after playtesting

1. Evaluation of respondents' performance while playing

Game testing is also done in consultation with an ADHD expert. Experts consist of 3 people with the following criteria: Have experience handling ADHD children's education for at least five years; Have an educational background in education for children with special needs; Understand the use of learning technology for children with special needs, especially games.

Table 8. Questionnaire for Experts

No	Questions	Expert A	Expert B	Expert C	Average
1	This game caught my attention.	7	7	8	7,33
2	This game provides content that stimulates the child's focus.	6	7	7	6,67
3	Most gaming activities are related to training focus.	6	7	7	6,67
4	In general, games allow children to stay focused on the game.	7	7	7	7,00
5	The child is not burdened with seemingly unrelated mechanics.	7	8	8	7,67
6	In-game learning content is sufficient.	7	8	7	7,33

Testing is done by showing game demos to experts and conducting interviews related to games that have been developed. According to experts, to train ADHD children's focus, two critical points must be considered, namely, honing their memory and listening skills. The ability to remember in children with ADHD can be sharpened using visual memory. While the listening ability of children with ADHD can be sharpened using auditory memory. The game developed can hone listening and remembering skills because players must recognize the map in the game. Players must listen to instructions that explain the game map images. Coordination of motor and visual abilities of ADHD children can also be trained with this game because to be able to complete game missions. Players must be able to avoid objects that require eye-hand coordination skills. The game developed has also accommodated players to train their focus by recognizing objects that players must look for to complete game missions. Testing was also carried out using a questionnaire with a 10-point Likert scale (1 = "strongly disagree," and 10 = "strongly agree") on five questions. Experts use questions to assess game content refers to research [23]. Table 8 shows the results of the expert's assessment of the developed game.

Based on the conclusions from the expert testing results, this game can be developed further by paying attention to the background music and visual appearance of the game. The music in the game should use a slow tempo at the beginning and then increase as the level of the game increases so as not to distract the player's focus. In addition, in terms of visual appearance, it is better to use contrasting color combinations at the initial level and use simple object images.

5. Conclusion

We have developed the game "Tanji Adventure to Diamond Temple" and tested it on ADHD children. It aims to be one of the educational tools that helps students with ADHD learn to focus more on what they are studying in class and their daily lives. The game applies essential ideas that can improve a child's ability to concentrate by enhancing their hearing, memory, visual skills, and eye-hand coordination. In addition, this game offers encouraging comments and motivates players to keep playing till the end. Players can also reflect on achievements and strategize to complete the next mission. The game review involves experts and parents whose children have been diagnosed with ADHD. Testing with several respondents gives acceptable results. Each of the three respondents offered a better chance than before playing the game. A review of ADHD experts suggests that this game has included elements that help hone children's attention and is suitable as an alternative learning medium to increase the focus of ADHD children. This research still has several limitations. Children's exposure to video games is only three times, making it difficult to relate the results to the use of games. The testing environment is only at one school, and other schools may have different constraints. These limitations leave gaps for further research to improve game effectiveness by observing more children in more locations.

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