



## Utilization of Electronic Nursery Games and Mental Skills Development in Preschoolers in Public Early Child Care Centres in Rivers State

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### Abstract

The study determined the relationship between the utilization of electronic nursery games and mental skills development in preschoolers in public early child care centres in Rivers State. The study had three objectives, three research questions, and three corresponding null hypotheses. A correlational research design was adopted, targeting a population of 7,589 preschoolers in nursery three (transition class) in public early child care centres across Rivers State. A sample of 755 preschoolers was selected using a stratified random sampling method. Data were collected using two researcher-designed instruments: The Brain Games Observational Checklist (BGO) and the Mental Skills Checklist (MSC). The instruments were validated by three experts in Early Childhood Education and Measurement and Evaluation, yielding reliability coefficients of 0.83 and 0.78, respectively, established using the split-half method. The collected data were analyzed using inferential statistics, Pearson's Product Moment Correlation to answer the research questions and inferential statistics (multiple regression analysis) to test the null hypotheses at a 0.05 significance level. Findings revealed that the use of electronic nursery games significantly enhanced preschoolers' mental skills in terms of attention, concentration, and visualization. Shadow Brain Teasers were found to be the most effective across all domains, while Optical Illusion, Memory Games, and Colour Words had a more pronounced effect on visualization. Based on the findings, recommendations include encouraging school administrators and educators to integrate electronic nursery games into preschool curricula, ensuring guided instruction, and further exploring individual differences in cognitive benefits through future research.

**Keywords:** Electronic Nursery Games, Mental Skills Development, Preschoolers, Attention, Concentration

### Introduction

The development of human mental capacity is a process that evolves right from conception through the early childhood period. It is associated with biological, psychological and intellectual potentials required for daily living; hence the caution on adequate care and attention during pregnancy and infancy to prevent anomalies that may jeopardize this process and ensure proper development of the fetus in-utero or the newborn infant, postnatally. This is because a deficiency in biological and psychological materials may lead to the development of abnormalities, which could be congenital or even after birth and capable of affecting normal mental and intellectual development that lead to skills acquisition (Anita, 2011). Retrospectively, it is worthy to note that hitherto this digitalized era, the acquisition of mental skills among children and its facilitating materials was the traditional chalk board and oral approach of imparting knowledge to pupil. To a great extent, the mental skill acquired then and its associated individual capability was commensurate to the economic, industrial, social and cultural need of the people in that era. However, considering the reality of life and its changing process, it is obvious that such erstwhile method, approach, process and the associated skill it offered are bound to surrender to the forces of change. Again, judging from the fact that children are the acclaimed leaders of tomorrow, it is also necessary to guide them to develop skills that will be required to meet the task ahead, which is requisite mental skills; even though there is no more controversy to the fact that the neonates are not mentally empty as propounded by John Lock's tabular rasa theory (Eze & Ugwu, 2017). It is still germane to properly guide the children towards the development of mental skills that will meet the taste of time. And being that a significant amount of human

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brain development takes place during the early childhood period (UNICEF, 2017), from birth to five years. The presentation of materials that enhance the development of certain mental skills required for proper functioning is a worthwhile exercise. The panacea to this demanding task is the utilization of appropriate electronic nursery games that initiate a stimulation of the brain and bodily activities, leading to development and improvement in mental skills in the developing child. Raghu (2009) described the word utilization in terms of asset performance measurement, where it is seen as the transformation of inputs into set goals. Asogwa et al. (2013) explained utilization in terms of the rate or how often an instructional material is put into use by educators, depending on their availability in the school.

Utilization in this case means the employment of electronic nursery games in the inculcation of mental skills abilities in preschoolers in public early child care centres. The appropriateness of using electronic nursery games in stimulating mental skills development in children is necessitated by the fact that the world market today is already ICT driven, and for anyone to be successful in today's economy, one will have to be ICT compliant. Hence, a quality early introduction of the children to ICT through the use of electronic nursery games in their play and learning becomes the right approach to a much-needed foundation in the usage of modern technology for the early child. One obvious truth is that our contemporary society requires children to have a level of competency that is more than just functional skills in the use ICT to function effectively and also have a competitive edge in life. Mental skills such as attention, concentration, and visualization are essential in preparing the preschoolers for future learning; therefore, they have to be developed before transition to the formal education system. For example, a child who is deficient in paying attention in the class or at play will not be able to gain maximally from any educational programme. Such a child will not grasp what is presented in school, not to talk of understanding it as attention precedes understanding. A situation such as poor attention span has to be heeded with a careful watch to rule out attention deficit hyperactive disorder (ADHD). This is because a child with ADHD will not benefit from a normal class and is likely not to be able to learn anything, even in special situations. These children experience more obstacles in their path to success than the average children as symptoms such as inability to pay attention, difficulty sitting still and lack of control of the many impulses make it difficult for a child with the diagnosis of ADHD to perform well in school. It has been estimated that three hundred and eighty-eight thousand (388,000) children between two to five years old suffer from attention deficit hyperactive disorders (O'Neil et al., 2017). Children with poor attention spans are more likely to have difficulties in school, problems with peer relationships and learning, and are at higher risk of injuries. Early recognition is important in its control, especially in a setting where caregivers and teachers in the school can demonstrate the level of commitment that can ensure efficient and effective observation of children to detect early any abnormal condition, so that the child can get the needed help to minimize the problems and benefit from school works. This is because the early years are a time for significant brain development, as well as an optimal time for children to learn positive behaviours, relationships and interests. Hence, problematic behaviours need to be addressed sooner than later.

Furthermore, concentration is a very important skill for learning. Preschoolers learn through play and other hands-on activities in which concentration is highly necessary, and a keen assemblage of component particles or items of a particular artwork will produce the needed product as well as teach a particular skill required in a child. Testing out this ability in the child will help caregivers detect early any problem with concentration, to proffer solution to it and prevent a problem with poor concentration which manifests as inability to focus on events. Visualization involves focusing and identifying features of an object or whatever is presented. Children at the preschool level have a lot to do with visualization as it is a major way of learning and understanding their environment. Visualization leads to recognition and identification, which are also important aspects of childhood learning. This is expressed in the findings that the children at this level operate at the concrete stage and understand as well as believe to exist only concrete objects that can be seen or touched, making this skill an important aspect of childhood education. Again, inability to acquire this skill will reveal the problem with a child's vision. Problems such as amblyopia (lazy eye), colour blindness, myopia and several others can be detected in the course of teaching the child to visualize, and this will provide a chance for early treatment that prevents future problems in learning and play.

### Statement of the Problem

In today's digital era, technology integration in early childhood education has become increasingly significant, with electronic nursery games emerging as valuable tools for cognitive and mental skill development in preschoolers. Mental skills such as attention, concentration, and visualisation are critical for early learning as they form the foundation for higher cognitive processes, academic achievement, and problem-solving abilities. Despite the potential benefits of electronic nursery games in fostering these skills, there remains limited empirical evidence on their effectiveness in public early child care centres in Rivers State. Existing research has highlighted the role

of play-based learning in early childhood education, emphasizing the need for interactive and engaging methods to stimulate young learners. However, traditional teaching methods in many public early child care centres often rely on rote memorization, with minimal emphasis on technology-driven learning approaches. This gap in pedagogical strategies raises concerns about whether preschoolers are receiving the adequate cognitive stimulation necessary for optimal mental skill development. While various electronic nursery games such as Colour Words, Visual Games (Spot the Difference), Shadow Brain Teasers, Memory Games, and Optical Illusion activities have been designed to enhance attention, concentration, and visualization skills, their actual impact on preschoolers in Rivers State remains largely unexplored. The absence of empirical studies in this area makes it difficult for educators and policymakers to make informed decisions regarding the adoption and integration of these digital learning tools into early childhood education programs. This study seeks to bridge this knowledge gap by examining the relationship between electronic nursery games and the development of mental skills, specifically attention, concentration, and visualization, among preschoolers in public early child care centres in Rivers State.

### **Aim and Objectives of the Study**

The study aims to determine the relationship between the utilization of electronic nursery games and mental skills development in preschoolers in public early child care centres in Rivers State. Specifically, the study aimed at achieving the following objectives:

1. Ascertain the relationship between (Colour Words, Visual Games (spot the difference), Shadow Brain Teasers, Memory Games & Optical Illusion) and enhancement of mental skill in terms of attention, in preschoolers in public early child care centres in Rivers State.
2. Ascertain the relationship between (Colour Words, Visual Games (spot the difference), Shadow Brain Teasers, Memory Games & Optical Illusion) and promotion of mental skill in terms of concentration, among preschoolers in public early child care centres in Rivers State.
3. Determine if there is any relationship between (Colour Words, Visual Games (spot the difference), Shadow Brain Teasers, Memory Games & Optical Illusion) and enhancement of visualization in preschoolers in public early child care centres in Rivers State.

### **Research Questions**

The following research questions were posed to guide the study:

1. What is the relationship between the use of electronic nursery games (Colour Words, Visual Games, Shadow Brain Teasers, Memory Games & Optical Illusion) and enhancement of mental skills in terms of attention in preschoolers in public early child care centres in Rivers State?
2. How does the use of electronic nursery games (Colour Words, Visual Games, Shadow Brain Teasers, Memory Games & Optical Illusion) relate to the promotion of mental skills in terms of concentration among preschoolers in public early child care centres in Rivers State?
3. How does the use of electronic nursery games (Colour Words, Visual Games, Shadow Brain Teasers, Memory Games & Optical Illusion) relate to the enhancement of mental skills in terms of visualization in preschoolers in public early child care centres in Rivers State?

### **Hypotheses**

The following hypotheses were tested at a 0.05 level of significance:

**H0<sub>1</sub>:** There is no significant relationship between the use of electronic games (Colour Words, Visual Games, Shadow Brain Teasers, Memory Games & Optical Illusion) and enhancement of mental skills in terms of attention in preschoolers in public early child care centres in Rivers State.

**H0<sub>2</sub>:** There is no significant relationship between the use of electronic games (Colour Words, Visual Games, Shadow Brain Teasers, Memory Games & Optical Illusion) and promotion of mental skills in terms of concentration among preschoolers in public early child care centres in Rivers State.

**H0<sub>3</sub>:** There is no significant relationship between the use of electronic games (Colour Words, Visual Games, Shadow Brain Teasers, Memory Games & Optical Illusion) and improvement of mental skills in preschoolers in terms of counting in public early child care centres in Rivers State.

### **Methodology**

The correlational research design was adopted for the study to establish the relationship between electronic nursery games and the development of mental skills (attention, concentration, and visualization) among preschoolers in public child care centres in Rivers State. The design was relevant in this study because the researcher wanted to establish the relationship between the two major variables under study. The study was conducted in Rivers State. All the 7589 registered preschoolers in nursery three (transition class) in the 521 public early child care centres in

the state made up the population for this study. This population was found in all the public early child care centres in the State (Rivers State Universal Basic Education Board, 2018). 755 preschoolers constituted the sample of the study, selected through the stratified random sampling method. To select this sample, the entire 23 local government areas (LGA) in the state were stratified into three strata of urban, rural and riverine, based on their topography. Then 20% of the LGAs in each stratum were randomly selected; this yielded two local government areas from each stratum, giving a total of six local government areas that house 177 public early child care centres. Two instruments, the Brain Games Observational Checklist (BGOC) and Mental Skills Checklist (MSC), were used to generate data for the study. Then, an electronic nursery games, which are a set of games that are presented electronically to the children, for play, entertainment as well as learning were used as stimulus. Mental Skills Checklist (MSC), a researcher-designed instrument containing 18 items covering the variables under study, was used to obtain information on the children's performance as they responded to the actions and questions posed in the games during the study. The instrument has a 3points option of 3, 2 and 1 for the responses based on the performance of the children while watching the games. If the child performs the expected action all the times, he scores 3, if sometime he scores 2 and if he did not perform the action at all he scores 1.

The Brain Games Observational Checklist (BGOC), also a researcher-designed instrument, was used to obtain data on the children's performance while playing the games. The instrument contained 25 items, measuring the activities carried out by the children and also had a 3-point score of 3 when the children perform the actions very easily, 2 when actions were just performed easily and 1 when they hardly perform the actions. The instruments were shown to the researcher's supervisor and two other experts in the department of Early Childhood/Primary Education, who made corrections and very useful inputs. The same were effected before pilot testing of the instruments was done. The instruments were finally approved by the research supervisor for use as a tool for data collection. The split-half method was used to determine the reliability of the instruments. A total of 30 copies of the instruments were administered on 30 preschoolers in a public early child care centre in Andoni Local Government Area, who were not part of the study. The items of the instruments shared into two based on even and odd numbers items and were first correlated using the Pearson Product Moment Correlation, then the Spearman formula established the reliability of the instruments to obtain indices of 0.83 and 0.78 for Brain Games Observational Checklist (BGOC) and Mental Skills Checklist (MSC) respectively. The instruments were administered on a one-on-one basis by the researcher and five trained early childhood experts. The letter of introduction was submitted ahead of time to the head teachers and the caregivers in the different schools, and a particular date for the data collection was chosen. On the agreed date, the researcher and assistants arrived at the centre with the instruments, which included a laptop, overhead projector and a piece of white material that acted as a screen. The participants were grouped into three in all the schools visited to enable the assessors to have smaller groups to deal with. The games were then projected on the screen for the children to watch and play with while the researcher and assistants observed and ticked the checklists. At the end, all the children in the classes used were appreciated, and all instruments and data were gathered and taken home for coding and analysis. All the instruments were screened for completeness before data entry and analysis. Quantitative data from the instruments were coded and entered using the Excel data entry program. Research questions were answered using Pearson Product Moment Correlation, while hypotheses were tested using multiple regression analysis.

## Results

**Research Question 1:** What is the extent to which the games (Colour Words, Visual Games (spot the difference), Shadow Brain Teasers, **Memory Games & Optical Illusion**) relate to enhancement of mental skills in terms of attention in preschoolers in public early child care centres in Rivers State?

**Table 1: Summary of Pearson's correlation matrix on the relationship between games and enhancement of mental skill (attention) in preschoolers in public early child care centres in Rivers State.**

| SN | Variable            | N=753                                  | 1              | 2              | 3              | 4              | 5              | 6 |
|----|---------------------|--|----------------|----------------|----------------|----------------|----------------|---|
| 1  | Visual Game         | Pearson Correlation<br>Sig. (2-tailed) | 1              |                |                |                |                |   |
| 2  | Optical Illusion    | Pearson Correlation<br>Sig. (2-tailed) | .698**<br>.000 | 1              |                |                |                |   |
| 3  | Shadow Brain Teaser | Pearson Correlation<br>Sig. (2-tailed) | .705**<br>.000 | .681**<br>.000 | 1              |                |                |   |
| 4  | Colour words        | Pearson Correlation<br>Sig. (2-tailed) | .415**<br>.000 | .040<br>.277   | .401**<br>.000 | 1              |                |   |
| 5  | Memory Games        | Pearson Correlation<br>Sig. (2-tailed) | .429**<br>.000 | .333**<br>.000 | .318**<br>.000 | .317**<br>.000 | 1              |   |
| 6  | Attention           | Pearson Correlation<br>Sig. (2-tailed) | .647**<br>.000 | .664**<br>.000 | .909**<br>.000 | .322**<br>.000 | .389**<br>.000 | 1 |

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The result from Table 1 shows the summary of Pearson's correlation matrix on the relationship between the use of games (Colour Words, Visual Games (spot the difference), Shadow Brain Teasers, Memory Games, & Optical Illusion) and enhancement of mental skill (attention) in preschoolers in public early child care centres in Rivers State. It shows that there were positive and strong relationships between the use of games and enhancement of mental skill in terms of attention in preschoolers in public early child care centres in Rivers State. (Colour Words,  $r=0.322$  Visual Games (spot the difference),  $r=0.647$  Shadow Brain Teasers  $r=0.909$  Memory Games,  $r=0.389$  & Optical Illusion,  $r=.664$ )

**Research Question 2:** To what extent do games (Colour Words, Visual Games (spot the difference), Shadow Brain Teasers, Memory Games & Optical Illusion) relate to promotion of mental skills in terms of concentration among preschoolers in public early child care centres in Rivers State?

**Table 2: Summary of Pearson's correlation matrix on the relationship between games and promotion of mental skill (concentration) among preschoolers in public early child care centres in Rivers State.**

| SN | variable            | N=753                                  | 1              | 2              | 3              | 4              | 5              | 6 |
|----|---------------------|--|----------------|----------------|----------------|----------------|----------------|---|
| 1  | Visual Game         | Pearson Correlation<br>Sig. (2-tailed) | 1              |                |                |                |                |   |
| 2  | Optical Illusion    | Pearson Correlation<br>Sig. (2-tailed) | .698**<br>.000 | 1              |                |                |                |   |
| 3  | Shadow Brain Teaser | Pearson Correlation<br>Sig. (2-tailed) | .705**<br>.000 | .681**<br>.000 | 1              |                |                |   |
| 4  | Colour words        | Pearson Correlation<br>Sig. (2-tailed) | .415**<br>.000 | .040<br>.277   | .401**<br>.000 | 1              |                |   |
| 5  | Memory Games        | Pearson Correlation<br>Sig. (2-tailed) | .429**<br>.000 | .333**<br>.000 | .318**<br>.000 | .317**<br>.000 | 1              |   |
| 6  | Concentration       | Pearson Correlation<br>Sig. (2-tailed) | .603**<br>.000 | .515**<br>.000 | .853**<br>.000 | .376**<br>.000 | .373**<br>.000 | 1 |

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The result from Table 2 shows the summary of Pearson's correlation matrix on the relationship between the use of games (Colour Words, Visual Games (spot the difference), Shadow Brain Teasers, Memory Games, &

Optical Illusion) and enhancement of mental skills in terms of concentration among preschoolers in public early child care centres in Rivers State. It shows that there were positive and strong relationships between the use of games and enhancement of mental skill in terms of concentration in preschoolers in public early child care centres in Rivers State (Colour Words,  $r=0.367$ , Visual Games (spot the difference),  $r=0.603$  Shadow Brain Teasers,  $r=0.853$  Memory Games,  $r=0.376$  & Optical Illusion,  $r=0.373$ )

**Research Question 3:** How does do games (Colour Words, Visual Games (spot the difference), Shadow Brain Teasers, Memory Games & Optical Illusion) relate to enhancement of mental skills in terms of visualization in preschoolers in public early child care centres in Rivers State?

**Table 3: Summary of Pearson's correlation matrix on the relationship between games and enhancement of mental skills (visualization), in preschoolers in public early child care centres in Rivers State.**

| SN | Variable            | N=753                                  | 1      | 2      | 3      | 4      | 5      | 6 |
|----|---------------------|--|--------|--------|--------|--------|--------|---|
| 1  | Visual Game         | Pearson Correlation<br>Sig. (2-tailed) | 1      |        |        |        |        |   |
| 2  | Optical Illusion    | Pearson Correlation<br>Sig. (2-tailed) | .698** | 1      |        |        |        |   |
| 3  | Shadow Brain Teaser | Pearson Correlation<br>Sig. (2-tailed) | .705** | .681** | 1      |        |        |   |
| 4  | Colour words        | Pearson Correlation<br>Sig. (2-tailed) | .415** | .040   | .401** | 1      |        |   |
| 5  | Memory Games        | Pearson Correlation<br>Sig. (2-tailed) | .429** | .333** | .318** | .317** | 1      |   |
| 6  | Visualization       | Pearson Correlation<br>Sig. (2-tailed) | .556** | .555** | .883** | .435** | .430** | 1 |

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The result from Table 3 shows the summary of Pearson's correlation matrix on the relationship between the use of games (Colour Words, Visual Games, Shadow Brain Teasers, Memory Games, & Optical Illusion) and enhancement of mental skill (visualization) in preschoolers in public early child care centres in Rivers State. It shows that there were positive and strong relationships between the use of games and enhancement of mental skill in terms of visualization in preschoolers in public early child care centres in Rivers State (Colour Words,  $r=0.435$ , Visual Games (spot the difference),  $r=0.556$  Shadow Brain Teasers,  $r=0.883$ , Memory Games,  $r=0.430$  & Optical Illusion,  $r=0.555$ ).

### Hypotheses Testing

**H0<sub>1</sub>:** There is no significant relationship between the use of games (Colour Words, Visual Games (spot the difference), Shadow Brain Teasers, Memory Games & Optical Illusion) and enhancement of mental skills in terms of attention in preschoolers in public early child care centres in Rivers State.

**Table 4: Summary of multiple regression analysis on the relationship between the use of games and enhancement of mental skill (attention) in preschoolers in public early child care centres in Rivers State.**

| Model | R=0.918,<br>Adjusted R-squared=0.842.<br>F5, 747=801.659, p=0.00 | Unstandardized Coefficients |            | Standardized Coefficients |        |      |
|-------|--|-----------------------------|------------|---------------------------|--------|------|
|       |  | B                           | Std. Error | Beta                      | t      | Sig. |
| 1     | (Constant)   | -.011                       | .049       |                           | -.216  | .829 |
|       | Visual Game(X <sub>1</sub> )                                     | -.073                       | .039       | -.048                     | -1.896 | .058 |
|       | Optical Illusion (X <sub>2</sub> )                               | .046                        | .023       | .051                      | 2.004  | .045 |
|       | Shadow Brain Teaser (X <sub>3</sub> )                            | .976                        | .026       | .890                      | 37.536 | .000 |
|       | Colour words (X <sub>4</sub> )                                   | -.060                       | .020       | -.058                     | -3.055 | .002 |
|       | Memory Games (X <sub>5</sub> )                                   | .121                        | .015       | .128                      | 7.792  | .000 |

a. Dependent Variable: Attention,  $Y = -.073 X_1 + .046 X_2 + .976 X_3 - .060 X_4 + .121 X_5 - .011$

The result from Table 4 shows the summary of multiple regression analysis on the relationship between the use of games and enhancement of mental skill (attention) in preschoolers in public early child care centres in Rivers State. The result showed that there is a significant relationship between the use of games and enhancement of mental skill (attention) in preschoolers in public early child care centres in Rivers State ( $R=0.918$ ,  $F=801.659$ ,  $p=0.00$ ). The Adjusted R-squared of 0.842 showed that the when the independent variables jointly contributed 84.2% to the changes in the mental skill in term of attention among preschoolers whereas the remaining 15.80% unaccounted for might have been as a result of extraneous variables to the present study. The result further showed that only Optical Illusion (Beta=.051), Shadow Brain Teaser (Beta.890) and Memory Games (Beta.128) partially contributed positively to the changes the mental skills in terms of attention among preschoolers. The null hypothesis  $H_{01}$  was rejected at a .05 level of significance in each case.

**H<sub>02</sub>:** There is no significant relationship between the use of games (Colour Words, Visual Games (spot the difference), Shadow Brain Teasers, Memory Games & Optical Illusion) and promotion of mental skills in terms of concentration among preschoolers in public early child care centres in Rivers State.

**Table 5: Summary of regression analysis on the relationship between the use of games and promotion of mental skill (concentration) among preschoolers in public early child care centres in Rivers State.**

| Model | R=.868,<br>Adjusted R-squared=.751.<br>F5, 747=455.003, p=0.00 | Unstandardized Coefficients |            | Standardized Coefficients |        |      |
|-------|--|-----------------------------|------------|---------------------------|--------|------|
|       |  | B                           | Std. Error | Beta                      | t      | Sig. |
| 1     | (Constant)   | .311                        | .053       |                           | 5.833  | .000 |
|       | Visual Game(X <sub>1</sub> )                                   | .058                        | .042       | .044                      | 1.393  | .164 |
|       | Optical Illusion (X <sub>2</sub> )                             | -.152                       | .025       | -.195                     | -6.137 | .000 |
|       | Shadow Brain Teaser (X <sub>3</sub> )                          | .881                        | .028       | .931                      | 31.305 | .000 |
|       | Colour words (X <sub>4</sub> )                                 | -.047                       | .021       | -.053                     | -2.209 | .028 |
|       | Memory Games (X <sub>5</sub> )                                 | .113                        | .017       | .140                      | 6.769  | .000 |

a. Dependent Variable: Concentration,  $Y = .311 + .058 X_1 - .152 X_2 + .881 X_3 - .047 X_4 + .113 X_5$

The result from Table 5 shows the summary of regression analysis on the relationship between the use of games and promotion of mental skill (concentration) among preschoolers in public early child care centres in Rivers State. The result showed that there is a significant relationship between the use of games and promotion of mental skill (concentration) among preschoolers in public early child care centres in Rivers State ( $R=0.868$ ,  $F=455.003$ ,  $p=0.00$ ). The Adjusted R-squared of 0.751 showed that the when the independent variables jointly contributed 75.1% to the changes in the mental skill in terms of concentration among preschoolers, whereas the remaining 24.9% unaccounted for might have been as a result of extraneous variables to the present study. The result further showed that only Visual Game (spot the difference) (Beta=.044), Shadow Brain Teaser (Beta.931) and Memory

Games (Beta.140) partially contributed positively to the changes in the mental skills in terms of concentration among preschoolers. The null hypothesis  $H_{02}$  was rejected at a .05 level of significance in each case.

**H<sub>03</sub>:** There is no significant relationship between the use of games (Colour Words, Visual Games(spot the difference), Shadow Brain Teasers, Memory Games & Optical Illusion) and improvement of mental skills in preschoolers in terms of counting in public early child care centres in Rivers State.

**Table 6: Summary of regression analysis on the relationship between the use of games and enhancement of mental skill (visualization) in preschoolers in public early child care centres in Rivers State.**

| Coefficients <sup>a</sup> |   |                             |            |                           |        |      |
|---------------------------|---|-----------------------------|------------|---------------------------|--------|------|
| Model                     | R=.913,<br>Adjusted R-squared=.832<br>F5, 747=744.810, p=0.00 | Unstandardized Coefficients |            | Standardized Coefficients |        |      |
|                           |   | B                           | Std. Error | Beta                      | T      | Sig. |
| 1                         | (Constant)  | .209                        | .048       |                           | 4.386  | .000 |
|                           | Visual Game(X <sub>1</sub> )                                  | -.354                       | .037       | -.244                     | -9.453 | .000 |
|                           | Optical Illusion (X <sub>2</sub> )                            | .008                        | .022       | .009                      | .358   | .721 |
|                           | Shadow Brain Teaser (X <sub>3</sub> )                         | .975                        | .025       | .948                      | 38.756 | .000 |
|                           | Colour words (X <sub>4</sub> )                                | .090                        | .019       | .093                      | 4.728  | .000 |
|                           | Memory Games (X <sub>5</sub> )                                | .177                        | .015       | .201                      | 11.843 | .000 |

a. Dependent Variable: Visualization,  $Y = .209 - 354X_1 + .008X_2 + .975X_3 + .090X_4 + .177X_5$

The result from Table 6 shows the summary of regression analysis on the relationship between the use of games and enhancement of mental skill (visualization) among preschoolers in public early child care centres in Rivers State. The result showed that there is a significant relationship between the use of games and enhancement of mental skill (visualization) among preschoolers in public early child care centres in Rivers State ( $R=0.913$ ,  $F=744.810$ ,  $p=0.00$ ). The Adjusted R-squared of 0.832 showed that the when the independent variables jointly contributed 83.2% to the changes in the mental skill in term of visualization among preschoolers whereas the remaining 16.8% unaccounted for might have been as a result of extraneous variables to the present study. The result further showed that Optical Illusion (Beta=.009), Shadow Brain Teaser (.948), Colour Words (Beta.093), and Memory Games (Beta.201) partially contributed positively to the changes in the mental skill in terms of visualization among preschoolers. The null hypothesis three was rejected at a .05 level of significance in each case.

## Discussion

The result from Table 1 showed that there were positive and strong relationships between the use of games and enhancement of mental skill in terms of attention in preschoolers in public early child care centres in Rivers State. (Colour Words,  $r=0.322$  Visual Games (spot the difference),  $r=0.647$  Shadow Brain Teasers  $r=0.909$  Memory Games,  $r=0.389$  & Optical Illusion,  $r=0.664$ ). When put to statistical test using multiple regression analysis, the result from Table 6 showed that there is a significant relationship between the use of games and enhancement of mental skill (attention) in preschoolers in public early child care centres in Rivers State ( $R=0.918$ ,  $F=801.659$ ,  $p=0.00$ ). The Adjusted R-squared of 0.842 showed that the independent variables jointly contributed 84.2% to the changes in the mental skill in terms of attention among preschoolers, whereas the remaining 15.80% unaccounted for might have been as a result of extraneous variables to the present study. The result further showed that only Optical Illusion (Beta=.051), Shadow Brain Teaser (Beta.890) and Memory Games (Beta.128) partially contributed positively to the changes in the mental skill in terms of attention among preschoolers. The null hypothesis  $H_{01}$  was rejected at a .05 level of significance in each case. From the result, it can be seen that shadow brain teaser best supported the development of attention in preschoolers, followed by optical illusion and memory games. The present findings are in agreement with an earlier finding of Gwen (2014) in the bid to support the usefulness of games in enhancement of mental skills in children showed a growing evidence of school children paying more attention in class when they return from a break that is devoid of any adult intervention; but had their free play controlled by only themselves. Here, they minded their own business and paid total attention to what they did during the play section. This means that during playing, they learnt how to focus attention on the events in other not to lose tract of the activities they are carrying out while managing their play. Therefore, if children



can learn anything at all while managing their play, then they can learn a whole lot when a caregiver guides them through some useful electronic games that help them learn more than mere identification and pronunciation of the words, as seen when they play with colour word games.

However, can it be said that it was only Optical Illusion (Beta=.051), Shadow Brain Teaser (Beta.890) and Memory Games that were able to attract the children's attention? This may not be true because other authors have been able to show the benefits of other electronic games on children. For example, Eugenio (2017) in his study on the cognitive benefits of playing video games for kids. Kneteman (2019) on the surprising benefits of video games for kids respectively pointed out that electronic games are capable of enhancing social skills in children and also help them develop their sense of self, a sense of competence, boosts their self-esteem and make them learn to be autonomous. This means that the other games used in this study also contributed, though not significantly, to the enhancement of attention in preschoolers. Again, helping children learn how to be focused and concentrate on activities and also to pay attention, especially to details right from the early age is important because failure to achieve this will result in different disorders of which attention disorder is one; attention disorder is a worrisome condition as it leaves the children with difficulty to focus on any activity and carry same out with minimal mistakes. The problem of attention disorder could also surface in adult life in which the individual is not able to successfully earn a profession or even learn a trade, leading to the presence of many unbalanced adults who are not confident of achieving any task on their own and may remain a nuisance to the society. Bowen (2014) also lends his opinion on the relationship between electronic games and mental skills when he reports that violent shooter electronic games boost children's mental skills of attention, concentration, visualization and a few others required for learning, health and social skills acquisition. Other benefits include spatial navigation, reasoning, memory and perception. Going by the findings of meta-analysis of the effect of video games on children in 2013 still holds that shooter video games plays the same role as academic courses designed to enhance the same skills the games improve in the children as they work to improve the player's capacity to think about objects in three dimensions (Bowen, 2014). Furthermore, Bowen (2014) noted that while playing electronic nursery games have helped children develop a problem-solving skill, enhanced thinking was not found when playing other types of games, such as puzzles or role-playing games; which is also the case with the other two games used in this study and did not support the enhancement of attention in preschoolers.

The result from Table 2 showed that there were positive and strong relationships between the use of electronic nursery games and enhancement of mental skill in terms of concentration in preschoolers in public early child care centres in Rivers State (Colour Words,  $r=0.367$ , Visual Games (spot the difference),  $r=0.603$ , Shadow Brain Teasers,  $r=0.853$  Memory Games,  $r=0.376$  & Optical Illusion,  $r=0.373$ ). When put to statistical test using multiple regression analysis, the result from Table 5 showed that there is a significant relationship between the use of games and promotion of mental skill (concentration) among preschoolers in public early child care centres in Rivers State ( $R=0.868$ ,  $F=455.003$ ,  $p=0.00$ ). The Adjusted R-squared of 0.751 showed that the when the independent variables jointly contributed 75.1% to the changes in the mental skill in terms of concentration among preschoolers, whereas the remaining 24.9% unaccounted for might have been as a result of extraneous variables to the present study. The result further showed that only Visual Game (Beta=.044), Shadow Brain Teaser (Beta.931) and Memory Games (Beta.140) partially contributed positively to the changes in mental skill in terms of concentration among preschoolers. The null hypothesis was rejected at a .05 level of significance in each case. This finding showed that the Shadow Brain Teaser promoted concentration more in the children, followed by Memory Games and finally Visual Games (spot the difference), with all of them collectively promoting concentration up to 75.1%. This implies that whenever the games are played, 75.1% of the children's concentration can be achieved. It further suggested that an increase in the application of these electronic nursery games on the children will simultaneously increase the rate of development of concentration or any other skills that are required to be developed in the children. The present findings are in agreement with an earlier finding of Michelon (2008) which established that visual game (spot the difference) is a very good way of gaming in which both children and adults can exercise the brain, as to identify and list the difference in the two diagrams, involves the stimulation of different mental skills because different areas of the brain are involved and are exercised. For example, the occipital and parietal lobes of the brain are put in use when analyzing the spatial relationships between the observed objects.

Furthermore, the frontal lobe, in combination with the two parietal lobes, is responsible for the ability to remember the features in pictures and compare them with one another. Thus, with consistent exposure of the children to visual games, which require them to focus and be swift in their thinking, the mental skill under study will come into play and, at the same time, be promoted. The same thing was reported by Pollard (2019), that no one can play such puzzles as spotting the difference without giving a hundred percent attention and concentration, which are

some of the benefits of puzzle games. He concluded by saying that the game helps to exercise the mind and boost concentration skills, which is a very important trait to develop, especially in children, because to him, almost every problem in this universe will require complete focus, attention and reasoning to get them properly solved. The use of puzzles in the development of mental skills in children is a step in the right direction as it means training the mind to do well in other areas of life (Pollard, 2019). In a related finding, Cell Press (2011), in their study on infant training on concentration, reported that children who have adequate self-comportment right from the early childhood period do better in academics because they can maintain self-control and focus on what they do at any time, and so they learn better. They also reported that they found that differences exist in the children's ability to control their attention and concentration as early as the developmental years; in that while some children can concentrate on one object such as their books and ignore distractions, others cannot.

The result from Table 3 showed that there were positive and strong relationships between the use of electronic nursery games and enhancement of mental skill in terms of visualization in preschoolers in public early child care centres in Rivers State (Colour Words,  $r=0.435$ , Visual Games (spot the difference),  $r=0.556$ , Shadow Brain Teasers,  $r=0.883$ , Memory Games,  $r=0.430$  & Optical Illusion,  $r=0.555$ ). When put to statistical test, the result of multiple regression analysis from Table 6 showed that there is a significant relationship between the use of games and enhancement of mental skill (visualization) among preschoolers in public early child care centres in Rivers State ( $R=0.913$ ,  $F=744.810$ ,  $p=0.00$ ). The Adjusted R-squared of 0.832 showed that the independent variables jointly contributed 83.2% to the changes in the mental skills in terms of visualization among preschoolers, whereas the remaining 16.8% unaccounted for might have been as a result of extraneous variables to the present study. The result further showed that Optical Illusion (Beta=.009), Shadow Brain Teaser (.948), Colour Words (Beta.093), and Memory Games (Beta.201) partially contributed positively to the changes in the mental skills in terms of visualization among preschoolers. The null hypothesis three was rejected at a .05 level of significance in each case. This implies that whenever the games are used in the entertainment and presentation of instructional materials to preschoolers, there is a corresponding gain of 83.2% increase in their mental skills, especially in visualization. Also, a closer look at the result in Table 3 showed that the shadow brain teaser-  $r=0.883$  contributed more in the development of visualization in the children. The simple explanation for this is that the children needed to focus more and look keenly to be able to identify the shadow that corresponds to the actual picture or image, hence the high contribution. This also means that an increase in the use of shadow brain teaser will simultaneously increase the mental skills mostly required in playing the puzzle and by so doing, the children will gain in their mental skills development. However, can it be said that visualization is the only mental skill that can be enhanced by this game? The answer is no because while watching keenly to identify, there is also the application of reasoning, which helps to make the right judgment. The present findings are in agreement with an earlier finding of Kumar (2018) who pointed out that the use of shadow brain teaser in the enhancement of mental skills in children is highly goal oriented because it is capable of stimulating almost every aspects of the mental skills required for normal development such as attention, concentration, visualization, counting and reasoning. Again, in the views of Williams (2020), brain teaser as puzzles usually requires uncommon thinking to be solved, and that helps to sharpen the minds of children even when it is used by caregivers for entertainment or fun play for children in early child care centres. Other benefits of electronic nursery games, especially shadow brain teasers, include improved thinking ability as the mind becomes stronger and sharper with the engagement of the brain to solve puzzles and improvement in problem-solving skills, which occur with regular challenges at brain teasers. These benefits and more have made playing age-appropriate electronic games in the form of puzzles to bring about neuroplasticity, a condition of re-wiring of the brain, or the brain undergoing biological changes due to psychological experiences, worthwhile (Oppel 2019; Williams, 2020).

## Conclusion

The findings of this study provide substantial evidence that the use of electronic nursery games significantly enhances key mental skills such as attention, concentration, and visualization among preschoolers in public early child care centers in Rivers State. The statistical analyses demonstrated strong and positive relationships between various game types and the development of these mental skills, with Shadow Brain Teasers emerging as the most effective across all three domains. The multiple regression analysis further confirmed that a significant proportion of the variance in preschoolers' mental skill development could be attributed to the use of these games. Additionally, while Optical Illusion, Memory Games, and Colour Words contributed to improvements in visualization, their impact on attention and concentration was less pronounced. These findings align with existing literature, reinforcing the role of structured play and digital engagement in cognitive development during early childhood. Given the importance of attention and concentration in academic and social success, integrating these games into preschool curricula could serve as a strategic approach to fostering cognitive growth from an early

age. The study also highlights the need for further research to explore additional factors that may influence the cognitive benefits of electronic games, including individual differences in learning styles, duration of gameplay, and the role of guided instruction by educators. Future studies could also examine the long-term effects of these games on children's academic performance and overall cognitive development. Nonetheless, the current study underscores the importance of incorporating well-designed interactive games as a tool for early childhood education, ensuring that young learners develop essential cognitive skills engagingly and effectively.

### Recommendations

Based on the findings and the conclusion of the study, it was recommended that:

1. School administrators, educators, and caregivers should make available and adequately expose the children to the identified electronically played nursery games that serve as instructional materials because they make learning fun and interactive enough for the children to enjoy and equally show sustained interest that leads to skills enhancement.
2. Supervisors should ensure caregivers and educators adhere to the use of play, which is the recommended method of delivering instructional materials at the preschool level of education, to present the teaching materials to the children and by so doing make the preschoolers watch and play with some of the electronic nursery games identified to have a positive relationship with mental skills development in the children.
3. School administrators should ensure that some educators' or even caregivers' made games are recorded and presented electronically as entertainment and learning materials for the children.

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