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Innovation of a 3D pop-up book and culturally-based animated film as positive stimulation for children with attention deficit hyperactivity disorder (ADHD)

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Abstract

Background: Attention Deficit Hyperactivity Disorder (ADHD) is a common problem in the medical, psychological, and even educational fields. ADHD is the third most common mental illness after depression and anxiety disorders. Indonesia has a population of 82 million children, with one in five children and adolescents under 18 experiencing mental health problems, including ADHD. Therefore, it is important to develop positive stimulation media for children with ADHD.
Purpose: To develop and test the effectiveness of positive stimulation media that is easy to use while introducing Indonesian culture to attract the interest of children with Attention Deficit Hyperactivity Disorder (ADHD).
Method: This research uses a mixed method exploratory research that combines quantitative and qualitative research approaches. 3D Pop Up Book media and culturally based educational animated films are packaged according to the child's age category with attractive colors and storylines with typical Indonesian characters complete with accents and batik. So that children will be able to focus more and stimulate their brain function.
Results: This research has successfully developed 3D Pop Up Book media and culturally based educational animated films designed to support positive stimulation for children with ADHD. The development process began with a Focus Group Discussion (FGD) with psychologists, pediatricians, health promotion experts, animators, teachers, and parents of children with ADHD, which generated input regarding media needs, visual design, and appropriate cultural content. The FGD results emphasized the importance of media that is engaging, easy to understand, and able to channel children's energy through visual and motor activities. Testing on children with ADHD showed significant changes in distractible behavior. In the pretest, 33.3% of children were in the low category, 40% in the medium category, and 26.7% in the high category. After the intervention, the proportion increased in the low category (53.3%) and decreased in the high category (16.7%). Analysis using the Wilcoxon Signed Rank Test showed a p-value of 0.049, indicating a significant difference before and after the intervention.
Conclusion: These findings indicate that this culture-based media is not only innovative but also effective in reducing distractible behavior in children with ADHD.

Keywords: 3D Pop-Up Book; Attention Deficit Hyperactivity Disorder (ADHD); Culture-Based Animated Film; Distracted Behavior; Positive Stimulation.

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INTRODUCTION

Neuropsychological and neurodevelopmental disorders, such as Attention Deficit Hyperactivity Disorder (ADHD), are frequently encountered in everyday life, especially in school-age children and adolescents. This disorder is characterized by inattention, difficulty concentrating, hyperactive behavior, disorganization, impulsive behavior, and difficulty controlling body movements (Salari, Ghasemi, Abdoli, Rahmani, Shiri, Hashemian, & Mohammadi, 2023). If not promptly addressed, ADHD can seriously impact a child's future (Lintuuran, Wiguna, Amir, & Kusumawardhani, 2016; Ditasari & Putri, 2024). Childhood is a golden period of human development. One important aspect is fine motor skills, but for children with ADHD, this golden period often presents a significant challenge due to difficulty maintaining concentration, which ultimately impacts the learning process and achievement (Sari & Agustriana, 2024).

The prevalence of ADHD in Indonesia is not yet definitive due to differences between studies. Globally, the prevalence of ADHD in children under 12 is 7.6%, while in adolescents aged 12–18 it is 5.6% (Salari et al., 2023). This indicates a relatively high prevalence of ADHD in children. With Indonesia's child population reaching 82 million, an estimated 16 million children experience mental health problems, including ADHD (Kusuma & Pustaka, 2025). Children with ADHD are also at high risk of impaired executive function, such as the ability to regulate thoughts and emotions. They often face limitations in using language, processing information, and exhibit distractible behavior, which diverts attention from activities that should be carried out. Therapeutic intervention is necessary, one of which is pharmacological treatment. However, medication consumption can cause side effects such as mood swings, repetitive motor or vocal behaviors, and a rebound effect (Pang, Wang, Dill, Boswell, Pang, Singh, & Rozelle, 2021).

This research is crucial considering the prevalence of ADHD in Indonesia and the world, as well as its negative impacts. Creating a 3D Pop-Up Book and Animated Film provides an effective, easy-to-use, and practical solution for positive stimulation that reduces children's distractible behavior. Stories can stimulate and stimulate concentration, as children with ADHD tend to listen and follow the storyline. The 3D Pop-Up Book is designed using attractive colors and images packaged in embossed images, enhancing fine motor skills, gross motor skills, and cognitive skills, while also introducing Indonesian culture. Therefore, through the components in this 3D Pop-Up Book, the behavior of children with ADHD based on their cognitive, affective, and psychomotor skills can be honed.

RESEARCH METHOD

Mixed method exploratory research is a type of mixed method research that combines quantitative and qualitative research approaches. This research is used to explore a topic before collecting quantitative data. In stage 1, a qualitative approach was used, namely conducting a Focus Group Discussion (FGD) Need assessment in the form of designing a 3D Pop Up Book and Culture-Based Animated Film. The FGD was conducted with pediatricians, psychologists, animators, Health Promotion Experts, Teachers and parents of children with ADHD. The FGD was conducted with the aim of assessing the needs of children with ADHD in order to suppress distracted behavior. In addition, it was also to obtain criticism and suggestions that were used as a basis for improving the 3D Pop Up Book and Culture-Based Animated Film. This 3D Pop Up Book and culture-based animated film contain two characters named Jalu and Janis who wear traditional batik clothes that reflect Indonesian culture. The contents of the 3D Pop Up Book consist of material and story scripts created by researchers that contain teachings for children to identify culture, language, values, and morals. Furthermore, researchers and a team of animators developed the concept of story ideas, storylines, and story characters based on local wisdom of Indonesian culture.

In stage 2, a quantitative approach was used. This research is a Pre-Experimental study with a one-group pretest-posttest design technique. By assessing the pretest (initial observation) first before being given the intervention, after that the intervention was given, then a posttest (final observation) was conducted. To determine distracted behavior,

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measurements were taken before (pretest) and after the intervention (posttest) which were then compared. The research subjects in the group were selected randomly. The population in this study were children with ADHD (Attention Deficit Hyperactivity Disorder) registered at SKh Putra Putri Mandiri – Special Needs School for Children with Special Needs, Disabilities & Learning Disabilities in South Tangerang.

In this study, the sample criteria include inclusion and exclusion criteria, where these criteria determine whether or not the sample can be used. The considerations in determining the sample in this study can be seen as inclusion and exclusion criteria. The inclusion criteria for the study are: Children diagnosed with ADHD; Parents of children who are willing for their children to be respondents; The exclusion criteria for the study is not participating in the entire intervention.

This study employed a mixed-methods exploratory design, so data analysis was conducted in two complementary stages: qualitative and quantitative analysis. Qualitative data were collected through Focus Group Discussions (FGDs) involving pediatricians, psychologists, animators, health promotion specialists, teachers, and parents of children with ADHD. The data were analyzed using thematic analysis, while quantitative data were obtained from pretest and posttest results to measure changes in distracted behavior in children with ADHD after receiving the intervention and were analyzed using the Wilcoxon Signed Rank Test, as the data were paired and not normally distributed, with a significance level (p-value) set at $\alpha = 0.05$.

RESEARCH RESULTS

The problem-solving approach and strategy is the development of ADHD prevention media in the form of 3D Pop Up Books and Culturally Based Educational Animated Films. This book serves as an effective educational tool for children, as it provides a fun learning experience. The educational media is equipped with a barcode scanner to listen to the story being read. A pop-up book is a type of media that has a 3-dimensional form and displays images that appear when the pages are opened (Sari, Nurhayati, & Wibowo, 2023). A pop-up book is a type of book that utilizes paper engineering. This book features 3-dimensional images that are used to explain the material in more detail (Yudiana, Andita, Lestari, Pratiwi, & Fridayanthi, 2024).

3D pop up book titled "*Ujang dan Jurus Angina Timur*" the book features an attractive design and color scheme. This is evident in the pop-up book's color selection and rural setting. This book tells the story of an ADHD child named Ujang who comes from the foot of Mount Tangkuban Perahu. Ujang's character is depicted as a boy wearing traditional West Javanese clothing. This 3D Pop Up Book consists of 6 pages with different sub-themes, accompanied by instructions or activities that readers can do. This story tells of Ujang, an agile child at the foot of Mount Tangkuban Perahu who is quick to anger. One day when he lost a game, he exploded with screams and slamming. The presence of Ki Atmaja, the village elder, changed everything. Ki Atmaja taught him the "East Wind Technique"—inhaling, holding his breath for a moment, exhaling slowly, closing his eyes, then opening them while smiling and speaking calmly. Ujang began practicing this when he lost a game of congklak. Instead of getting angry, he restrained himself and congratulated his friend. His friends were happy to play with him again. He learned that a true winner is one who can control his emotions. This story is also equipped with interactive activities such as expressing an angry face then changing to a calm one, breathing exercises, and making East Wind Style cards as a reminder. The book uses concise, concise, clear, and easy-to-understand language. This way, children will easily grasp the meaning and message contained within.

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Culture-based animated films are defined as learning media constructed and developed based on specific local cultural values (Anwar & Dahoklory, 2022). The culture-based animated film created by the researchers incorporates the cultural value of the "peacock dance" from West Java, thus presenting educational content that incorporates cultural elements in the narrative, visuals, and context. Therefore, in short, culture-based animated films are animations that utilize local cultural elements as the foundation for visuals, stories, and moral messages, thus functioning as a medium for entertainment, education, and cultural preservation.

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Culture-based animated films are designed with an attractive appearance and bright, warm colors, which play a significant role in expressing emotions, creating atmosphere, and reinforcing messages. Bright colors like red, orange, and yellow are often associated with enthusiasm, cheerfulness, and warmth. In children's animation, these colors enhance the visual appeal and facilitate the delivery of educational messages. For children with ADHD, these color choices can help portray cheerful and energetic characters and enhance the effectiveness of the messages conveyed in culture-based animated films.

This culturally-based animated film tells the story of a boy with ADHD named Ujang who lives at the foot of Mount Tangkuban Perahu. Ujang is depicted as a boy dressed in traditional West Javanese attire. This culturally-based animated film includes cultural elements in the form of a traditional peacock dance, which provides valuable educational value for the audience.

This animated film tells the story of Ujang, a lively boy from the foot of Mount Tangkuban Perahu, like the main character in a pop-up book. Ujang wears a batik headband and a batik sash. At school, he is often reprimanded for being restless. One day, he sees the serene and beautiful Merak Dance. Together with Teh Dira, he learns to channel his energy through breath, gentle movements, and the rhythm of nature. During the Cultural Performance, Ujang dances with his heart. The audience is amazed, his mother is proud. Now, whenever his body is full of energy, Ujang is no longer noisy—he dances, gracefully like a peacock in the forest.

This culture-based animated film is designed using simple language while still emphasizing the elements of effective sentences, such as brevity, conciseness, and clarity, so that the message is easily understood. This way, children will easily grasp the meaning and message contained in this culture-based animated film.











Here is the Barcode of culture-based animated films with the title Si Ujang and the Peacock Dance

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Qualitative Approach

The study in stage 1 is a qualitative approach by conducting Focus Group Discussions (FGD) with pediatricians, psychiatrists, animators, Health Promotion Experts, Teachers and parents/guardians of children with ADHD. The FGD was conducted with the aim of assessing the needs of children with ADHD in order to reduce distracted behavior. In addition, it was also to obtain criticism and suggestions that were used as a basis for improving the 3D Pop Up Book and Culture-Based Animated Film. This 3D Pop Up Book and culture-based animated film contain a character named Ujang who wears a headband and traditional batik that reflects Indonesian culture. The contents of the 3D Pop Up Book consist of materials and story scripts created by researchers that contain teachings for children to identify culture, language, values, and morals.

The importance of managing emotions

"The characters in the video have provided empathy, there is a dance teacher who teaches and motivates with positive affirmations that you can and also supports him, so that what was initially uncomfortable, a bit anxious, afraid that his movements would be incorrect, distracting others, becomes calmer and more comfortable. Then after that, there was actually a reward from his mother in the form of verbal like 'you're great', 'you can do it'. Then in the video, for him to be calmer, more comfortable, it was only the teacher who calmed him, the child should be given the opportunity to try it himself, such as giving instructions to take three deep breaths, later you will feel more comfortable when you move this can be calmed by adding other steps so that there is implementation or intervention when he feels uncomfortable, not only calming him, but he can be calmer in a way, his defense mechanism is more positive. This is also useful for reducing and reducing the child's anxiety who will later recognize how to think back if I am anxious, make a wrong move, or uncomfortable, I can take three deep breaths, I can make my behavior more directed again." inf 2

"For the book, so far, the reward factor is already there, the emotional regulation factor is also there, then there are instructions for him to be calmer because someone has taught him meditation, through breathing to be calmer, then there is also information for him to be more patient, to provide information and affirmations for him. Then there are also tips for calmer behavior." inf 2

"For the pop-up books and films themselves, I appreciate them for focusing on one main message. For example, in the pop-up book, it's about managing emotions through deep breathing and so on. Meanwhile, the videos and animated films are about helping ADHD children focus on one goal: not being too active. It's okay to be active, but the active we mean isn't excessive. I think it's quite good because it focuses on one main message." inf 3

Regarding the educational media that children need

"In terms of health promotion media, I think it's quite good because it encompasses both the digital era, the modern era, and the traditional era of this Pop-Up Book. However, in this case, when creating health promotion media, especially for children with ADHD, there are several important things we must pay attention to so that the information is easily accepted, understood, and also has a positive impact on children. For example, the media must be friendly to the characteristics of children with ADHD who tend to have difficulty focusing, are impulsive, and get bored easily. For example, if we look at the health promotion media that has been displayed, I think it's quite good because it uses simple, clear, and straightforward sentences. However, for the pop-up, if I look at the visual design, it's very attractive, but the font is not large enough and is too thick. So, my suggestion is that perhaps the font could be enlarged or bolded further for ease of reading. By using an easy-to-read font, we can avoid letters with complicated decorations. " inf 3

"The duration of the animated film is quite good because I think for children with ADHD who are more prone to losing focus, using fast transitions and a maximum of 2-3 minutes of video is effective. This animated film is already 3 minutes long. Then for the Pop-Up Book and the animated film, it is quite good because it builds children's confidence with affirmative sentences that I saw earlier such as you can take a deep breath, you can learn slowly and that is quite good." inf 3

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Regarding the content of educational media that children need

"The content is quite good, but it needs to be adjusted to match the mental age of children with ADHD to their abilities. This includes several assessment aspects based on cognition and interests and talents." inf 1

"When educating children with ADHD, it's important to understand that to support their abilities, it's crucial to provide rewards as a way to build on their progress and as positive stimulation to develop their abilities. These rewards can be verbal or nonverbal, and can also take the form of tangible gifts." (Inf 5)

"The narrative in the video, I noticed, is structured, logical, and easy to digest. Especially for children with ADHD, it's hoped the story isn't too complex. Secondly, it should be repetitive so they can remember the storyline.""The story that has been watched. Then, in the contents of the 3D Pop Up Book and animated film, it is hoped that there will also be instructions, thereby reducing instability and improving executive function when giving instructions. This will allow the child to complete the task. This is already present in the video, as the child is asked to follow the movements and then he follows the instructions given. If the child succeeds in carrying out the instructions correctly, he is given a reward from his mother. This visual stimulus is expected to improve the child's sensory skills because there is direction from the guide." inf 2

"For media for ADHD children, I think it's betterInvolved in interactivity like in pop-up books, it's quite okay because there are activity sheets, but it would be better if there were reward stickers, for example, what he has won or at the last part if I see, there is a bonus activity, namely the east wind technique card, draw this technique on paper or a small card and keep it in your bag when you start to get angry. I think it's okay if the bonus activity on the last page for the pop-up book is added with a small card that is already provided in the pop-up book with paper quality that is not easily damaged or lost. If seen based on health promotion media, we can focus on the target age. If the age is 4-7 years, maybe the media displayed will be more pictures with less text. But for ages 8-12 years, then it can start to be given simple explanations, for example logic, cause and effect. For example, if you run too fast, you'll fall, and so on. This provides an understanding of cause and effect, presented in positive language. And although this is a health promotion medium for children with ADHD, it's recommended that parents or teachers be involved as companions when watching this animated film or reading the pop-up book so the messages contained in the media can be relayed by the companions." inf 3

"In this Pop Up Book, there are exercises on each page. So, I think it might be better to condition or place the instructions for the exercises below. So the audience can read the story first, then read the exercises. So don't let them read the exercises first, then the story. Because these exercises are a continuation of the story on each page. For the animated film, I think it's quite good, but it needs to be added at the end, for example, the audience applauding, so the appearance also shows that the audience is euphoric and celebrates that they have succeeded. Maybe the dubbing or voice actors need to be more enthusiastic. So, for example, I think the beginning is a bit flat. But at the end, which shows the climax, the sound produced should be more enthusiastic." inf 3

"Overall, it's good, but the main character in this story should be given a different clothing theme to match the setting, for example, when at school, they wear a uniform. Secondly, if possible, you could add advice for parents to take their children to the hospital or a psychologist. Furthermore, you could also add specific information about the signs of ADHD in children, such as excessive activity (hyperactivity)." Inf-4

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Quantitative Approach

Table 1. Respondent Characteristics Data (N=30)

Variables	Results	p-value
Age (Mean±SD)(Range)(Year)	(41.30±7.253)(28-45)	
Age (n/%)		
≥ 40 years	16/53.3	
< 40	14/46.7	
Gender (n/%)		
Man	1/3.3	
Woman	29/96.7	
Level of Education (n/%)		
Junior High School/Equivalent	2/6.7	
High School/Equivalent	20/66.7	
Diploma Degree	4/13.3	
Bachelor's Degree	3/10.0	
Master's Degree	1/3.3	
Ocupation (n/%)		
Self-employed	1/3.3	
Private sector employee	3/10.0	
Teacher	2/6.7	
Housewife	24/80.0	
Distracted Behavior of Children with ADHD		
Pretest		
Low	10/33.3	
Moderate	12/40.0	
High	8/26.7	0.049
Posttest		
Low	16/53.3	
Moderate	9/30.0	
High	5/16.7	

Based on the table above, it is evident that the participants' characteristics by age show that more than half are aged 40 or older, specifically 16 participants (53.3%); nearly all are women, specifically 29 participants (96.7%); and there are almost no men, specifically 1 participant (3.3%). In terms of educational level, it is evident that more than half of the participants have a high school or equivalent education, totaling 20 (66.7%), and almost none have a master's degree, totaling 1 participant (3.3%). In terms of occupation, the majority of respondents were housewives, totaling 24 (80%), and almost none were self-employed, totaling 1 participant (3.3%).

Based on the inattentive behavior variable in the Pre-Test, it was found that nearly half of the participants had children with ADHD in the high inattentive behavior category (8 participants, 26.7%), and nearly half of them had children with ADHD in the moderate inattentive behavior category (12 participants, 40%). Based on the Post-Test results, it was found that more than half of the participants had children with ADHD in the low inattentive behavior category (16, or 53.3%), and a small portion had children with ADHD in the high inattentive behavior category (5, or 16.7%).

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This study uses the variable of Distracted Behavior of ADHD Children with an ordinal data measurement scale so that the bivariate test used is the Wilcoxon signed rank test as follows:

Table 2. Wilcoxon Test Results

	Negative Ranks	Positive Ranks	Ties	Mean Ranks	Sum Ranks	p-value
Pre-Post **Distracted Behavior**	11	4	15	8.36 7.00	92.00 28.00	0.049

From the results of the Wilcoxon signed rank test, the p-value calculation is 0.049 (2-tailed test). This means that Ha is accepted and Ho is rejected. Therefore, it can be concluded that there is a significant difference between distracted behavior in children with ADHD before and after positive stimulation using the 3D Pop Up Book media entitled "*Si Ujang dan Jurus Angin Timur*" and the Culture-Based Animated Film entitled "*Si Ujang dengan Tarian Merak*".

DISCUSSION

The parental age at birth was associated with the risk of ADHD, although the pattern of this relationship was complex. They found that younger parental age more consistently increased the risk of ADHD, while older parental age (≥40 years) showed inconsistent results after controlling for family factors and socioeconomic status (Min, Li, & Yan, 2021). That the relationship between advanced parental age and ADHD in children is often influenced by confounding factors such as family history or pregnancy complications. Thus, current evidence emphasizes the importance of considering both biological and social factors simultaneously when assessing the influence of parental age on ADHD (Lam & Xu, 2017).

The interventions based on*parent training*with a focus on positive stimulation, such as consistent reinforcement of behavior and parenting structure, is effective in reducing ADHD symptoms in children (Chacko, Merrill, Kofler, & Fabiano, 2024). The improvements in children's behavior can be sustained in the long term if parents consistently implement positive parenting strategies at home (Doffer, Dekkers, Hornstra, Van der Oord, Luman, Leijten, & Groenman, 2023). A positive parenting not only reduced externalizing symptoms but also improved cognitive abilities and emotion regulation in early childhood. These findings strengthen the evidence that positive stimulation through parenting interventions is an important component in ADHD management (Prime, Andrews, Markwell, Gonzalez, Janus, Tricco, & Atkinson, 2023).

Although evidence on aging in older adults is limited, their meta-analysis emphasized that the effectiveness of parenting training is more influenced by factors such as education, social support, and parental mental health than by chronological age alone. Thus, while parents over 40 may face energy or health limitations, they may also have the advantage of economic stability and life experiences that support positive parenting practices (Dekkers, Hornstra, van Der Oord, Luman, Hoekstra, Groenman, & van den Hoofdakker, 2022). The family socioeconomic conditions have a stronger influence on the developmental outcomes of children with ADHD than parental age. This underscores the need for further research specifically assessing whether parental age ≥40 years can moderate the effectiveness of positive stimulation in children with ADHD (Russell, Ford, Williams, & Russell, 2016).

The mother's role is very dominant in providing positive stimulation to children with ADHD. That maternal involvement in*behavioral parent training*associated with increased parenting consistency, decreased child problem behavior, and improved emotional regulation (Chronis-Tuscano, O'Brien, Johnston, Jones, Clarke, Raggi, & Seymour, 2011). This study emphasized that mothers are often the primary figures in home interventions, as they are traditionally more involved in the daily activities of children, including children with ADHD. The positive parenting by mothers had a significant impact on the social skills of children with ADHD. Their longitudinal

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study showed that emotional support, responsiveness, and consistent discipline by mothers contributed to reduced symptoms of inattention and hyperactivity. This highlights the importance of involving mothers in family-based interventions for ADHD (Breaux & Harvey, 2019).

On the other hand, fathers' involvement in positive stimulation is still relatively under-researched, although the majority of participation comes from mothers, the presence of a maternal figure remains a strong predictor of long-term intervention success. However, the researchers emphasize that interventions involving both parents will yield more optimal results. Thus, although women (mothers) dominate the positive stimulation role in children with ADHD, the integration of fathers remains crucial to strengthening the intervention's effects (Ramos, Matos, & Soares, 2022).

The parental education levels influence the quality of positive stimulation provided to children with ADHD. A parents with low to secondary education, such as high school graduates, often face limitations in effective parenting strategies, making them more susceptible to inconsistent parenting practices. However, when they receive specialized training, positive stimulation practices can significantly improve, suggesting that educational factors can be moderated by supportive family-based interventions (Russell et al., 2016). The parents with a high school education can still provide positive stimulation to children with ADHD if they receive guidance through parent training programs. They emphasized that lower formal education is not an absolute barrier, but rather an indicator of the need for additional support to ensure consistent implementation of positive stimulation strategies at home (Shokraneh & Xia, 2018).

In a meta-analysis of effective parent training components showed that parental education is associated with intervention success, with parents with a high school education achieving comparable outcomes to parents with a college education if provided with structured training. This confirms that secondary education does not diminish parents' potential to provide positive stimulation, provided the intervention is designed to be easily understood and implemented by individuals with diverse educational backgrounds (Dekkers et al., 2022).

The role of a stay-at-home mother is often associated with greater opportunities to provide positive stimulation to children with ADHD due to the high level of togetherness. The mothers who spent more time at home were able to implement behavioral parent training strategies with greater consistency, which was associated with reduced hyperactivity symptoms and improved emotional regulation in children. This confirms that intensive maternal involvement, particularly in stay-at-home mothers, can significantly impact the success of interventions (Chronis-Tuscano et al., 2016).

That mothers who did not work outside the home were more frequently involved in positive daily stimulating activities, such as helping their children with homework, guiding social behavior, and providing positive reinforcement. Their findings suggest that this involvement contributed to a decrease in inattention symptoms and improved social skills in children with ADHD. Thus, being a stay-at-home mother may be a protective factor in raising children with special needs (Smit, Mikami, & Normand, 2021).

The although housewives have more time to engage, the success of positive stimulation is still influenced by the quality of interactions, social support, and parental mental health. They highlighted that family-based interventions involving housewives as the primary agents are more effective when accompanied by external support, such as parenting training groups or mental health services. In other words, while work as a housewife provides opportunities for optimal positive stimulation, its effectiveness still requires adequate environmental support (Bögels, Oort, Potharst, Van Roosmalen, Williams, & de Bruin, 2021).

Based on the results of the analysis, it was found that there was a significant difference between distracted behavior in ADHD children before and after positive stimulation using the 3D Pop Up Book media entitled "Si Ujang and Jurus Angin Timur" and the Culture-Based Animated Film entitled "Si Ujang with the Peacock Dance".

An eye-tracking study on children aged 4–6 who listened to books with static illustrations and books with animated illustrations (animated storybooks). They found that animated illustrations captured

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children's visual attention better than static illustrations, and that animations tailored to the story text helped guide children's attention to key parts of the illustrations. While not specific to children with ADHD, these findings are relevant as evidence that moving elements and animated visuals can reduce distraction relative to less visually engaging media (Takacs & Bus, 2016). The electronic formats with motion and sound elements can maintain children's attention spans longer and increase story engagement, which implies improvements in distractibility behavior on reading/story tasks after exposure to animated books (Sun, Loh, & Charles Roberts, 2019).

Several visual/animation-oriented digital interventions for children with ADHD have reported improvements in attention on pre- and post-intervention measures. In the context of art therapy and immersive interactive animation examined the effects of using interactive animation as part of therapy for children with ADHD. While this study was more conceptual in nature and lacked quantitative details regarding 'pre-vs-post distraction frequency,' they reported that children demonstrated increased attention and engagement during the interactive animation intervention (Tang, 2021).

The RCT AKL-T01 significant improvements in inattention measures after an interactive digital program compared to a control, indicating objective distraction reduction (Kollins, DeLoss, Cañadas, Lutz, Findling, Keefe, & Faraone, 2020). A more recent clinical study on the attention training software “MindPro1” also reported significant changes in attention scores (measured using TOVA and SNAP-IV) before and after the intervention from pre-test to post-test in children aged 6–12 years. The results indicated significant changes in attention variables after the digital intervention. Although not using Pop-Up Book media plus video animation simultaneously, these results suggest that interactive visual and digital media do have the potential to reduce distractible behavior (Huang, Zhang, Lu, Xiong, Liu, & Sun, 2024).

Systematic reviews and peer-reviewed studies indicate that video-modeling and digital interventions have the potential to reduce problem behaviors and improve attention, but variability in study design (intervention duration, outcome measures, ADHD vs. non-ADHD samples) impacts the consistency of findings. In their review of video-modeling confirmed promising preliminary evidence for the use of video as a behavioral intervention tool, but highlighted the need for larger-scale RCTs and standardized pre-post measurements (Wilkes-Gillan, Cordier, Chen, Swanton, Mahoney, Trimboli, & Tam, 2021). That effects on inattention are often significant but effect sizes vary, and that longer-term studies and analyses of mechanisms (why animation reduces distraction) are still needed. Practically, current evidence supports that both animated storybooks and animated/digital videos can reduce distractible behavior in children (including those with ADHD), but practice recommendations should consider the quality of the evidence, the specifics of the medium, and the clinical context (Caselles-Pina, Sújar, Quesada-López, & Delgado-Gómez, 2023).

CONCLUSION

Thus, it can be concluded that the development of 3D Pop-Up Book media and culturally based educational animated films designed to support positive stimulation in children with ADHD has been successful. The FGD results emphasized the importance of media that is engaging, easy to understand, and able to channel children's energy through visual and motor activities. Positive stimulation through 3D Pop-Up Books and culturally based animated films provides dual benefits: reducing distractibility and improving the focus of children with ADHD, providing a fun learning experience while introducing local cultural values, and supporting children's social and communication development through directed and meaningful interactions. These results emphasize that educational interventions for children with ADHD should use a creative, interactive, and value-laden approach, rather than simply requiring children to "calm down." In this way, children can channel their energy positively and feel valued in the learning process.

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