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A Case Study of the Effect of Feedback and Repeatability of Game Storytelling on Overcoming Fear of Failure of a ADHD Child

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ABSTRACT

This paper reports the case study which examines that reading fairy tale games, including repetitive readings and real-time feedbacks on failure and success, has been effective in overcoming an ADHD child's fear of failure. The fairy tale game "The Fisherman and Genie", used in the experiment of this study, includes action and attention mission by utilizing scripts, BCI and motion sensing technology. Through this, the user can interact with the contents and the child was encouraged to complete the mission without giving up, and finally achieve the goal of reading and understanding the fairy tale to the end. The experiment of reading fairy tales was carried out for a total of 5 weeks: the first week of preparation session and four weeks of intervention sessions. The data was collected during the participant's reading process. The child's reading attitude and behavior were examined through participant observation and interviews were conducted after the intervention. As a result, it was found that the child could overcome the fear of failure. This is because the positive failure that a child experience repeatedly by reading fairy tale game "The Fisherman and Genie" is not considered as a shameful experience, but a failure experience that does not impair one's self-worth, and as well as to help the child to overcome failures effectively.

Key words: Fairy Tale Game, Feedback, Repeatability, ADHD, Fear of Failure, BCI(Brain Computer Interface), Motion Sensing Technology, Valuable Productivity of Game

1. Introduction

The purpose of this study is to observe how an ADHD child who has characteristics of Fear of Failure overcomes the fear of failure after playing an interactive fairy tale game.

The a child's story game "Fisher and Genie" used in this study used Microsoft's Kinect [25] as a motion sensing device. For the Brain Computer Interface (BCI), NeuroSky's MindWave [26] was connected to the Unity 3D game engine. The game is designed to allow users to interact with content through reading, acting and concentration [1].

In this study, we conducted an interactive child's story test for participants for a total of 5 weeks. Participants collected data during the process of

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reading the contents, and examined the children 's reading attitude and behavior through participation observation.

As a result of the experiment, we found cases of overcoming fear of failure in children. This case shows the effectiveness of problem solving through repetitive reading and failure of game and real - time feedback on success. Therefore, it is meaningful in terms of research on game productivity.

2. Background

2.1 Fear of failure

Failure means that the outcome is below the baseline. Fear of Failure is the motivation to avoid the negative perceptions and beliefs of the consequences of such failures, that is, the negative stimuli brought about by failure [15] [16].

The initial study of fear of failure was based on an understanding of achievement motivation.

According to Atkins and Feather [15], achievement motivation, a desire for excellence and excellence, consists of motivation for success, fear of failure to avoid shame and insecurity.

However, the researchers then defined the concept of achievement motivation and fear of failure as an independent concept and multidimensional concept of fear of failure [16].

Birney and Teevan [16] asserted that people were afraid of the consequences of failure rather than fear of failure itself. The results of failure are three factors: a decrease in self-worth, a non-self-punishment, and a decrease in social value. 'Decreasing self-worth' is related to the fear that if one fails, people will change their ratings and decrease their value. 'non-self-punishment' comes from the perception that if the rewards and achievements of success are lost as a result of failure, they have wasted time and effort.

'Reducing social values' is a fear associated with the belief that when someone fails, they will think of themselves as less valuable.

Conroy [2], on the other hand, developed the multifarious viewpoint of the fear of failure. These viewpoints are Fear of Experiencing Shame and Embarrassment, Fear of Devaluing One's Self-Estimate, Fear of Having an Uncertain Future, Fear of Upsetting Important Other's Interest, Fear of Upsetting Important Others.

Fear of failure is a concept involving various dimensions, and is reported to be related to emotional aspects such as fear, fear, and anxiety [3].

Indeed, a high level of fear of failure has emotional negative consequences, such as anxiety, shame, and learned helplessness. It has also been found to have negative consequences for an individual's achievement, such as making them vulnerable to frustration and resulting in under-achievement [4] [5] [17]. It is important to minimize the dysfunctional aspect of failure fears and to adaptively deal with failures during childhood when full-scale learning and achievement is achieved. In particular, children with ADHD who have problems of carelessness, hyperactivity, and impulsivity experience recurrent failures throughout learning and social relationships. In addition, it has been reported that children with negative self-concept and low self-esteem are experiencing problems compared with peers due to failure to complete the given task [6] [7].

Thus, in order to effectively deal with the negative impacts associated with the failure of ADHD children and to help their emotional adaptation, it is necessary to understand their experience and coping with the consequences of failure and to identify effective interventions that can overcome fear of failure .

2.2 Funny failure of the game

About the definition of the game, Jesse Schell [18] stated that games are a problem-solving activity that approaches the attitude of playing, winning or losing in solving problems. He said that for the problem solving system, we need the magic circle

of Huizinga [19], and that the problem solving activity in this system of realistic scaling model is meaningful and valuable in the real world as well.

Andrew Rollings and Ernest Adams [20] presented challenges such as logic, reasoning, lateral-thinking, memory, pattern recognition, ethics, spatial perception, reflection, and coordination on the pure challenge of game play.

The real productivity that users gain through game activities is the ability to solve problems related to logic and reasoning, horizontal thinking, memory, pattern recognition, ethics, spatial perception, reflection response, and coordination. Soon as the task is solved, the player repeats the failure and learns to solve the problems presented in the game.

However, the experience of failure here is very unique. As discussed earlier, failures in everyday tasks usually lead to reduced self-confidence or helplessness, but failures in games are not. Even if the game fails, the player is not disappointed at all, but rather intrigued and optimistic [8], eventually immersing himself in the game for failing to taste.

According to a study by Csikszentmihalyi [21], Flow was able to choose goals on his own, confront his or her disability, and have continuous feedback.

Jane McGonigal [22] called Goal, Rule, Feedback System, and Voluntary Participation for the elements that constitute the essence of the game. The player can know the results of his challenge in the game through real-time feedback. The results presented visually during the game proves the competence and influence of the player, so it can be said that it gives satisfaction and makes you want to challenge again. This is why players have failed to solve the challenge but the challenge is repeated voluntarily.

The game system is essentially to allow the player to practice problem solving by encouraging the player to do this repetitive activity voluntarily.

2.3 Fairy tale game

The fairy tale game <Fisherman and Genie> developed in this study has a virtual world and a real world connected.

Users interact with the virtual world within the content through graphical and textual reading, motion recognition using Kinect, and concentration using MindWave [9]. <Fisherman and Genie> In the interactive fairy tale, the character is user child, fisherman, and Genie.

The child acts as an external helper to assist the fisherman in the virtual world. Although it is not represented graphically in the content, it communicates with the fishermen and the genie in the virtual world through the brainwaves through the mindwave and the behavior information through the Kinect.

The experience given to children by <Fisherman and Genie>, an inherited story in the Arabian Knight, is similar to their behavior. A way to avoid their anger when they broke an adult's orders, and the psychological changes during the period when Genie was imprisoned is the reaction when the child falls off the parents. It has been reported variously that the child can truly understand Genie [23].

One of these is the understanding that fishing continues to fail, but it can be successful in the end. The fishermen must fish according to the rules of the village that they can catch fish only four times a day on the beach. He keeps the donkey, the bag, and the bottle to the net, but fails to catch the fish, but does not get discouraged and finally succeeds in catching the plausible thing.

Three consecutive failures convey a lesson that human beings are hard to succeed at once. Though it may be better to fail and give up, the fishermen 's actions show that they must work hard no matter how hard it is. The contrast between the trials of three fishermen and the increasingly resentful Genie's psychology in four stages shows how mature and successful the choice of the child is, and asks children what choice they should make when they fail.

Table 1. Sequences of Fairy tale Game "Fisherman and Genie"

	Sequence 1		Sequence 2	
Reading	Fisherman is preparing for fishing		Fisherman is heading for fishing place	
Interactive	**Mission**	**Interface**	**Mission**	**Interface**
	Greeting	Text Kinect	Going to the fishing place	Text Kinect Mindwave
	Preparation for fishing	Text Kinect	Quiz	Text Kinect
			Going to the fishing place	Text Kinect Mindwave
	Sequence 3		**Sequence 4**	
Reading	Fisherman is fishing a donkey, a bag, and a bottle		Fisherman saves the Genie from bottle, who is threatening him to kill	
Interactive	**Mission**	**Interface**	**Mission**	**Interface**
	Fishing (Waiting Pulling)	Text Kinect	Opening the gourd bottle	Text Kinect Mindwave
	Fishing (Waiting Pulling)	Text Kinect		
	Fishing (Waiting Pulling)	Text Kinect		
	Sequence 5		**Sequence 6**	
Reading	Fisherman is escaping out of the Genie's threatening		Fisherman is saving Genie	
Interactive	**Mission**	**Interface**	**Mission**	**Interface**
	Closing the gourd bottle	Text Kinect Mindwave	Agreeing	Text Kinect
			Opening the gourd bottle	Text Kinect Mindwave

Interactive child's story <Fisherman and Genie> consisted of 6 sequences. Each sequence is given a mission associated with the story, and if the mission fails, the fisherman repeatedly asks the child to help him or her to succeed in the mission.

In the 1 sequence, the child should greet the fisherman and help the fisherman to get the fishing gear. In the 2 sequence, there is a mission of watching the fisherman going to the fisher station (1 session, 3 session) or walking with the fisherman (2 session, 4 session) and solving the quiz. In the 3 sequence, the fisherman throws the net and waits quietly without moving. At this time, the mission to help the fisherman concentrate on the netting is repeated three times. In the 4 sequence, there is a mission to raise the concentration and to catch the lid of the bottle. In the 5 sequence, there is a mission to keep Genie in the bottle. In the 6 sequence, there is a mission to open the bottle again to save Genie or keep leave it unopened according to the decision of the child 's mind.

And when the child is overactive while reading the whole story, the story stops. The fairy tale is designed to repeatedly ask the child to take appropriate action while reading the fairy tale and to succeed in the goal of 'reading and understanding fairy tale' while fulfilling these requests.

3. Experiment and observation

3.1 Subject

The subjects of this study were the second grade male children who received counseling after receiving the diagnosis of ADHD. The characteristics of the children 's attitude toward reading, concentration, behavior, accomplishment and failure were as follows.

Table 2. Characteristics of the Participant

Attention	Short period of attention and turns it to what he wants
Behavior	Says or behaves regardless of the situation
Reading Attitude	Hates readings, and take it as a stressor Sighs if he were asked to read Reading at random (skimming) and finds it difficult to feel empathy
Reading Comprehension	There is no lack of ability in reading comprehension, but do not read the whole thing carefully
Failure Attitude	Covers the book immediately if he reads something wrong; he does not continue to do things he does not do well.

3.2 Experiment and participation observation

For the participant children, the reading experiment of the fairy tale game <fisherman and Genie> was conducted for one week (20 minutes) and four intervention sessions (40 minutes per session) every week for a total of 5 weeks. During the reading game, the children stored their concentration, behavior, and time information data at intervals of less than 1 second, and participated in observation.

Before and after the experiment, we conducted a test using the assimilation questionnaire [9] and conducted a parent interview after the experiment.

Table 3 shows the participant observation of each session.

Table 3. Participant Observation by Session

Preparation	A lot of movement. Nervous in an unfamiliar environment. Concentrate on contents and proceed reading fairy tale quite well. Read along with the full text quietly.
Session 1	Less movements than Preparation Stage. Read along with the full text clearly.
Session 2	Less movements than the First Session. Read along with the full text little more loudly than the First Session. Varies the vocal tone depending on each character. Breath along in response to the Fisherman's suggestions.
Session 3	Less movements than the Session 2. Read along full text loudly with immersed in emotions to character like a story-telling narration. Immersed into Fisherman's character, especially after 4 sequence. Start asking questions happily about fairy tales. Breath along deeply. Looks a bit bored after 3 sequence but read along with the text until the end.
Session 4	More movements than the Third Session Remember the story and the entire character's behavior. Did not read along with the text from 1 to 3 sequence. Continue to talk about his thoughts on the contents of the fairy tale and the character's appearance after 4 sequence.

3.3 Understanding Reading

The Reading Checkpoint is a reading comprehension evaluation point for story texts, based on what Idoll [10] has suggested, and has been tested by experts.

The questionnaire consisted of 6 questions including two factual questions, three analytical questions, and one question about the understanding of causal relationships. The score for each question is two points.

A comparison of scores on the reading comprehension questionnaires before and after the experiment shows that the understanding of realistic and analytic questions has increased (Table 4). A realistic question means a basic question to know and answer the meaning as it is written, and an analytical question means to find an answer by combining the contents of the text.

Table 4. Pre-Post Score of General Reading Comprehension Questionnaires

Question	Pre-Score	Post-Score
Literal Comprehension	0	4
Interpretive Comprehension	1	4
Summarizing	0	0

3.4 Concentration, behavior, mission completed data

The concentration and average value of the participating children in the sequence were slightly decreased in the second session but in the third session the concentration increased as the session progressed. In the third session, it was stable at 50-60 overall, even in the deviation of concentration. (Fig. 1)

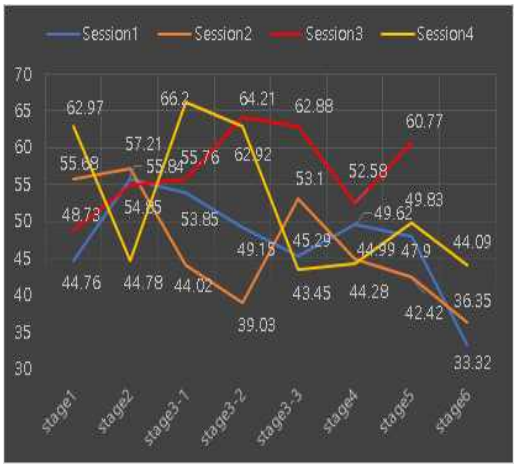

Fig. 1. The Attention of Each Session

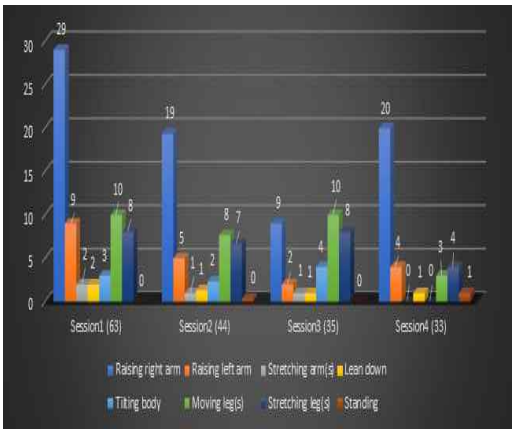

Fig. 2. Recognized Motions by Session

As a result of comparing the number of unnecessary behaviors except the necessary actions for games, unnecessary behaviors of children were reduced as the session progressed, and unnecessary behaviors were greatly reduced in the third session. In the fourth session, the number of leg movements decreased, but the number of times the right hand was used increased (Fig. 2).

The number of failures also decreased as the session was repeated, but slightly increased in the fourth session (Table 5).

Table 5. Number of Mission Failures of Each Sequence by Session

	Pre	Ses.1	Ses.2	Ses.3	Ses.4
Sequence 1					
Sequence 2	5				
Sequence 3		1	1		
Sequence 4		2			
Sequence 5			3		
Sequence 6		5	4		2
Total	5	8	8		2

3.5 Parents Interview

After the 5th session, we interviewed the parents and their children in daily life. Table 6 summarizes parents interviews for changes in attitude toward concentration, behavior, reading, and failure by minimizing the corrections.

Table 6. Parent Interview

Attention	Yesterday, he was with his daddy and it looks like he was paying attention and reading it. I peeped through the door but he was so concentrated and immersed in text that he did not know if someone was staring.
Behavior	It seems that it takes time to get distracted again when he is concentrated. He said he endured because he did not want the fisherman to fall down.
Reading Attitude	He borrowed a book from school so I told him to read it since there was some time left. He nonstop read it to the end in one setting loudly. I was so surprised. I'd never seen him like that before. His father (/My husband) was surprised too. I could tell that he was enjoying himself. He was immersed in emotions that I and the father were surprised. He said that he would like to take a book with him to read on our way, so I told him that we could stop by library on the way to the art school and select books.
Reading Comprehension	He read it like a story-telling narration depending on each character's role. Then he explained about it after finish reading it. He could say about his feelings and I was really surprised. He said that he enjoys coming in here and he often talk about his change of mind about the Fisherman. He said that the Fisherman seems to be struggled, and he felt sorry for the Pink Monster, and should not be greedy. I think there is a lot of emotions when he talk about simple things.

Failure Attitude	The child cannot read texts fast and easy. He doesn't like to falter over and get so stressed out that he would avoid reading books. However, yesterday he read texts with deliberation, read it over again if he misread a word and was empathized in readings although there was not much writing. He would cover the book immediately and put it away, saying 'I'm not going to read it' or 'I will read it later' if he read something wrong. But yesterday, he read it, get involved, calmed down again and proceeded reading texts slowly. He read a book from the beginning to the end even though it was a thick one. He also said that the reading is so fun. He read it once again even if he misread words. It was so awesome.

4. Discussion

Through interviews with the children 's parents, it was confirmed that there was a positive change in the reading concentration, attitude, and emotion of the children after the experiment. Especially when the child failed to read the book, he repeatedly showed him reading the whole book until the end.

It is very encouraging that it has changed the behavior of a child who is reluctant to challenge failures - For example, when a child takes out a book and reads a book - because he is afraid to fail.

The child read with a lower voice at the time of preparation, and tried to read clearly at the first session. However, that feeling of tension was changed by the ample time to entertain the emotion during the third session, to read it happily, to move the arm during the fourth session, and to show the failure to deliberately fail.

The movement in the fourth session can be considered as an overactive behavior of ADHD children. However, other parts of the body such as the legs did not move, and only the movement of the right arm appeared. It seems that the child was deliberately unsuccessful and was looking for interaction with other fairy tale games.

Previous researchers have focused on parenting attitudes as the main variable that reinforces fear of failure. According to their assertion, the recognition of the child's accomplishment is stingy, while the punishment behavior of the parent punishing for failure is related to the child's fear of failure [11] [12].

When a child experiences a punitive response from a parent to his or her behavior, the child also becomes negative, self-confident, repressive, and punitive. This constantly diminishes the sense of self-worth of the child, which ultimately provokes a shame for himself [13] [24].

In addition to parental punishment, parental anxiety and negative and inconsistent feedbacks have been reported to be significantly associated with fear of failure [14].

The experience of shame has a great influence on the development of fear of failure when the developmental path of the fear of failure which the previous researchers claim as above is taken into consideration. Negative feedback, such as blame and punishment, leads to a decline in self-worth. The subject of the study "Reading through the game" seems to have experienced the following. Instead of providing negative feedback, such as the experience of shame, blame, and punishment, they have experienced interesting failures. The child may have experienced a failure that does not impair his sense of self-worth.

This has helped the child avoid dysfunctional coping with fear and avoidance of failure. This leads to voluntary repetition and attempts to overcome failures, thus helping to overcome failures effectively. It is expected that this experience of reading books will be extended to other performance and social situations.

Currently, many children with ADHD are at risk of recurrent failure experiences throughout their academic and social interaction. Although there is a limit to the generalization of the single case analysis, the discussion of this study on the effective coping of the failures experienced by children with ADHD may be used to develop and

develop effective interventions for ADHD children in the future.

Subsequent studies are needed to verify the effectiveness and change of ADHD children.

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<국문초록>

게임스토리텔링의 피드백 및 반복성이 ADHD 아동의 실패 두려움 극복에 미치는 영향에 대한 사례 연구

장석진, 박승이, 길태숙

본 논문은 반복적인 읽기와 실패 및 성공에 대한 실시간 피드백이 포함된 동화 게임 읽기가 실패 두려움의 특징을 보인 한 ADHD 아동의 실패 두려움 극복에 효과적이었음을 관찰하고 이 사례에 대해 보고한 것이다. 본 연구의 실험에 사용된 동화 게임 <어부와 지니>는 읽기 스크립트와 BCI와 모션센싱 기술을 활용한 행동과 집중력 미션을 포함하고 있으며, 이를 통해 사용자가 콘텐츠와 인터랙션 하도록 하고, 아동이 책읽기 도중에 실패할 경우 포기하지 않고 미션을 완수해 줄 것을 독려하여 동화를 끝까지 읽고 이해하기의 목표에 성공하도록 디자인되었다.

동화읽기 실험은 참여자 아동을 대상으로 준비기 1회, 중재 4회의 총 5주 동안 실행되었다. 참여자가 콘텐츠를 읽는 과정 동안 데이터가 수집되고, 참여 관찰을 통해 아동의 읽기태도와 행동을 살펴보고, 사후 보호자 인터뷰를 하였다. 실험 결과, 아동에게서 실패의 두려움을 극복하는 모습이 발견되었다. 이는 아동이 동화 게임 <어부와 지니>를 읽으며 반복적으로 경험한 재미있는 실패가 수행에 참여하는 아동의 수치심 경험으로 작용하지 않고 자기가치감을 손상하지 않는 실패로 경험됨으로써 그 결과 아동이 실패를 효과적으로 극복하도록 도운 것으로 생각할 수 있다.

<결론 및 향후 연구>

본 연구에서는 동화 게임 읽기에서의 재미있는 실패 경험이 실패에 대해 두려움을 가지고 있는 한 ADHD 아동의 실패 두려움에 대한 극복에 효과적이었음을 관찰하고 이를 보고하였다. 동화 읽기에 참여한 아동의 일상에서 스스로 두꺼운 책을 선택하여 틀렸는데도 불구하고 괜찮다며 끝까지 완독하는 모습은 게임 활동을 통해 사용자가 얻게 되는 현실적 생산성을 제고하게 한다. 본 연구의 대상 아동이 경험한 즐거운 놀이의 하나로 존재하는 재미있는 실패는 실패 두려움의 발달에 핵심적으로 기여하는 수치심의 경험과 그로 인한 자기가치감의 저하로 이어지게 하는 비난·처벌과 같은 부정적인 피드백 대신 수행에 참여하는 아동의 '자기가치감을 손상하지 않는 실패'로 경험되었을 것으로 보인다. 이는 아동으로 하여금 실패를 두려워하고 회피하는 역기능적인 대처를 하지 않고 실패를 극복하기 위한 자발적인 반복과 연습의 시도로 이어지도록 하여, 그 결과 실패를 효과적으로 극복하도록 도운 것으로 볼 수 있다. 이러한 책읽기에 대한 성공 경험은 다른 수행 및 사회적 상황으로 확대될 수 있을 것으로 기대한다.

본 연구는 단일 사례 분석이 갖는 일반화의 제한점이 있다. 그럼에도 ADHD 아동이 경험하는 실패 결과의 효과적 대처에 대한 본 연구의 논의는 향후 학업 및 사회적 상호작용 전반에 걸쳐 반복적인 실패 경험으로 위축된 ADHD 아동을 위한 효과적인 중재 방안을 마련하고 발달시키는 데 활용할 수 있을 것이다. 후속 연구를 통하여 보다 많은 수의 ADHD 아동을 대상으로 한 실험을 통해 실패에 대한 아동의 변화와 효과성을 검증할 필요가 있다.

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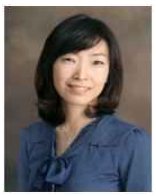

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