



# EFFECT OF GAME INTEGRATION INTERVENTION PROGRAM AS TREATMENT OF ADHD CHILDREN

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## ABSTRACT

Attention Deficit Hyperactivity Disorder (ADHD) is a neuro development disorder that affected many children that often have into adulthood. It is characterized by persistence of inattention, hyperactivity and impulsivity in appropriate levels with the age of the child.

According Centre for Disease Control and Prevention (CDC), ADHD can affect one out of every ten American children between the ages of 4 and 17. A challenging condition to diagnose, ADHD can cause acting out of physical aggression, anxiety, and academic difficulties. While 6.1% of American children was being treated for ADHD with medication but these medications rarely treat the symptoms of ADHD and sometimes cause of side effects that mimic the symptoms themselves. Family members of such psychological patients suffer not only from the patient's behaviors.

Most of the pervious review literature, number of related studies or researches and magazines, books and journals are aware of ADHD as commonly mental disorder in children that affected attention, the ability to sit still, self-control and planning, organizing time and materials, making decisions, shifting from one situation to another, controlling our emotions and learning from past mistakes, weak Executive functions are the self-regulating skills to finish tasks, from getting dressed to doing homework in school and home setting.

In this research collected the sample of 30 ADHD children were selected for the study the basis of purposive sampling method. Age limit of the children was 5 to 12 years from school from Jaipur district. ADHD Rating Scale-IV questionnaire was implemented by teachers as pre- test and post- test.

The result showed there were significant positive differences between pre-test and posttest scores regarding children inattention, hyperactivity and impulsivity symptoms as reported by their teacher's game integration program as intervention (video game and play game). The outcome indicated that game integration intervention may be effective method for treating children with ADHD. Moreover, there were finding statistically significant differences in children's cognitive function and behavioral disturbances pre and posttest intervention as game intervention program include physical game and video game sessions. Teachers and parents to cooperate actively when game program as intervention include play game and video game sessions are held for persistency of treatment effects and further studies should be carried out on the effectiveness of game program as intervention and use of combination therapies or approach for children with ADHD are beneficial.

## INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a most common mental disorder diagnosed clinically in early childhood and is characterized by "developmentally inappropriate levels of inattention, impulsivity and hyperactivity" (Coates, 2017).

ADHD published by "the American Psychiatric Association for DSM-5 medical classification system (2001) ADHD as a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development".

ADHD is a long-term disorder that affects children and can last far into adolescence, if not adulthood. ADHD is characterized by a mix of chronic attention problems, hyperactivity, and impulsive behavior. ADHD is a neurodevelopmental disorder that involves problems focusing attention on a task and controlling behavior and activity levels.

ADHD has identified an insistent pattern of inattention or hyperactive and impulsive behaviors to face difficulties in implementation and finish of daily routinetasks. "Children may show distractive and destructive behaviors more commonly or persistently seen in a child at the same developmental level in diagnosed withADHD" (Efron, Scibberas & Hassell, 2008). ADHD has an impact on a child's learning abilities, school performance, peer and family interactions, and other areas. "Children with ADHD may struggle with low self-esteem, strained relationships, and poor academic achievement," but "while some children never completely outgrow their ADHD symptoms, they can learn skills to help them succeed". ADHD is more likely when a parent or sibling suffers from the illness, and symptoms might worsen if the child is exposed to stress, family menial troubles, harsh or inconsistent parenting, or is a family felon. ADHD has been linked to a "variety of neurological, mental health, and physical issues".

ADHD is a "medical disorder in which children's brain growth and activity vary, affecting their attention, capacity to sit still, and self-control". They tend to be weak in certain areas. Executive functions are the self-control skills needed to complete tasks such as getting dressed and doing homework. They include things like

“planning, arranging time and materials, making decisions, transitioning from one scenario to the next, managing our emotions, and learning from our mistakes”. These children's behaviors include excessive motor activity and a high level of energy; the following conduct is sometimes misinterpreted as a feature of the disease, requiring specific interventions.

### SYMPTOMS OF ADHD

According to the fifth version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), “nine symptoms indicate ADHD is Primarily Inattentive, and nine symptoms that indicate ADHD is Primarily Hyperactive/Impulsive”. A kid may be “diagnosed with ADHD on the presence of at least six out of nine long-term (lasting at least six months) symptoms of inattention, hyperactivity-impulsivity, or both” (American Psychiatric Association, 2013). To be considered, “the symptoms must have appeared by the age of six to twelve and occur in the home, school and work areas. The symptoms must be inappropriate for a child of that age and there must be evidenced that causes social, school, or work-related problems” (Berger, 2011; APA and Steinau, 2013).

### SUBTYPES OF ADHD

The American Psychiatric Association defines these criteria in the DSM in the United States. According to the DSM, there are three types of ADHD (American Psychiatric Association, 2013).

1. ADHD predominantly inattentive type (ADHD-PI) “presents with symptoms including being easily distracted, forgetful, daydreaming, disorganization, poor concentration, and difficulty completing tasks” (American Psychiatric Association, 2013).
2. ADHD predominantly hyperactive-impulsive type (ADHD-PH or ADHD-HI) “presents with excessive fidgetiness and restlessness, hyperactivity, difficulty waiting and remaining seated, immature behavior; destructive behaviors may also be present” (American Psychiatric Association, 2013).
3. ADHD combined type (ADHD-C) is a “combination of the first two subtypes.

### GAME INTEGRATION INTERVENTION PROGRAM

- Ring Toss



Ring toss is a game where rings are tossed surrounding direction of peg or poles. It is a very common game at fairs. It consists of two base sticks, five pegs, and six rings, as well as a carry handle that may be joined into a travel case. Ring throw creates a board with vertical pegs in the most basic variant. In this game has typical distance between targets from 8 to 15 feet, feet from the players and there are draw a line. Each player has followed same distances online for toss rings into peg. Mostly through this game children have enhanced various development skills such as concentration, gross motor skills, social skills and hand – eye coordination from arrange rings size and throw rings onto peg with fun.

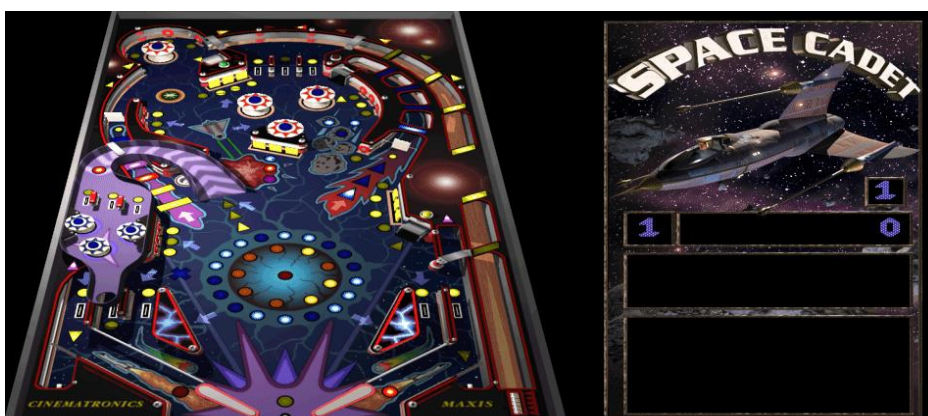
- Laundry Baskets Ball



Laundry basketball game is playing with various balls such as soft balls, paper balls, squeegee balls and plastic balls thrown into basket. It is a very common or useful game for development in children and all age group player. Laundry basket ball is an indoor and outdoor game, you can play indoor like as your own homes, offices or building complexes and outdoor like as play in park, on playground and on grass.

It includes from easy to high or difficult skills level so all age group people can play with them level of skills or increase the level according them. The purpose of player in the game throw ball into laundry basket the best way and got maximum points or scores. It is a very simple version of game in which each player thrown balls from the same distance as you decided into laundry basket, and set point of score for each ball. When you were throwing more ball into basket without fail, gets more points or scores. The child who got the maximum points, the winner of the game. Laundry baskets ball game has need to focus on balls for throw and catching into baskets. It's a team game, so improved social skills in children. It is very useful to improve attention level and reduce impulsive behaviors in ADHD children.

- Pin Ball Game



A player uses flippers to operate one or more balls within a pinball machine, which is a sort of coin-operated entertainment game. A pinball machine is a glass-covered cabinet with a play field or space filled with lights, targets, bumpers, ramps, and several other things that vary depending on the design structure. Pinball game is a type of video game or arcade game would be operating from PC or console machine. It's commonly found in arcades, bars, hotels and other business setting up. Pinball game is requiring attention, stability on game and hand-eye coordination skill to play game.

The goal of a pinball game is to hit targets and create various shots from the ball using flippers before all balls drain at an exit, which is usually located at the bottom of the play field. In video games, balls and lives are used interchangeably in most pinball games. The game ends when the payer has no more balls to play or when all of the balls have been used. It is well known that good hand-eye coordination is required to play pinball. Hand eye coordination can be improved twofold by learning to play or playing pinball frequently, as well as having lightning-fast reflexes and excellent timing.

## REVIEW OF LITERATURE

Few studies results indicated that single treatment was not much improved compare to combined treatment on ADHD symptoms. Klein, Abikoff, Klass, Ganeles, Seese, & Pollack, (1997) studies demonstrated that “multimodal treatments hold importance for those children for whom treatment with medication alone is not sufficient” (Klein et al., 1997). Hinshaw et al., (2000) found “improvement after using a multimodal intervention in children of many areas such as anxiety, academic performance, oppositional behaviour and parent-child interaction”. Researchers discovered “significant favourable benefits in school behaviour when multimodal treatment was combined with improved parenting abilities, such as more effective disciplinary responses and reinforcing”. Despite significant disparities in their sample's socio demographic parameters, “these findings were repeated across all six research sites”. “The study is overall results appear to apply to a wide range of children and families identified as in need of treatment services for ADHD” (NIMH, 2000).

Similarly, “a quasi-systematic review has comprised 605 articles, 128 were reviewed, 44 observational studies, 26 quasi-experimental studies, 26 experimental studies, 8 systematic reviews, 9 narrative texts, 6 case reports, 7 pilot studies, 8 systematic reviews, and 2 meta-analyses). This study has used serious video games as an intervention for ADHD patients. It is useful and increasing cognitive rehabilitation tool in clinical setting” (María, R.Y. et. al, 2022)

According to the “Entertainment Software Association” (ESA, 2014), “over 59 percent of Americans play video games, with nearly 30 percent of that population being under the age of 18”. According to the findings, “42 percent of parents play video and computer-based games at least regularly, despite the fact that only 30% of adolescents play video games”. The majority of parents believe and agree that playing video games with

their children provides an opportunity to interact with them (ESA). This study demonstrates that play-based technology benefits not just all children but also their parents through video games.

Meta analyses of three published studies result shown that the effect of playing specific video game improvement on cognition functions in children. The first two studies were done by group of Powers and colleagues” (Powers & Brooks, 2014; Powers et al., 2013). In their first meta-analysis, Powers et al. (2013) The Latest studies, longitude study was revealed that “positive effect of video game playing on ADHD symptoms. Video game playing can represent a risk factor for the development of attention problems in early adolescence at 12-13 age. This study was sample of Canadian Youth” (Tiraboschi, G. A. 2022).

“Playing method is a natural way for children to express themselves and developed many areas such as appropriate communication, relationship enhancement and growth with an opportunity to gradually release suppressed emotions and tensions, disappointments, feeling of insecurity, aggression, and fear of confusion” (Barzegary L, Zamini S. ,2011; Nigussie B. ,2013) Accordingly these studies, “play therapy can be used for children with ADHD to connect, learn, provide reassurance, reduce anxiety and improve self-esteem” (Robaie E, Malekian F 2015, Schlack R, Mauz E, Hebebrand J, et al. 2014).

“A physical activity or exercise program as treatment for ADHD children include too diffident to high intensity interval training and cognitive tasks are suitable. The preliminary state of the evidence supports physical exercise as an adjunctive treatment for ADHD at this time. The outcomes have benefits imitate the positive correlation between cognition and physical activity, and these benefits will also lead to changes in executive function after long-term training” (Yuan, S. C. (2021).

## OBJECTIVES

1. To examine the effect of game integration program as intervention on level of inattention in ADHD children.
  2. To examine the effect of play game and video game as intervention on level of hyperactive – impulsive in ADHD children.
  3. To examine the interaction effect of play game and video game as intervention on inattention and hyperactive- impulsive symptoms in ADHD children.
- HYPOTHESIS*

1. There would be a significant difference in the level of inattention symptoms before and after Video game and play games as an intervention program in ADHD children.
2. There would be a significant difference in the level of hyperactive- impulsive symptoms before and after video game and play games as an intervention program in ADHD children.
3. There would be a significant difference in the level of ADHD symptoms (inattention and hyperactive- impulsive) before and after play games and video game as an intervention program in children.

## METHODOLOGY

### *Sample*

The size of sample N - 30 comprised both boys and girls with ADHD symptoms Jaipur city. The sample was selected for the study of convenience sampling method.

### *Inclusion criteria*

The sample age taken was 5- 12 years with ADHD symptoms. The children undertake in the study were boys and girls in Jaipur city.

### *Research Design*

Sample of 30 children (boys and girls) with ADHD symptoms will be taken. Pre and Post Design will be used for the present study. In this design, experimenter collects of data from the group of subjects before intervention and after intervention.

### *Controls*

- Investigator should be careful about background both session play game and video game in intervention room.
- The environment of the laboratory provided should be silent and peaceful.
- There were appropriate light and seating management.
- Every step or level was noted carefully during intervention program conducting.
- To control the effect of extraneous variables by the investigator.

### *Measure Tools*

ADHD Rating Scale-IV Teacher Version by “George J. DuPaul, Thomas J. Power, Arthur D. Anastopoulos, and Robert Reid, 1998. It was designed to measure ADHD symptoms in children. 8 In this questionnaire was 18 statements for measure ADHD symptoms, in which 9 statements measure inattention symptoms and 9 statements measure hyperactive –impulsive symptoms in children. “Each statement or item was scored between 0 and 3, depending on the response given by children”. in this scale have to give response with 4 alternative options: 1. Never or rarely 2. Sometimes 3. Often 4. Frequently or very Often.

This scale has “internal consistency reliability of ADHD RS-IV (teacher version) measured by Cronbach’s Alpha method was 0.94 and the test-retest reliability measured by the Pearson correlation coefficient method was 0.90. The same values in ADHD RS-IV (parent version) were 0.92 and 0.85 respectively” (DuPaul, Power et al., and 1998).

## PROCEDURE

After the selection of appropriate questionnaire, the subjects of the sample are contacted at the special schools, Jaipur. The chosen subjects 30 were tested on the selected questionnaire.

Care was taken of that, only completely filled questionnaire with all required information were included in the study for the research work. In all questionnaires completely filled answer sheets were obtained. After that, scoring was done and thus saw data was obtained. Then, statistical analysis was carried out and thus, results were drawn. In all 30 completely filled answer sheets were obtained. After that, scoring was done and thus saw data was obtained. Then, statistical analysis was carried out and thus, level. results were drawn.

## RESULTS AND DISCUSSION

### Objective

1. To examine the effect of game integration program as intervention on level of inattention in ADHD children.

### Hypothesis

1. There would be a significant difference in the level of inattention symptoms before and after game integration program as an intervention in ADHD children. Table-1

#### Showing Mean, S.D. and 't' of Pre-test and Post-Test on Inattentive (IA)

Group	N	Mean	SD	S.E. E	t
Pre test	30	23.43	2.192	.400	6.343*
Post-Test	30	19.77	2.285	.417	

\* Significant at .05 level (2.04)

Table No. 1, the Mean, S.D & S.E of IA (Inattentive) i.e., Pre-test was  $23.43 \pm 2.192$ , 0.400, and Post-test of IA (Inattentive) was  $19.77 \pm 2.285$ , 0.417. The acquired value (6.343) was higher than the tabulated value (2.04) required for the t-test to be statistically significant at the .05 level of confidence, indicating that there was a significant difference between pre-test and post-test of ADHD children based on IA.

Video game training (VGT) was conducted that some characteristics of computer - based games such as plus the video game elements on children with ADHD. Green and Bavelier (2006) was recommended that "video game has a causal role in increasing the number of items kept in visual attention. Other studies, investigator was a single administration of video game as intervention in children and adolescents with

ADHD” (Green and Bavelier, 2006). The result was shown that “video game has used to encourage a state of great cognitive performance such as increasing the activate level and improved motivational performance, attention level” (Koepp MJ, Gunn RN, Lawrence AD, CunninghamVJ, Dagher A, Jones T, et al., 1998, and Tahiroglu A, Celik G, Avci A, SeydaogluG, Uzel M, Altunbas, 2010) and “inhibitory responses” (Lawrence et. Al., 2002, Shaw R et. Al.,2005). Another study was shown that physical exercise as a treatment have positiveeffect on ADHD such as decrease inattention level, hyperactivity and impulsivity behaviours in people or players (Gapin, & Etnier, 2013).

#### Objective

- To examine the effect of play game and video game as intervention on levelof hyperactive – impulsive in ADHD children.

#### Hypothesis

- There would be a significant difference in the level of hyperactive- impulsive symptoms before and after video game and play games as an intervention program in ADHD children.

Table- 2

**Showing Mean, S.D. and 't' of Pre-test and Post-Test on Hyperactive-Impulsive (HI)**

Group	N	Mean	SD	S.E. E	T
Pre test	30	20.67	3.089	.564	4.454*
Post-Test	30	17.33	2.695	.492	

\* Significant at .05 level

Table No. 2, the Mean, S.D & S.E of Hyperactive- Impulsive (HI) i.e., Pre- Test was  $20.67 \pm 3.089$ ,  $0.400$ , and Post-test was  $17.33 \pm 2.695$ ,  $0.492$ . The “t-test was statistically significant as the obtained value (4.454) was higher than the tabulated value (2.04) required for the t-test to be significant at .05 level of confidence, which shows that there was significant difference between Pre-Test and Post-Test in ADHD children on the basis of Hyperactive- Impulsive (HI)”. Gapin et al. (2011) was found that “several studies result shown the positive effect of physical game or exercise on the behaviour of people with ADHD in improving various factors such as self- awareness, self-esteem, behavioural capacity as well as decreasing behavioural problems in involved inattention, hyperactivity, aggression, and negativism” (Aggelopoulou-Sakadami, 2004).

#### Objective

3. To examine the interaction effect of play game and video game as intervention on inattention and hyperactive- impulsive symptoms in ADHD children.

#### Hypothesis

3. There would be a significant difference in the level of ADHD symptoms (inattention and hyperactive- impulsive) before and after play games and video game as an intervention program in children.

Table- 3

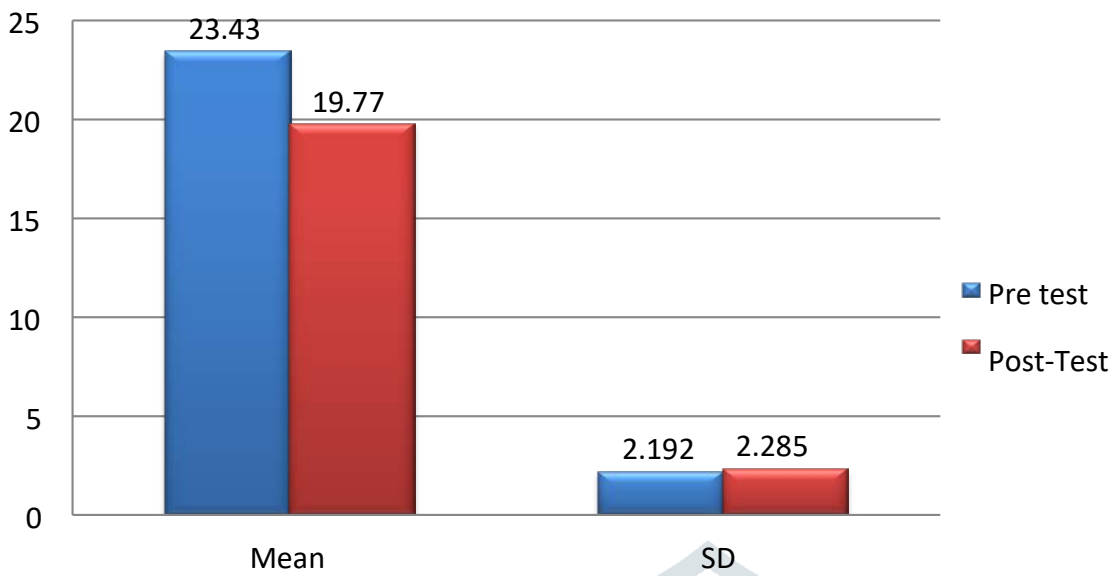
**Showing Mean, S.D. and 't' of Pre-Test and Post-Test mADHD (Inattentive, Hyperactive – Impulsive)**

Group	N	Mean	SD	S.E. E	t
Pre test	30	44.10	4.788	.874	5.841*
Post-Test	30	37.10	4.490	.820	

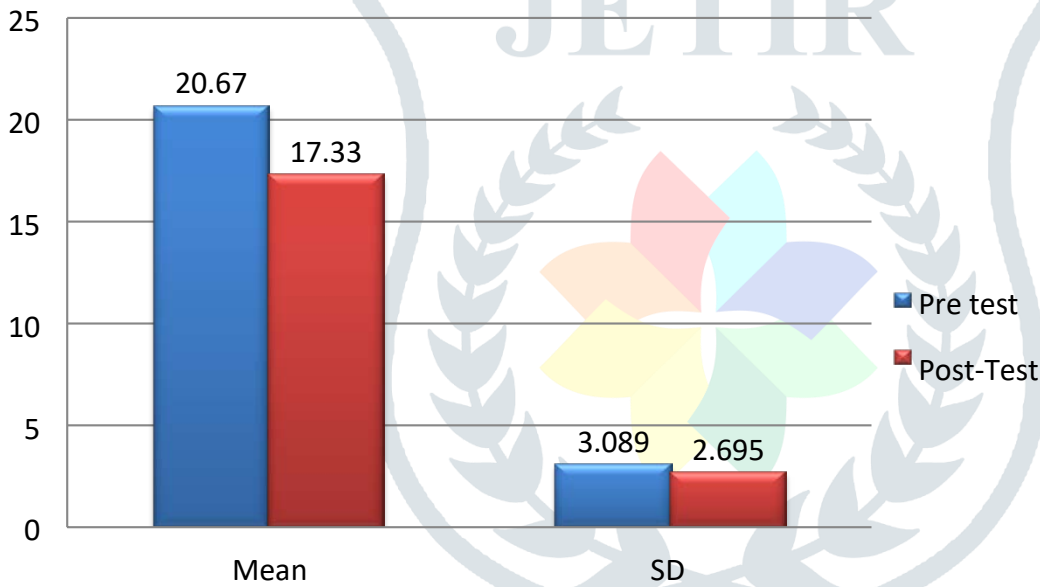
\* Significant at .05 level

In the below revealed Table No. 3, the Mean, S.D & S.E of ADHD(inattentive, hyperactive – impulsive) symptoms in children i.e., Pre-Test was  $44.10 \pm 4.788$ ,  $0.874$ , and Post-test was  $37.10 \pm 4.490$ ,  $0.820$ . The 't'-test was statistically significant as the obtained value  $5.841$  was higher than the tabulated value ( $2.04$ ) required for the t-test to be significant at .05 level of confidence, which shows that there was significant difference between Pre- Test and Post-Test on the basis of ADHD symptoms include inattentive, hyperactive – impulsive". A "meta-analysis" conducted by Nikkelen et al. (2014) found that "positive correlations have for the studies in which focused on inattention ( $r+ = .32$ ) and impulsivity ( $r+ = .11$ ) ADHD related behaviours with media use. In this study included Across 29 cross-sectional, 12 longitudinal studies and four experimental studies had shown significant positive correlation found ( $r+ = .12$ ) between general media used such as television and video games, and established a combined level of attention, impulsive, and hyperactive problems, or behaviours" (Nikkelen et al., 2014). A recent physical activity or exercise program as treatment for ADHD children include too diffident to high intensity interval training and cognitive tasks are suitable. The outcomes have benefits imitate the positive correlation between cognition and physical activity, and these benefits will also lead to changes in executive function after long-term training (Yuan, S. C. (2021).

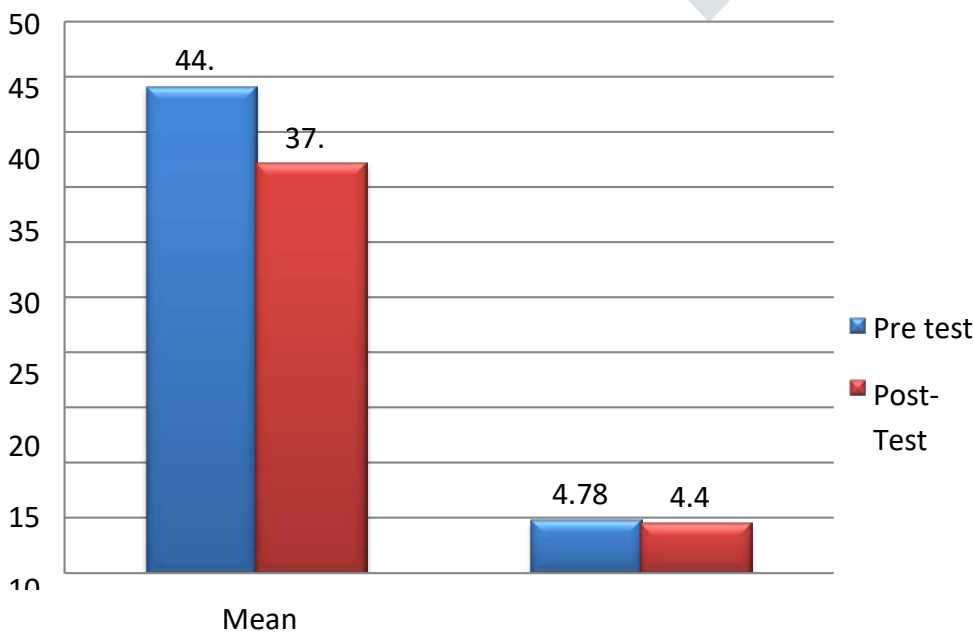
**Graph- 1**



**Graph-2**



**Graph-3**



## CONCLUSION

The purpose of the study to examine effect of game integration intervention program as treatment in ADHD children. In present study, focus game intervention program (online and offline) through treatment of ADHD children.

It is concluded that there is a significant difference between before and after of game integration program as an intervention program in ADHD symptoms included inattention symptoms such as enhanced attention level, boost concentration and hyperactive- impulsive symptoms such as reduce quick temper, decrease moment of foot tapping leg and hands are shaking as well as control impulsive behaviors in children with ADHD.

## LIMITATIONS OF THE STUDY

- 1) One of the most persuasive study limitations is the low number of participants in study and limited to a certain extent by the age of the samples.
- 2) Another limitation of this study was that the participant sample was limited in Jaipur.
- 3) Declining some centers for applying video and play game sessions that leading to inability of carrying out this study for a larger number of children.

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