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The Effect of Digital Games on Enhancing Creativity and Improving Executive Functions in Preschool Children

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This study aims to investigate the effect of digital games on enhancing creativity and improving executive functions in preschool children. This quasi -experimental study employed a pre/post -test design and a control group. A total of 60 children aged 5–6 who were very interested in drawing and highly motivated to participate in the experiment were selected to participate in the experiment. Children were randomly divided into experimental group(n=30, female=19; male=11, Mean age by month=60.2, SD=0.34), and control group (n=30, female=20; male=10, Mean age by month=60.3, SD=0.36). To verify the research hypotheses (assessing the effectiveness of digital games on executive functions and creativity of preschool children), multivariate analysis of variance (MANOVA) was conducted. The model included one between-group variable with two levels (Experimental vs. Control), one repeated-measures variable with two levels (pre-test vs. post-test), and an interaction factor (condition × time). Results of this study emphasized the significant effect of digital games on executive functions and Creativity in preschool children.

Keywords: digital games, executive functions, creativity, preschool children, teaching, learning

INTRODUCTION

Early childhood

Childhood is the first and most important period of human life, because it is considered a critical period for the development of neurobehavioral and emotional processes that underlie higher cognitive functions and psychological well-being (Kavak et al., 2020; & Emiroğlu, 2021; Polat et al., 2022). In the child's brain, situational changes occur in various functional and structural areas, especially the limbic and frontal regions (Akar & Aksoy,2021; Ezmeci et al., 2022).

Digital games

Play, which has an important place in an individual's life from the first years, is defined as an activity that involves pleasure and happiness (Biricik & Atik, 2021). Whether it develops with or without a specific purpose, rules-based or non-rules, prepares the child

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for life, and is optional in all cases, play is a learning process for the child. Play can be used to get to know the child, to educate the child, and to contribute to the child's cognitive, language, psychomotor, social, and emotional development (Uçuş, 2016). Theorists such as Froebel, Spencer, Gross, Hall, Montessori, Piaget, Freud, Vygotsky, Bruner, Smianski, and Sutton-Smith have emphasized the importance of play, which is considered a child's basic need (Durualp & Aral, 2018). Theoretically, the common view is that play has a positive impact on the child's developmental areas. From past to present, gaming culture has changed under the influence of technological advancements, and the digital age has dominated gaming. Instead of outdoor physical activity-based games, children have largely turned to indoor computer games that individualize their play (Sapsağlam, 2018). Computer games, which are highly preferred, refer to digital games based on technology and can be played on computers. Digital games, a specific field of educational technology, are captivating people's attention. Digital games are defined as any type of game, educational or non-educational, played online on a computer, console, or handheld device, depending on the platform (Kara & Taner, 2025; Yumrukuz, 2021).

Digital games are defined as "games that are programmed using various technologies and provide user input through a visual environment, guided progressively within the framework within which the game is presented, and have become a popular culture" (Aydın et al., 2024; Fleer, 2014). Computer games are elements and application areas where systems such as visual design, software, sound, music, and scenarios are used together and in harmony, interacting with the user and used for purposes such as entertainment, education, leisure, etc. In computer games, not only software and visual design but also elements such as music, scenario, plot, and graphic design are important (Blumberg et al., 2024; Soroush et al., 2014). Digital games, which have a significant place in the media and offer a medium for individual communication, provide access to many opportunities simultaneously. As digital games have become easily accessible thanks to the ease of computers, smartphones, and internet connection, the age of playing digital games has also dropped to 3-6 years old (Akyel, 2020).

Executive functions of preschool children

It should be said that executive functions develop from childhood to adolescence. Executive functions(EF) develop from childhood to adolescence. These functions play a key role in children's development and are skills that help a person pay attention and plan to complete important aspects of a task (Segundo-Marcos et al., 2022). These functions are fundamental and fundamental to many cognitive, emotional, and social skills and are associated with abnormalities in the frontal cortex (Friedman & Robbins,2022). Executive functions, and other cortical and subcortical areas (Strommer et al., 2024). Diamond (2013) defines three core EFs components: inhibition, working memory (WM) and cognitive flexibility. Inhibition is defined as the ability to control one’s behaviours, emotions and attention in order to achieve a goal without blindly following impulses. It is a crucial ability since it allows change, giving the chance to choose despite habits or salient external stimuli (Diamond, 2013). Another important component of executive functions is cognitive flexibility; that is, the ability to change the answers one gives to a question, generalize what one knows to other contexts, and

not limit its application to a specific context. In fact, flexibility is the ability to revise one's plan when encountering obstacles, new information, or errors. Flexibility is important for changing circumstances (Rahayungsih et al., 2025). Working memory is also a mental system that is responsible for the temporary storage and processing of information to perform a series of complex cognitive tasks such as understanding, reasoning, and learning (Sana & Fenesi, 2025). Working memory is also the ability to maintain information in the mind while performing complex tasks and the ability to use previous experiences.

Creativity of pre-school children

Another important concept in children that has received less attention is creativity. Creativity is considered one of the core values of modern societies and is considered a key point in contributing to the growth of knowledge societies (Marquall, 2006, cited in Ott & Posey, 2012; Liu, Cheng, & Huang, 2011). The prevailing view in this field considers creativity as novelty and appropriateness. There are many problems in the world (Paltz & Peng, 8) that can be effectively addressed by using existing or previous solutions, delegating, or consulting. However, there are some important tasks in school and in children's lives that require outcomes that are novel and unstructured, because there are no ready-made answers.

Research findings by Green and Baulier (2006) showed that computer, video/executive games are effective cognitive tools for both adolescents and adults. In addition, J. Computer (2005) believes that digital games can improve creativity and problem-solving skills, such as when they encourage players to consider different factors before making a move and to consider new strategies and goals to advance the game. In a study conducted by Green and Baulier (2003), they found associations between visual selective attention and playing computer games. Studies by Bassak et al. (2008) have also shown that playing computer games can improve executive functions including task switching, working memory, visual short-term memory, reasoning, and problem solving among children . Meyer (2014) concluded in his study that playing Tetris has a positive effect on mental rotation skills. Also, in a large-scale controlled experiment conducted by Hardy et al. (2015) who played a 15-minute game of Lemusi, they concluded that people who played a 15-minute game of Lemusi scored better on all cognitive tests than an active control group who solved a type of word puzzle. Researchers state that well-designed video/computer games can be a suitable tool for developing complex problem-solving skills and creativity that are needed in the real world (Griff & Funk, 2009). Well-designed games (such as action, puzzle, and strategy genres) improve problem-solving and creativity because they involve continuous interaction between the player and the game (Schott, Ventura, & Bauerozapata-Rivera, 2009; Van Wak, 2006).

Research gap

It seems that digital games are a new window in the development of children's skills and can affect the cognitive and behavioral skills that digital games lead to improved attention, working memory of children. Some studies have shown that digital games lead to improved attention, working memory of children. Further evidence comes from

a meta-analysis by Badiou et al. (2018). In their study, they showed that people who played digital games for at least 8 hours in action scored better on tests of perceptual attention and spatial ability than people who did not play such games. In contrast, a meta-analysis conducted by Sala, et al. (2018) showed that playing digital games has a negligible effect on attention skills and also has a negative effect on other cognitive skills such as executive functions, memory, and reasoning abilities. Therefore, it is still unclear what role digital games play in the development of cognitive skills. Given that preschool is a sensitive period for the development of creativity and executive functions (Garon et al., 2008), deficits in executive functions and creativity in children may manifest themselves as weaknesses in areas such as problem solving, learning, memory, information processing and reasoning, communicating with others and social interactions, reading comprehension, writing, completing schoolwork, playing group games, doing a project or craft (Brackmeyer, 2010).

Significance

Digital games, which have a significant place in the media and offer a medium for individual communication, provide access to many opportunities simultaneously. As digital games have become easily accessible thanks to computers, smartphones, and the ease of internet connection, the age of playing digital games has also dropped to 3-6 years old (Ozyurek et al., 2022).

Objectives

Therefore, this study aims to investigate the effect of digital games on enhancing creativity and improving executive functions in preschool children.

Hypotheses

Accordingly, the hypotheses of the present study are:

1.Digital games lead to increased executive functions (inhibition, cognitive flexibility and working memory) of preschool children.

2. Digital games lead to increased creativity (fluidity, flexibility, expansion and initiative) of preschool children

METHOD

Design

This quasi -experimental study employed a pre/post -test design and a control group.

Sample

After communicating with the kindergarten teachers in Al Majma'ah City in Saudi Arabia, we learned that the kindergarten classes are highly correlated with age. Children in the kindergarten small class are 3–4 years old, middle class children are 4–5 years old, and senior class children are 5–6 years old. After introducing the purpose of this experiment and the experimental requirement that an equal number of children is

required, the teachers actively cooperated with the experimental requirements. In the end, a total of 60 children aged 5–6 who were very interested in drawing and highly motivated to participate in the experiment were selected to participate in the experiment. The inclusion criteria for children were being within the age range of 5–6 years old and verified physical and mental health based on their school health records. All participants had normal corrected/uncorrected vision and had not used the game before the experiment. The exclusion criteria for children were having developmental, and neurological disorders. All participants, kindergarten teachers and parents of participants were informed of the purpose of the experiment in advance and agreed to participate in writing. Children were randomly divided into experimental group(n=30, female=19; male=11, Mean age by month=60.2, SD=0.34), and control group (n=30, female=20; male=10, Mean age by month=60.3, SD=0.36).

All procedures in studies involving human participants were performed in accordance with the ethical standards of the institution's Human Research Ethics Committee of Al Majma'ah University

Data collection tools

The tools along with instructions was translated to Arabic by a Ph.D. of English language teaching and psychologist separately. A 3-person group consisting of two translators, and a psychologist reviewed the primary translated version. The tools were translated back to English by an independent translator (Ph.D. in English language teaching).

*Assessment of children's executive function:*The Behavior Rating Inventory of Executive Functions (BRIEF) for Schoolchildren (Gioia et al., 2000) was developed by Gioia et al. (2000). This is the Chinese version of the questionnaire, published by PAR Publishing. The BRIEF assesses executive functioning in children aged 6 to 18 in their daily lives. The questionnaire consists of 86 items and includes two indices: the behavioral regulation index (BRIEF), which measures inhibition, shifting, and emotional regulation, and the metacognition index (MCI), which measures initiation, working memory, planning/organization, organization of materials, and self-monitoring. Each item is scored on a scale of 1 to 3, depending on frequency. Higher scores reflect more severe impairment in executive functioning. Scoring is performed using a T-score, with scores above 65 indicating clinically significant improvement in that dimension. The BRIEF has test-retest reliability ranging from .76 to .85. The content validity of this scale has been confirmed. The Cronbach's alpha coefficient of this scale was also obtained as 0.87.

The Torrance Test of Formal Creative Thinking (Figure B) was chosen because it is suitable for children aged three to seven years, and it has high validity and reliability (Qattami & Ashar,2007). The test uses drawing as a means of answering, making it popular and acceptable for children aged five to six, in addition to its simplicity of presentation and use. The test consists of 36 circles of the same size on two consecutive pages. The examinee is asked to draw as many pictures as possible within the time limit (ten minutes), making the circles the main part of their drawings. This is done by adding

pencil lines, either inside or outside the circle, or inside it together, in any place they choose to complete the picture or shape they see. They then place an unusual title that expresses a new idea under each picture. By correcting this activity, the examinee receives three types of grades: fluency, flexibility, and originality. The total score for the three activities represents the overall creativity grade. (The trainee students wrote the title of the drawing after asking the child about the title they would give to each one.) (Circle drawn if the drawing is not clear). The Cronbach's alpha coefficient for this questionnaire demonstrated good internal consistency: 0.888. Regarding convergent validity, the Average Variance Extracted (AVE) for STQ was 0.56, which is slightly above the threshold of 0.5, indicating that the construct explains more than half of the variance in its indicators. The Composite Reliability (CR) was 0.86, which is above the acceptable threshold of 0.7, suggesting good internal consistency and reliability.

Intervention and implementations

Intervention Program: In order to implement cognitive games, the computer games Lumosity and Tetris were used, which were examined in the continuation of each game. Tetris game: This game was designed by Russian game designer and programmer Alexei Pajitnov (Shahmoradi et al., 2022). Puzzle pieces fall from the top of the screen and the player must arrange the pieces on a line at the bottom of the screen. If the player fails, the puzzle pieces pile up and a pile of pieces is formed that reaches the top of the screen. In this case, the game ends. The subjects in the Tetris experimental group received this program individually in 16 sessions, 2 one-hour sessions per week, for approximately two months.

Lumosity game: Lumosity is the name of a program that has been published with the slogan "Brain Training" by the company Lumosity Labs for both Android and iOS operating systems. This program can be considered the most complete and best mobile application designed in the field of enhancing intelligence, memory, and efficiency of the human brain (Nouchi et al., 2013). The Lumosity program is based on a vast range of research and studies by great researchers and provides exercises in the form of a game to enhance the memory and analytical power of the human brain with scientific methods. It is interesting to know that this application is currently the most popular mobile application presented in the aforementioned field. The Lumosity game teaches five basic memory skills, It measures attention, speed, flexibility, and problem-solving skills of individuals. The Lumosity experimental group received these games in 16 sessions, 2 one-hour sessions per week for about two months.

Statistical analysis

To verify the research hypotheses (assessing the effectiveness of digital games on executive functions and creativity of preschool children), multivariate analysis of variance (MANOVA) was conducted. The model included one between-group variable with two levels (Experimental vs. Control), one repeated-measures variable with two levels (pre-test vs. post-test), and an interaction factor (condition × time). Post hoc analyses were performed to compare between- and within-groups. For variables with a normal distribution, Student's t-test was used, and for variables with a non-normal

distribution, the Mann-Whitney U test was used. The threshold for statistical significance was set at $p < 0.05$. See Table 1 for means and standard deviations of pre scores across groups.

FINDINGS

Before the intervention, there were no differences in the executive functions and creativity between the comparative groups. After the intervention, statistically insignificant increases in executive functions and creativity was observed. A statistically significant group × time interaction effect was observed for artificial intelligence literacy learning achievement ($F = 87.20$; $p = 0.001$). Post-hoc analysis showed a difference between the groups in the assessment after the intervention ($p = 0.001$). The experimental group reported higher executive functions scores than the control group.

Also a statistically significant group × time interaction effect was observed creativity ($F = 89.20$; $p = 0.001$). Post-hoc analysis showed a difference between the groups in the assessment after the intervention ($p = 0.001$). The experimental group reported higher creativity scores than the control group.

Table 1
Pretest Scores. Means, standard deviations, t-value and significance level for experimental and control groups on age (by month), IQ, executive functions and creativity

Variable	Group	N	M	SD	t-value	P
Age	Experimental	30	59.3	2.96	-.120	-
	Control	30	59.1	2.01		
IQ	Experimental	30	110.34	2.47	-.225	-
	Control	30	110.89	2.20		
Creative Thinking	Experimental	30	14.98	3.50	-.547	-
	Control	30	14.02	3.63		
Executive function	Experimental	30	120.70	2.21	-.550	-
	Control	30	120.11	3.04		

Table 2
Pre-post differences in executive functions and creativity within and between experimental and control groups.

Outcome measure	Group	Pre-test		Post-test		Between-subjects effects		
		M	SD	M	SD	Group	Time	Group X Time
						P	P	P
Creative Thinking	Experimental	14.98	3.50	27.17	1.12	0.375	0.001	0.001
	Control	14.02	3.63	16.12	2.16			
Executive function	Experimental	120.70	2.21	200.14	1.12	0.390	0.001	0.001
	Control	120.11	3.04	130.20	2.16			

M – mean; SD – standard deviation; Bold indicates significant value at $p < 0.05$.

DISCUSSION

This study aimed to determine the effectiveness of digital games (Lumosity and Tetris) on improving executive functions and creativity in preschool children. The research problem has been addressed.

Executive functions

The first hypothesis of the present study emphasizes the significant effect of digital games on executive functions in preschool children. The results showed that digital games (Lumosity and Tetris) were effective in improving executive functions in preschool children. Digital games are efficient tools for fostering cognitive skills (Plass et al., 2015). Most individuals begin playing games at a young age. Research shows that well-designed digital games can enhance EFs, underscoring their potential as a tool for cognitive development (Homer et al., 2018; Parong et al., 2017; Plass et al., 2019). The digital educational game training could effectively improve the creative thinking of preschool children(Xiong et al., 2022).

Play is a process that children enjoy, and it can be said that combining education with a process that is enjoyable for the child can increase the effects of education and, in fact, pave the way for improving the cognitive aspects of the individual through an enjoyable activity(Plass et al., 2023). In fact, computer games challenge children and stimulate their curiosity, and this curiosity increases their motivation in the learning process and, as a result, improves attention (Hovey & Jakubowicz, 2024). Perhaps, from an intuitive point of view, it can be argued that playing digital games is an imaginative and engaging experience, and It can be useful in children's lives because these games can greatly attract the child's attention and regulate his level of arousal; that is, by diverting children's attention from distracting issues and encouraging them to increase their concentration, it paves the way for improving their attention. The findings highlight the critical role of digital games aimed at enhancing EFs(Hovey & Jakubowicz, 2024). High-integration games, which incorporate features such as adaptive difficulty, incentive systems, and engaging narratives, demonstrate significant potential for improving specific EF skills.

In explaining the effectiveness of cognitive games in strengthening executive function, we can point to the nature of the game Lumosity and Tetris. In fact, the game Lumosity and Tetris are games that focus on working memory and train the brain. The designers of this game have received help from neuroscience experts and believe that children can witness the strengthening of their mental power by dedicating 15 minutes a day to playing various interesting intellectual games that are given to people based on their memory power. The creator of this game has marketed it with the slogan of increasing intelligence and making people prominent in society. This game series claims to strengthen the brain muscles with continuous daily exercises along with providing children with points in different sections in a user-friendly and beautiful environment. (Checa-Romero & Gimenez-Lozano, 2025)

The main goal of the Lumosity game is to strengthen memory and mind, which it pursues through a very beautiful user interface and visual environment, numerous and

diverse games, the ability to display the user's mental achievements from different aspects, and the ability to compare one's performance with others (Al-Thaqib et al., 2018). In addition, presenting tasks from simple to difficult allows children to have more motivation to complete the task while mastering the initial skills to perform more difficult tasks. In most computer games, images are much more important than words and allow individuals to track a moving object and determine its location at different times and have a curious awareness of reality(Lai & Hu,2025).

Creativity

The second hypothesis of the study was the effect of cognitive games on the creativity of preschool children. The results showed that computer cognitive games were effective in improving creativity and all its components.

One of the issues that has attracted the attention of many psychologists today is the issue of children's creativity. Throughout history, creativity has been a manifestation of mystical inspiration, and it is only in modern times that creativity has become a subject for research studies. The study of the development of creativity in children and its cultivation in preschool has always been accompanied by scientific and educational attractions. Ups and downs, to the point that theoretical, research and applied studies in the field of children's creativity can be considered among the necessary topics in child psychology and education. In particular, the preschool period, especially the age range of 5 to 6 years, is of particular importance from the perspective of creativity development, to the extent that some have referred to preschool ages as the first golden period for children's creativity development (Kupers et al., 2018).

Ismaili et al. (2017) showed that cognitive-based computer games are effective on the creativity of 7-year-old students. Hassani & Mohammadi (2019) showed that a creativity development program can significantly improve creativity and its components in children. Mirani Sargazi et al.(2019) showed that play plays an important role in developing creativity in preschool children. They showed that using the game method significantly increased creativity in all four of its components in the game and storytelling groups. Khaneghahi et al. (2022) showed that students who played computer games had lower scores in the dimensions of originality and elaboration than students who did not play computer games. Ott and Pozzi (2012) showed that digital games increased children's creative skills and attitudes over a three-year period. . In explaining the effectiveness of computer cognitive games on creativity, it can be said that the reason for increasing creativity is that playing removes obstacles to creativity and mental and psychological stagnation from people's feet and advances problem solving in an enjoyable and entertaining process. Also, children who have attended game sessions are more successful in finding original and new solutions to problems, and when children are exposed to teaching methods to increase creativity, they prefer playing to other methods (Vázquez-Martín et al., 2025).

LIMITATIONS

It is worth noting that the present study was limited to preschool children (4 to 5 years old), which limits the generalizability of the results obtained. Also, the limited sample size and the lack of control over variables such as experience using digital games were other limitations of this study. It is suggested that research in this field be conducted with a larger sample size and for different ages and clinical samples. This will allow for comparison of the results. It is also suggested that more measurement tools be designed and developed separately to examine executive functions in preschool children. Finally, it is suggested that the long-term effects of cognitive digital games be examined. In other words, it is suggested that multi-month follow-up tests be considered in this field.

RECOMMENDATION AND FUTURE RESEARCH

Further research should investigate how contextual variables, such as classroom integration and player motivation, interact with game design to influence EF development. Future research will explore how specific game design elements impact EFs to provide clearer insights into their effectiveness. This focus will guide researchers in developing more targeted and effective games for enhancing EFs across various contexts.

CONCLUSION

This study aimed to investigate the effect of digital games on enhancing creativity and improving executive functions in preschool children. To conclude, results of this study emphasized the significant effect of digital games on executive functions and creativity in preschool children. Digital games, with their competitive, complex, experimental, flexible, self-dynamic and ability to respond to the needs of learners, have a significant impact on creativity, learning, personality and talent of individuals. In fact, digital games, while using the motivational features of games, computer games and providing motivation to continue playing for success and benefit from the rules and principles of learning such as reinforcement urgency can be effective in improving characteristics such as active memory.

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REFERENCES

Akar, T., & Aksoy, A. B. (2021). Research Method Trends Related to Cognitive Development In 3-6 Ages Between 2008-2018 Years in Turkey. *Psycho-Educational Research Reviews*, *10*(2), 373–382. https://doi.org/10.52963/PERR_Biruni_V10.N2.25

Akyel, A. İ. (2020). The effect of digital game-supported social skills training program applied to children attending preschool education institution on social skills acquisition. (Master's Thesis). Retrieved from https://tez.yok.gov.tr.

Al-Thaqib A, Al-Sultan F, Al-Zahrani A, Al-Kahtani F, Al-Regaiey K, Iqbal M, &Bashir S. (2018) Brain Training Games Enhance Cognitive Function in Healthy Subjects. Med Sci Monit Basic Res. 24:63-69. doi: 10.12659/msmbr.909022.

Aydın, M. ., Usta, E. ., Kırımlı, H. ., & Çakıroğlu, Ünal . (2024). The More Digital You Are, The More Your Child is Addicted to Digital Games: A Correlational Study. *Psycho-Educational Research Reviews*, *13*(1), 60–76. https://doi.org/10.52963/PERR_Biruni_V13.N1.04

Biricik, Z. & Atik, A. (2021). The changing concept of play from traditional to digital and the digital play culture of children. Gümüşhane University Journal of Communication Faculty e-Journal, 9(1), 445-469.

Blumberg FC, Flynn RM, Homer BD, Bailey JO, Eng CM, Green CS, Giannakos M, Papadakis S, &Gentile DA. (2024)Current state of play: Children's learning in the context of digital games. J Child Media. 18(2):293-299. doi: 10.1080/17482798.2024.2335725

Checa-Romero M & Gimenez-Lozano JM (2025) Video games and metacognition in the classroom for the development of 21st century skills: a systematic review. *Front. Educ*. 9:1485098. doi: 10.3389/feduc.2024.1485098

Diamond, A.(2013).Executive functions. *Annual Review of Psychology,* 64 (2013), pp. 135-168, 10.1146/annurev-psych-113011-143750

Durualp, E. & Aral, N. (2018). Play development and types. In A. B. Aksoy, (Ed.), Child and play (pp. 34- 54). Ankara: Hedef

Esmaili M, Ashayerih H, Esteki M. (2017).The Effect of Computer Games on Improving Student's Critical Thinking. Advances in Cognitive Sciences. 19 (1): 14-24 .

Ezmeci, F. ., Parpucu, N., & Akman, B. . (2022). The Mediating Role of Self-Regulation Skills in the Relationship Between Social Skills and Problem Behaviors in the Early Childhood Period . *Psycho-Educational Research Reviews*, *11*(3), 738–750. https://doi.org/10.52963/PERR_Biruni_V11.N3.06

Fleer, M. (2014). The demands and motives afforded through digital play in early childhood activity settings. Learning, Culture and Social Interaction, 3(3), 202-209.

Friedman, N.P.,& Robbins, T.W. (2022)The role of prefrontal cortex in cognitive control and executive function. *Neuropsychopharmacol.* **47**, 72–89 . https://doi.org/10.1038/s41386-021-01132-0

Gioia, G., Isquith, P., Guy, S., & Kenworthy, L. (2000). BRIEF: Behavior Rating Inventory of Executive Function. Odessa, FL: Psychological Assessment Resources.

Gözüm, A. İ. C. & Kandır, A. (2020). Investigation of preschool children's play tendency and concentration levels according to their duration of playing digital games. Atatürk University Kazım Karabekir Faculty of Education Journal(41), 82-100

Hovey C&Jakubowicz S(2024)Motion Design for Emotion Design Games and Learning Alliance10.1007/978-3-031-78269-5_32(337-342)Online publication date: 20-Nov-2024

Hassani, K, Mohammadi, I .(2019). The effect of computer games on the creative thinking of children in preschool centers in Marivan, Third International Conference on Innovation and Research in Educational Sciences, Management and Psychology, Tehran .

Kara, D., &Taner Derman, M. (2025).Digital play addiction and interactive peer play behaviors in preschool children. *Educ Inf Technol* **30**, 21849–21888 https://doi.org/10.1007/s10639-025-13518-4

Kavak, Şule, & Deretarla Gül, E. (2020). Bilingualism in Early Childhood: Code Switching. *Psycho-Educational Research Reviews*, *9*(3), 70–83. Retrieved from https://www.perrjournal.com/index.php/perrjournal/article/view/114

Keleş , O., & Emiroğlu, T. (2021). The Scale of Determining the Problem Behaviors of Children in Preschool Period: A Validity and Reliability Study. *Psycho-Educational Research Reviews*, *10*(3), 350–361. https://doi.org/10.52963/PERR_Biruni_V10.N3.22

Khaneghahi, S., Pudineh, A., & Zehi, M. A. M. (2022). Investigating the effect of intellectual computer games on creative thinking skills and increasing concentration in children of divorce. *Journal of Social, Humanity, and Education*, *2*(4), 283–293. https://doi.org/10.35912/jshe.v2i4.946

Kupers, E., Lehmann-Wermser, A., McPherson, G., & van Geert, P. (2018). Children's Creativity: A Theoretical Framework and Systematic Review. *Review of Educational Research*, *89*(1), 93-124. https://doi.org/10.3102/0034654318815707

Lai, C.-H., & Hu, P.-Y. (2025). The Gaming Revolution in History Education: The Practice and Challenges of Integrating Game-Based Learning into Formal Education. *Information*, *16*(6), 490. https://doi.org/10.3390/info16060490

Mirani Sargazi, N,.Shafiei-Sarvestani, M., Pudineh, F, & Besharatnia, M.S.(2019).Investigating the Impact of Educational Computer Games Strategy on Creative Thinking Management in Children Using Interactive Strategies: A Controlled Clinical Trial, Journal of Research in Rehabilitation Sciences, 15(2), 79-85

Nouchi R, Taki Y, Takeuchi H, Hashizume H, Nozawa T, Kambara T, et al. (2013) Brain Training Game Boosts Executive Functions, Working Memory and Processing Speed in the Young Adults: A Randomized Controlled Trial. PLoS ONE 8(2): e55518. https://doi.org/10.1371/journal.pone.0055518

Ott, M., & Pozzi, F. (2012). Digital games as creativity enablers for children. Behaviour & Information Technology, 31(10), 1011- 1019.

Ozyurek, A., Yildirim, N., Aydin, U., Yazgan, E., Korkut, A., Ersan, E., … & Karabulut, Z. E. (2022). An examination of digital games played by preschool children. TEBD, 20(3), 950-972. https://doi.org/10.37217/tebd.1078627

Plass JHomer B; Bromley M; Froehlich F Shao YY; &oung J(2023)Does Digital Game Play Affect Social/Emotional Child Wellbeing? Serious Games10.1007/978-3-031-44751-8_11(155-170)Online publication date: 26-Oct-2023

Polat, Özgül ., Kurtuluş Küçükoğlu, E. ., & Aydın, E. . (2022). Analysis of the Effect of Mind Mapping Studies on the Acquisition of the Concept of Time Among 60-72 Month-Old Children. *Psycho-Educational Research Reviews*, *11*(1), 254–269. https://doi.org/10.52963/PERR_Biruni_V11.N1.16

Qattami, Y. and Ashar, I. (2007). School Thinking at the Primary stage. Amman: Debotoo Publishing House.

Rahayungsih, S., Ade Eka Anggriani, Mardhatillah, Siti Faizah, Yuniawatika, & Kamarudin, N. . (2025). The Relationship Between Cognitive Flexibility and Mathematical Literacy: Insights from Indonesian Elementary Students. *International Electronic Journal of Elementary Education*, *17*(3), 367–381. Retrieved from https://iejee.com/index.php/IEJEE/article/view/2309

Sana, F., & Fenesi, B. (2025). Working Memory and Instructional Fit: Reintroducing Aptitude–Treatment Interaction in Education Research. *Behavioral Sciences*, *15*(6), 765. https://doi.org/10.3390/bs15060765

Sapsağlam, Ö. (2018). Changing play preferences of preschool children. Kırşehir Education Faculty Journal, 19(1), 1122-1135.

Segundo-Marcos, R., Carrillo, A. M., Fernández, V. L., & González, M. T. D. (2022). Development of executive functions in late childhood and the mediating role of cooperative learning: A longitudinal study. *Cognitive Development, 63,* 1–16. https://doi.org/10.1016/j.cogdev.2022.101219

Shahmoradi L, Mohammadian F, &Rahmani Katigari M. (2022) A Systematic Review on Serious Games in Attention Rehabilitation and Their Effects. Behav Neurol. 2017975. doi: 10.1155/2022/2017975.

Soroush, M., Hancock, M. S. & Bohns, V. (2014). Self-control in casual games the relationship between Candy Crush Saga™ players' in-app purchases and self-control. Psychology, Computer Science, 1, 1-6. https://doi.org/0.1109/GEM.2014.7048099

Strommer N, Okon-Singer H, &Gabay S. (2024)The subcortical role in executive functions: Neural mechanisms of executive inhibition in the flanker task. Cogn Affect Behav Neurosci. 24(6):1023-1030. doi: 10.3758/s13415-024-01215-7.

Uçuş G. (2016). Metaphors of Pre-school Teacher Candidates and Pre-school Teachers about the Concept of Play and Toy. *Psycho-Educational Research Reviews*, *5*(1), 38–53. Retrieved from https://www.perrjournal.com/index.php/perrjournal/article/view/317

Vázquez-Martín, C., Ramírez-Hurtado, J.M., & Vázquez-Cano, E. (2025). Impact of video game use on fostering creativity in Waldorf School students. International Journal of Technology in Education (IJTE), 8(1), 174-192. https://doi.org/10.46328/ijte.1020

Yumrukuz, Ö. (2021). Examining PUBG playing practices in terms of digital game addiction. Atatürk Communication Journal (21), 5-28.

Xiong, Z., Liu, Q., & Huang, X. (2022). The influence of digital educational games on preschool children's creative thinking. *Computers & Education, 189,* 1–18. https://doi.org/10.1016/j.compedu.2022.104578