Attention Improvement through Play Puzzle Therapy to Promote Self-Regulation in Children with Attention Deficit Hyperactivity Disorder (ADHD)

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Abstract

Attention Deficit Hyperactivity Disorder (ADHD) is a pervasive developmental disorder that results in individuals having difficulties organizing behavior to be more focused. This study at to determine the effect of attention and self-regulation on children with ADHD through play therapy with puzzles. The design of this study was a non-equivalent control group design. The technique of taking the subject used purposive sampling and the research subjects were 12 ADHD children who were divided into 6 experimental groups and 6 control groups. The scale used to measure the pretest and post-test was the Indonesian Hyperactive Child Rating Scale to measure attention, and the Self Control Rating Scale to measure self-regulation. Results indicate a positive effect of attention improvement on self-regulation in children with ADHD through play puzzle therapy. The experimental group receiving puzzle play therapy had better self-regulation compared to the control group receiving no treatment.

Keywords: Attention, ADHD, child, self-regulation, play puzzle therapy.

Introduction

ADHD is a neurodevelopmental disorder due to individual biological conditions. Children diagnosed with ADHD tend to have trouble focusing on an object and in self-regulating environmental stimuli. Children diagnosed with ADHD are characterized by impulsive behavior and hyperactivity (Morris et al., 2020). Children with ADHD range from 3-7% (Furlong et al., 2021). Moreover, research studying child prevalence of ADHD confirmed the increase in outpatient visits at a developmental pediatric clinic in the central public hospital.

There were 162 medical records of ADHD reported cases in 2005-2006 among children aged 3 to over 7 (Kogan et al., 2018). ADHD causes children to experience deficit attention and hyperactivity, leading to behavioral self-regulation difficulties due to careless processing of environmental stimuli. They tend to respond to all environmental stimuli, and therefore, the children may fidget. Such disorders commonly occur partially or fully in children. Full ADHD could trigger impulsivity and inattention simultaneously in their daily life. Simultaneously, children diagnosed with partial ADHD would experience one among both of these symptoms (Coutinho et al., 2018). Children with ADHD may have difficulties getting along with their friends. Usually, the children will have difficulties playing with the other children due to inadequate attention (Coutinho et al., 2018).

Children with ADHD experience troubles in their executive function leading to difficult self-regulation. This executive function is a series of cognitive processes in assisting the planning, initiating, behavioral tasking, and problem-solving. This executive function will run a series of cognitive processes associated with self-regulation when individuals intend to finish specific tasks (Barkley, 1981). Executive function disorder causes child incapability of self-regulating (Cibrian et al., 2022). The executive function deficit in children with ADHD is strongly correlated to how they perform self-regulation, especially to resist hyperactivity, develop reasoning, planning, and problem-solving as the pre-regulation-requirement. Self-regulation involves self-controlled or planned thoughts, feelings, and actions based on effort or the determined achievement (Cleary, 2020; Zimmerman, 2013).

Self-regulation could help the children perform directed responses. Such directed responses will sustain the child's strategy to finish tasks and achieve goals as evidence of personal development (Bandura, 1991). Children with ADHD had trouble in self-regulation or performing the task to achieve a specific goal. Deficit self-regulation in children will intervene in their daily lives, including peer group, family, and learning interaction. Deficit self-regulation will disrupt their capacity optimization in behaving adaptively and negatively interfere with their learning achievement, resulting in lower quality of future life (Barkley & Murphy, 2006).

One contributive factor in promoting self-regulation is attention improvement. A longitudinal study concerning children, development suggested that brain regions involved in attention improvement or the present attention during infancy serve to promote self-regulation (Brandes-Aitken et al., 2019).

An infant with sufficient attention will have a good self-regulation ability in adulthood, and this concludes that attention is the primary cause of self-regulation development (Posner & Rothbart, 2007).

Attention improvement in children with ADHD was reported to promote numerous positive behavior, primarily positive academic performance (Zuberer et al., 2018). Considerations-from both the child and caregiver viewpoints-for designing technological interventions supporting children with ADHD (Cibrian et al., 2020). However, there were only a few studies that concerned children with ADHD. Moreover, self-regulation and attention are crucial components for ADHD treatment. To control attention in many environmental stimuli is a binding domain for self-regulation improvement (Posner & Rothbart, 2007).

Several methods with various media have been developed to improve children's attention capacity with ADHD. The most frequent psychological therapy applied to children with ADHD is play therapy. Landreth (2012) suggested that the therapy aimed for attention improvement with playful media could significantly affect the children since they could deliberately express their behavior. Although there are various play therapy options for children with ADHD, the most exciting method is the one that could accommodate favorite media for them. The children will have less difficulty channeling their focus on such media.   Play therapy can be performed through puzzle media and by providing the images that motivate them (Suyami et al., 2019).

An experimental study performed by Putri & Surtikanti (2019) concluded that puzzle play therapy could improve concentration in children with ADHD considering the children's motivation to finish the puzzles with pictures. The experiment found a positive change in the child's capacity to pay attention to people's explanations or, in short, their communication skills developed.

As for this experimental research, it is more practical and easier to implement because it focuses more on playing puzzles which makes children more challenged to complete their tasks without having to add additional intervention variations such as adding the use of images or other media that have been carried out by many other researchers. In addition, focusing on one treatment will clarify the effect or impact of the treatment itself.

Based on the problems, therapy definition, and the benefits discussed previously, this study aimed to employ psychological play puzzle therapy to boost attention and improve self-regulation among the children diagnosed with ADHD. The hypothesis of this research is that Play Puzzle Therapy can improve attention and self-regulation in children with ADHD.

Methods

Design Experimental

The research design uses Non-Equivalent Control Group Design as a development model of a simple experimental design, by observing the results of the pretest and post-test of both control and experimental groups. The research subjects were 12 ADHD children who were divided into 6 experimental groups and 6 control groups.

The design was based on the purpose of the research, to observe changes within the subjects or children with ADHD through play therapy intervention. The pretest served to collect initial information related to the attention and self-regulation capacity of the subject. In this design, both the experimental and control group were compared, and the groups were selected without random selection. Both groups were given a pretest, and in turn, they were introduced to the treatment. By the end of the experiment, they were given a post-test.

The first step in this research was conducting the utilized instruments and expert judgment on the experiment's intervention module. Subsequently, the author performed a pretest and gave a Child Hyperactivity Rating Scale (Darmawan et al., 2018) and Self Control Rating Scale (SCRS) to the children's supervisor (Kendall & Wilcox, 1979; Pandya, 2020). The experimental group's initial assessment was done through interviews and questioning their availability to participate in the experimental group. The intervention of play puzzle therapy was addressed to the experimental group while no treatment was given to the control group.

The intervention consists of 1) *Introduction:* at this stage it is explained to teachers and parents regarding the purpose, benefits and procedures of playing puzzles. Children are also introduced to various types of puzzles to attract their interest in playing; 2) *Selection of Puzzles:* at this stage the
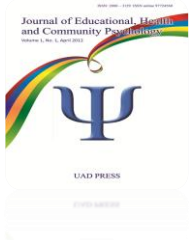
child is asked to choose various puzzles that he likes and if he is able to choose the child is given praise; 3) *Separating & Assembling Puzzles:* at this stage the child is asked to complete the task, which is to assemble the puzzle; 4) *Termination & Evaluation:* this stage is the end of the intervention, the child is given praise for his efforts and evaluates the intervention given.

A detailed description of each intervention session is in the intervention module. After the intervention, the authors gave the child supervisor a rating scale for attention and self-regulation for the control and experimental groups. The next step is to analyze the data. The data generated from both the control variables and the experimental group were analyzed to identify the effectiveness of the therapy and the hypothesized outcomes. The hypothesis of this research is that Play Puzzle Therapy can improve attention and self-regulation in children with ADHD.

Materials

This study used two rating scales to measure the researcher's attention variable, including Children Hyperactivity Rating Scale (SPPAHI) developed by Darmawan et al. (2018). This scale consists of 35 questions. The correlation coefficient between the items is higher than 0.2 with a minimal value of 0.25. Therefore, the existing item had a high correlation to the total value. The reliability or internal consistency test generated *standardized item alpha* 0.9856, and therefore, the psychopathology had very high internal consistency. As for the examples of the items, they are never silent, tireless, often fail to complete tasks, and their attention is often easily distracted by external stimuli.

Meanwhile, the self-control rating scale (SCRS) was used to measure the self-regulation variable. This scale was developed by Kendall & Wilcox (1979) dan Pandya (2020) containing 33 items for teacher assessment or *significant other*. Internal reliability employing Cronbach Alpha was 0,938 or over 0.60. Therefore, it can be concluded that the 33 question items on the scale are reliable. As for the examples of items, namely, *can the child sit still? does the child violate the rules?, and does the child interfere with the game with friends?*
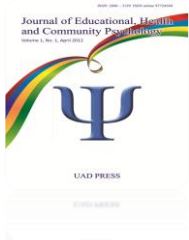
Procedure

Criteria for the subject in this experiment included children with ADHD at the elementary school level. This experiment's total subjects were 12 children diagnosed with ADHD divided into two experimental and control groups. Each group contained six children. The selection of subjects was carried out through purposive sampling with consideration of the authors and client criteria as follows: (1) Children diagnosed with ADHD based on parental reports or school screening results, (2) Children aged 7-11 years old who can assess and clarify certain things, as suggested by Piaget, this age range is a concrete operational development phase in the child's development, (3) According to the interview of the closest person, the subject has never received treatment or intervention related to increased attention and self-regulation, (4) The child and the parents will commit to participating in therapy by signing consent.

Pre-evaluation Research

On the Self Control Rating Scale (SCRS), a piloting test was done to identify and minimize linguistic misunderstanding errors. Instrument feasibility trial was performed on seven assessors with a comprehensive understanding of self-regulation and ADHD. The trial was also performed on six subjects of a control group. As a result, there was a minor correction on SCRS containing 33 questions. These corrections based on the piloting scale result encompassed items no. 6, 8, 15, 16, 23, and 30. Data analysis using nonparametric with Mann Whitney and Wilcoxon test with the help of SPSS v. 23 for Windows.

Research ethic

The Ethical Commission of Experimental Research of the Faculty of Psychology, University of Muhammadiyah Malang approved the study (approval number research ethics:E.6.m/296/FPsi-UMM/XI/2021). The authors assured the participants that the study data would be presented anonymously, and they agreed in writing to participate.

Results

Manipulation Check

The manipulation check aims to ensure whether the puzzled media can contribute significant attention improvement to the subjects. In this study, the manipulation check was initially done through the Wilcoxon test to identify any difference between the pretest and post-test on both groups' attention variables. Mann-Whitney test was performed to identify any difference in the collected data from both groups after receiving the treatment.

The Wilcoxon test result indicated that the experimental group receiving the play puzzle treatment obtained an attention pretest score of M=119.83 with an SD = 4.792. The obtained post-test results were M = 89.67 and SD =3.615. It is implied that the post-test mean value was lower than the pretest mean value regarding the attention variable with Asymp. Sig (2-tailed) value 0,028 < 0,05, due to unfavorable scale. It indicated the reduced difficulty of attention on the experimental subjects. Therefore, it can be concluded that there was a significant difference between the experimental group's pretest and post-test results where the post-test score was lower than the pretest score.

Wilcoxon test indicated that the control group self-regulation pre-test score was M = 119.67 with SD = 3.933 and post-test self-regulation score was M = 118.33 with an SD = 5.125. Therefore, the pretest mean value was lower compared to the post-test. Observing the Sig (2-tailed) score of 0.273> 0,05 implied no significant difference was found in the pretest and post-test comparison. The decrease in scale rating score indicated an improved self-regulation capacity after the experimental group received treatment. On the contrary, the analysis result indicated no significant difference before and after receiving treatment. Therefore, it can be concluded that play puzzle therapy affected the experimental group.

The *Man Whitney* U test result on attentional variables was 0.000, and the P score was 0.004 (p<0.05), which demonstrated a difference in the attention of both groups. This result confirmed the difference in the attention score between the control and experimental groups.
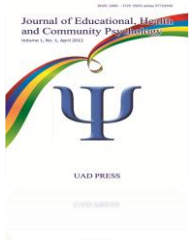
Hypothesis Test

Correlation between both positive variables was significant with the correlation coefficient value of the attention variable towards the self-regulation variable with a p-value of 0.006 (p<0.05). Therefore, a higher attention capacity of an individual will generate a higher capacity for self-regulation.

As for the comparison result of pretest and post-test self-regulation variables in each group, the Wilcoxon test was used to confirm the research hypothesis. The collected data indicated that the experimental group receiving play puzzle therapy had a self-regulation pretest score of M= 199.50 with SD = 3.619. Post-test score was M = 12.271 with SD = 12.271. Therefore, the post-test mean value was lower than the pretest regarding the self-regulation variable with Asymp. Sig (2-tailed) 0,027 < 0.05 due to the unfavorable scale. This result indicated a reduced difficulty in the subject's self-regulation. Therefore, there was a significant difference identified in the experimental group's pretest and post-test scores.

The pretest score on the self-regulation variable was M = 204.33 with SD = 2.503, while the post-test score was M = 201.67 with SD 3.724. Therefore, the pretest mean value was lower than the pro-test by observing the Sig (2-tailed) represented 0,026 < 0.05.

Due to the unfavorable scale, this indicated a decreasing capacity of self-regulation among the control group subjects. A reduction in the experimental group's scale score indicated an increasing self-regulation ability after receiving therapy from the experimental group. A similar trend was also reflected from the control group, where the decreasing mean score from pretest to post-test indicated weakened self-regulation of control group subjects. Therefore, it is assumed that other potential factors are affecting the control group's mean score change.

The Mann-Whitney U test result on variable attention score was 0.000, and p score was 0.004 (p<0.05). It indicated that a difference was identified regarding the attention of both the experimental and control groups. On the self-regulation variable, the result indicated a score of 0.000, and the p score was 0.004 (p<0.05). Therefore, it can be confirmed that a difference is present in the control group's self-regulation score. It proves that the self-regulation score difference between the control group and the experimental group through attention improvement. Self-regulation in the
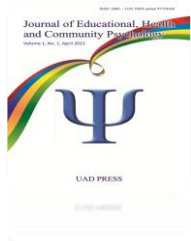
experimental group experienced a decreasing score compared to the control group or, in short, decreasing ability in self-regulation was identified among the control group. Overall, it can be concluded that although the Wilcoxon test identifies decreasing scores on self-regulation within the control group before and experimental group after receiving the therapy, both groups demonstrated a significantly different score on the self-regulation variable.

Discussion

This study's results indicated a positive effect of attention improvement on self-regulation development in children with ADHD through play puzzle therapy. Previous studies have also found that therapy with puzzle play can improve fine motor skills in ADHD children (Preges et al., 2018; Xanda et al., 2018). Research by Suyami et al. (2019) also found that puzzle games are able to increase the concentration of children with attention deficit disorder and hyperactivity (ADHD). Supporting Rosma (2019) research which also found that puzzle game therapy can deal with hyperactive children. Handling hyperactive children through puzzle game therapy can make children talk to teachers and friends in moderation, not disturbing friends in their class, not running around and going around or climbing around in situations where teaching and learning activities are taking place.

Besides, in this experiment, the experimental group subjects were the children diagnosed with ADHD living in a foundation shelter house with their friends. It provided access for the authors to perform observations and experiments. As a result, it was reported that the experimental group receiving puzzle play therapy had better self-regulation compared to the control group receiving no treatment. However, the experimental group subjects also showed a lower increase of self-regulation based on the research results. This fact clarified that there are other potential contributing factors in the improved self-regulation among control group subjects.

After a further investigation on decreasing self-regulation scores among the control group subjects, it was observed that control group subjects lived with their family and received full care from their parents, unlike with the subject from the experimental group. The potential influence of this treatment was also explained by Beaumont et al. (2021). It was stated that self-regulation had a

potential improvement through parental care. Parental care could contribute convenience and security to the children, which may help them behave appropriately based on what they learned from their parents. Children's self-regulation may develop through supportive parental interaction. The parent's understanding and capability in adapting with the children is the pre-requirement for children's self-regulation development. Responsive mothers care for the children's needs, such as offering them warmth and comfort, reflected an acceptance of their disability. Children receiving this treatment will have good self-control. Children diagnosed with ADHD raised with harsh physical punishment will respond with uncontrolled behavior (Sukowati et al., 2020).

In addition, age is also an influence on children's self-control, in this study the average age of children in the control group is easier than the age of children in the experimental group, according to Barkley & Murphy (2006) self-regulation of children with ADHD can be distinguished by age, children younger children will find it more difficult to resist stimuli in acting on internal impulses than older children so that the control group has a lower score on self-regulation problems even though they are not given treatment because they have more supportive family and age support.

Children with better attention will possess better self-regulation in adulthood. Children at the age of 7 months old to 7-8 years old had attention capacity rehearsed from the early period, affecting the child's brain development, which leads to better attention. Rehearsal applied to the children will affect their temperament and their emotional expression. Brain regions involved in the attention improvement during infancy indicated that its connectivity is directed to improved self-regulation (Lemberger-Truelove et al., 2018; Posner & Rothbart, 2007). Theoretically, a requirement for more controlled behavior is the increasing attention to the external environment stimuli in children (Alvares et al., 2019; Williams, 2018).

The ability to perform self-regulation can be said to be optimal due to the attention role. In one experimental study, children had good orienting attention reflecting a more controlled behavior (Brandes-Aitken et al., 2019; Rothbart et al., 2011; Savina, 2021).. Children's attention measurement was performed with Children Hyperactivity Rating Scale (SPPAHI). The measurement results on the overall subject showed that they had a cutoff score of more than 29 which indicated the subject had problems with attention and impulsivity, but in this case, the therapist focused on the results of the

attention indicator on the scale. Subjects in the experimental group appeared to have item scores that revealed decreased attention after being given therapy, which means that there was an increase in attentional ability which had an effect on the child's ability to self-regulate. Based on the results of observations from significant others, it can be seen that there is a good change in terms of carelessness in children and children are also easy to invited to communicate.

The measurement of self-regulation in the overall subjects used *Self Control Rating Scale (SCRS)* to consider that the scale could reveal impulsivity and self-regulation. Self-control and self-regulation refer to the same variable: an individual's capacity to control their impulsive behavior and divert it to more appropriate behavior (Baumeister, 2002; Estrapala et al., 2021). Self-control has defined the ability to rule out temptation or impulsive behavior to perform a more appropriate task. Therefore, self-control is a crucial component to self-regulate (Burns et al., 2021; Milyavskaya et al., 2021).

The overall subjects' scale results indicated that the average subjects had difficulties in self-regulation both before and after receiving therapy. One child had an excellent self-regulation score in the experimental group after receiving therapy, where the scale did not indicate any signs of self-regulation difficulties. Other remaining subjects consistently showed difficulty in self-regulation. However, the experimental group's overall subject showed a decreasing score before and after therapy, although still categorized as having difficulties in self-regulation. Based on the observation result by *significant other*s, the experimental group's overall subjects were observed to have changed behavior. Recently, the children could communicate, listen to other people, and be directed not to take their friends' stuff.

As for the child with good pretest results of self-regulation, they have friends who like them daily. It is considered to be one good contributing factor for better self-regulation compared to the other five children. This good result of better self-regulation is supported by Mastoras et al. (2018), who confirmed that children with ADHD could improve their resistance and control of their behavior.

Play therapy using puzzles is a play tool that can facilitate children's associative games when playing, so that puzzles can be used as a means of playing as well as have a therapeutic impact that makes children more focused and concentrated, in contrast to other play therapies that involve many people,
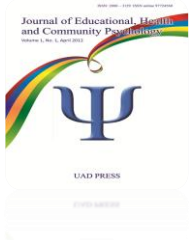
so that they are less able to help ADHD children because their attention will be easily distracted by the many stimuli that will interfere with them.

Thus, play therapy is very suitable for children, considering their fondness for play objects, the importance of play for children, and their difficulty in expressing themselves through words. In addition, what makes them motivated is playing with puzzles according to the children's preferences. Children are allowed to choose the available puzzles. As a result, the available jigsaw puzzles can stimulate their motivation toward treatment.

Conclusion

Based on the results of the study, it can be concluded that it indicates a positive effect of attention improvement on self-regulation in children with ADHD through puzzle play therapy. The experimental group receiving puzzle play therapy had better self-regulation compared to the control group receiving no treatment.

Conflict of Interest

The authors declares that there is no conflict of interest.

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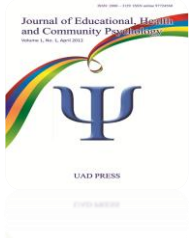
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