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Comparison of Effects of 3D Puzzles and Painting on Executive Functions and Visual Memory of Preschool Children

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Abstract

The present study aimed to compare the effectiveness of Lego therapy and painting therapy in improving executive functions and visual memory among preschool children. A quasi-experimental design with pretest, posttest, and follow-up assessments, including a control group, was employed. The study population consisted of all preschool children in Ahram, from which 27 children aged 4.5–6.5 years were selected using convenience sampling. Participants were then randomly assigned to three groups (n = 9 each): a Lego therapy group, a painting therapy group, and a control group. The painting therapy intervention was implemented according to Zade Mohammadi's protocol and consisted of ten 40-minute sessions conducted twice weekly. Similarly, the Lego therapy intervention followed the protocol developed by Asal and Asadian and included ten 40-minute sessions delivered twice weekly. Data were collected using the Rey Visual Design Learning Test (or Andre Rey Visual Memory Test, if that is the official name of the instrument) to assess visual memory and the Ridley Stroop Test to assess executive functions. The findings indicated that both Lego therapy and painting therapy produced significant improvements in children's visual memory and executive functions ($p < .05$). However, no statistically significant differences were found between the two intervention groups. These findings suggest that both Lego therapy and painting therapy are effective approaches for enhancing cognitive functioning in preschool children and may serve as valuable interventions for promoting cognitive development during early childhood.

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Extended Abstract

Introduction

Preschool education plays a pivotal role in promoting children's cognitive, social, and emotional development. High-quality early childhood programs can function as protective factors by reducing developmental risks and fostering the acquisition of essential cognitive skills. Because cognitive development progresses rapidly during the preschool years, educational interventions implemented during this period can have long-lasting effects on children's academic achievement and adaptive functioning. Play- and art-based interventions are among the most widely used approaches for promoting cognitive development during early childhood. These methods capitalize on children's natural inclination toward play and creative expression, making learning more engaging and developmentally appropriate. Compared with more structured instructional approaches, play- and art-based activities provide opportunities to enhance higher-order cognitive processes while maintaining children's motivation and participation. Given the importance of cognitive development during the preschool years, the present study compared the effectiveness of Lego therapy and painting therapy in improving executive functions and visual memory among preschool children.

Two well-recognized intervention methods in preschool education are play therapy and art therapy, which are widely employed in contemporary societies to foster cognitive development. These approaches leverage play and creative expression, making them particularly effective for preschool-aged children who may not yet be fully prepared for more structured or verbal forms of learning. Play and art-based methods align with children's natural interests, making them enjoyable and engaging, which helps foster an environment conducive to learning. Given the importance of cognitive development in the preschool years and the positive effects of indirect learning methods, this study compares the effectiveness of two specific forms of therapy: Lego therapy and painting therapy. The goal is to examine their impact on executive functions and visual memory in preschool-aged children.

Method

This study employed a quasi-experimental design with pretest, posttest, and follow-up assessments, including a control group. The study population comprised all preschool children in Ahram. A total of 27 children aged 4.5–6.5 years were selected through convenience sampling and randomly assigned to one of three groups: a Lego therapy group, a painting therapy group, or a control group (n = 9 per group). Follow-up assessments were conducted three weeks after completion of the intervention. The painting therapy program was implemented according to Zade Mohammadi's protocol and consisted of ten 40-minute sessions conducted twice weekly. Likewise, the Lego therapy program followed the protocol developed by Asal and Asadian and included ten 40-minute sessions delivered twice weekly. Visual memory was assessed using the Andre Rey Visual Memory Test, whereas executive functions were measured using the Ridley Stroop Test, with particular emphasis on attentional control and inhibitory functioning.

Results

The results demonstrated that both painting therapy and Lego therapy significantly improved visual memory and executive functions compared with the control group ($p < .05$).

However, no statistically significant differences were observed between the two intervention groups, indicating that both approaches were similarly effective in enhancing cognitive functioning among preschool children.

Discussion

This study highlights the potential of art- and play-based therapies to promote cognitive processes in preschool children, demonstrating their value as educational interventions. Painting therapy and Lego therapy provide creative and engaging approaches that support children's cognitive development. By enhancing executive functions, including attentional control, inhibitory control, and cognitive flexibility, these interventions may help children develop essential cognitive skills for problem-solving and adaptation throughout later stages of life. Executive functions undergo substantial development during childhood and play a critical role in enabling individuals to manage academic demands, social interactions, and everyday challenges effectively. Furthermore, improving visual memory through these interventions may positively influence children's daily functioning and future academic performance. Enhanced visual memory has been associated with better reading and writing abilities, improved spelling accuracy, and more efficient information retention and recall. These skills provide an important foundation for academic achievement and adaptive functioning. In addition, visual memory supports many everyday activities, including pattern recognition, visual recall, and problem-solving. In conclusion, both Lego therapy and painting therapy appear to be promising and accessible approaches to early childhood education that are consistent with children's developmental needs. As play- and art-based interventions, they engage children's interests while promoting cognitive development. Given the positive findings of the present study, incorporating these interventions into preschool educational programs may help enhance children's cognitive development. The findings also add to the growing body of evidence supporting the effectiveness of creative and play-based interventions and provide practical implications for educators, psychologists, and caregivers.

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