Volume 7, July/December 2026, Issue 2, pp. 151-159
Interdisciplinary Journal of Acute Care
Journal homepage: ijac.lums.ac.ir
Online ISSN: 3060-7159

The Effect of Adlerian Play Therapy on Spatial and Procedural Memory in Children with Intellectual Disabilities

Atefeh Beiranvand[1], Mehran Naghibeiranvand*[2], Akram Mansouri[3]

[1] Islamic Azad University, Professor Hesabi Branch, Tafresh, Iran
[2], Department of Nursing, Faculty of Nursing, Khorramabad Branch, Islamic Azad University, Khorramabad, Iran
[3] Department of Nursing, Shoushtar Faculty of Medical Sciences, Shoushtar, Iran

ARTICLE INFO

Article Type:
Research Article

Article History:
Received
11 January 2026
Received in revised form
18 August 2026
Accepted
19 September 2026
Available online
27 November 2026

ABSTRACT

Adlerian play therapy is one of the approaches whose distinctive feature is the implementation of treatment through a wide range of play therapy techniques. Considering the characteristics of children with intellectual disabilities, including verbal communication problems and the need for a safe environment for learning, the present study aimed to determine the effect of Adlerian play therapy on spatial and procedural memory in children with intellectual disabilities. The present study was a semi-experimental pretest-posttest study with a control group. The sampling method was convenience sampling, in which 30 children with mild mental retardation, aged 8 to 12, who were studying in special schools in Khorramabad in 2025, who referred to Navid Rehabilitation Center, participated. The children in the study participated in Adlerian standard play therapy. The data collection tools were the Course test and the motor sequence test. A comparison of the spatial memory post-test scores between the experimental and control groups using an independent t-test showed a statistically significant difference between the spatial memory of the two intervention and control groups ($P<0.05$). In addition, a comparison of the procedural memory test scores between the two groups also indicated a statistically significant difference($P<0.05$). Adlerian play therapy can be used as a complementary method in rehabilitation and educational centers for children with special needs.

Keywords: Adlerian play therapy, spatial memory, procedural memory, intellectual disabilities, children.

Cite this article: Beiranvand A, Naghibeiranvand M, Mansouri A. The effect of Adlerian play therapy on spatial memory and procedural memory in children with intellectual disabilities. *Interdisciplinary Journal of Acute Care*.2026;7(2):151-30. *Care*.2026;7(2):151-159. https://doi.org/10.22087/ijac.2026.586221.1109

Publisher:
Lorestan University of Medical Sciences

Introduction

Children with intellectual disabilities are a group of individuals who, due to cognitive and functional limitations, face numerous challenges in daily life. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), intellectual disability is characterized by an IQ below 70 and deficits in adaptive skills such as communication, self-care, and social interaction [1]. Compared to their typically developing peers, children with intellectual disabilities show poorer performance in spatial tasks [2]. Children with intellectual disabilities are impaired in many cognitive functions, especially visuospatial memory, and research evidence suggests that in some of these children, memory function and procedural learning are also impaired. Therefore, the use of play therapy-based interventions to improve these cognitive functions is of particular importance. Individuals with intellectual disabilities demonstrate weaker performance in hippocampus-dependent spatial learning and spatial memory compared to typically developing children. This weakness may be related to

* Corresponding author: Mehran Naghibeiranvand. Department of Nursing, Faculty of Nursing, Khorramabad Branch, Islamic Azad University, Khorramabad, Iran. Email: mehranbeiranvandmsc@gmail.com

DOI: 10.22087/ijac.2026.586221.1109

This is an open access article under the CC BY 4.0 license
(https://creativecommons.org/licenses/by/4.0/)

deficits in the processing and integration of sensory information [3]. Spatial memory functions as a specialized system for processing spatial relationships, highlighting the importance of interventions based on physical space in cognitive rehabilitation programs [4]. Spatial memory is a vital cognitive function that enables humans and animals to navigate environments and remember the location of objects and events. This form of memory relies on the brain's ability to store and retrieve information necessary for route planning and object location recall [5]. Research has shown that children with intellectual disabilities have greater deficits in response skills, motor learning, and procedural learning-related functions compared to their typically developing peers, and they require more practice and training to acquire and consolidate motor skills [6]. Procedural memory refers to the learning and retention of motor skills, cognitive skills, and behavioral patterns that are typically acquired implicitly [unconsciously] through practice and repetition [7]. According to recent reviews, approximately 1 to 3 percent of the world's population lives with intellectual disability, and this disorder remains a major challenge for health, education, and rehabilitation services systems worldwide [8].

Based on data analysis by the Iranian Welfare Organization, the registered prevalence of intellectual disability is reported to be about 13 cases per 1,000 population. However, due to limitations in the registration and data collection system, this rate is likely to be an underestimate of the true prevalence [9].

Zwart et al. [10], in a systematic review, reported that in individuals with developmental and cognitive disorders, some aspects of procedural learning may be relatively preserved, while performance in more complex tasks, sequence learning, and processes involving widespread neural networks is limited. Similarly, Kendall et al. [7] state that procedural memory is a type of long-term memory involved in the learning of skills, habits, and automatic behaviors, primarily associated with the functioning of basal ganglia circuits, the cerebellum, and cortical regions. Given the cognitive and emotional challenges of children with intellectual disabilities, play-based interventions have recently been emphasized as an effective approach in contemporary research [11]. Play is a rehearsal for the challenges and complexities of life, leading to increased competence, enhanced mental and physical skills, greater safety, and stronger social bonds[12]. Play therapy is an emerging tool for therapists through which significant progress can be made in the treatment of children with intellectual disabilities [13]. Among various play therapy approaches, Adlerian play therapy provides a structured framework for improving children's cognitive and emotional skills. Research evidence suggests that this approach is effective in reducing behavioral problems and supporting children's cognitive functions, although its impact on memory and executive functions has been reported inconsistently across studies [14]. Adlerian play therapy combines Adlerian psychological principles and strategies with play therapy techniques [15]. One of the underlying assumptions of Adlerian therapy is that humans are social beings who require connection and belonging. Individual psychology also posits that humans have the capacity for creative problem-solving when facing challenges. Another key concept in Adlerian theory is lifestyle, defined as a unique system of beliefs that determines how individuals evaluate themselves and think about themselves [16]. Play therapists believe that the natural medium of communication for children is play and activity [17]. Adlerian play therapy is one of the play therapies approaches whose distinguishing feature is the implementation of Adlerian individual psychology through a wide range of play therapy techniques [18].

Adlerian play therapy is an approach that combines the concepts and strategies of Adlerian individual psychology with play therapy techniques. This approach has four main stages: 1- Creating an egalitarian relationship; in which the therapist uses basic play therapy skills [tracking, retelling content, reflecting feelings] to create a safe and accepting space for the child so that the child feels valued and hopeful; 2- Exploring the child's lifestyle; in which the therapist discovers the child's thought, emotional, and behavioral patterns through play observation, targeted questions from parents and teachers, and artistic activities; 3- Helping the child gain insight; in which the therapist uses meta-understanding, therapeutic metaphors, and storytelling to help the child recognize their dysfunctional patterns; and 4- Reorientation and retraining; In which the therapist uses structured games, role-playing, and art activities to teach the child new skills such as problem-solving, anger management, and social skills] and prepares him or her to apply these skills in real-life situations[19]. Anderson et al. emphasized the role of practice and varying practice conditions in motor skill learning and acquisition [20]. Although limited studies have examined the direct effect of Adlerian play therapy on spatial memory, the systematic review by Sertkaya [2025] indicates that play-based interventions can influence cognitive functions such as attention and executive functioning, although the magnitude of these effects varies across studies [21]. Considering the characteristics of children with intellectual disabilities, including difficulties in verbal communication, the need for a safe environment, learning through concrete experience, and the positive impact of Adlerian play therapy with an emphasis on symbolic

play, the present study aimed to determine the effectiveness of Adlerian play therapy on spatial and narrative memory in children with intellectual disabilities.

Method

The present study was quasi-experimental research with a pre-test–post-test design and a control group. In the present study, blinding was single-blind and children were unaware of their allocation to the intervention or control group. The groups were randomly assigned, and the intervention was applied only to the intervention group. The post-test for both intervention and control groups were conducted immediately after the completion of the last intervention session [the twelfth session] and on the same day. The statistical population included all children with mild intellectual disability ([IQ 50–70) aged 8–12 years in special schools of Khorramabad city in 2025, and the study was conducted at the Navid Rehabilitation Center. The Navid Rehabilitation Center, operating under the supervision and with the official license of the State Welfare Organization of Iran, is one of the specialized centers providing educational and rehabilitation services for children with special needs. This center, utilizing a multidisciplinary team including psychologists, occupational therapists, speech therapists, and educational instructors, provides educational and rehabilitation services to children with intellectual disabilities. After obtaining the code of ethics from the Ethics Committee of Boroujerd Azad University and obtaining permission from the ETHICS Organization, the officials of the Navid Center provided full explanations to the parents about the research objectives and the confidentiality of the implementation method, and obtained written informed consent from the parents. In this study, 30 children aged 8-12 years who referred to Navid Rehabilitation Center in Khorramabad participated using a convenience sampling method, so that children who met the inclusion criteria were included in the study and then were placed in two intervention and control groups using a random number table. The sample size was determined based on similar studies in the field of play therapy for children with intellectual disabilities [22, 23]. Inclusion criteria included a diagnosis of mild intellectual disability based on medical records, absence of severe sensory or motor disorders, and informed parental consent. Exclusion criteria included absence from more than two intervention sessions and lack of cooperation of the child in performing the tests. None of the participating children had participated in any similar study or other research intervention in the field of memory or play therapy before entering this study. The research intervention consisted of two designed games [orientation and button sorting] and no other therapeutic intervention was applied to the children at the same time. The sessions were conducted by the principal investigator, and the center's instructors were present only in an assistant role to facilitate the children's cooperation. Data collection instruments included the Corsi Block-Tapping Task for assessing spatial memory and the Serial Reaction Time Task (SRTT) for procedural memory. The Corsi Block-Tapping Task is one of the tools used to assess visuospatial memory and spatial working memory. In this task, the participant must remember and reproduce presented sequences. This instrument has also been used in studies conducted on children with intellectual disabilities [21]. **Table 1** presents the structural and content relationship between the game and memory components.

Table 1: Structural and content relationship between game and memory components

Intervention game	Target memory component	Measuring tool	The logic of structural and content communication
Address Finder Game	Spatial memory	Course blocks assignment	Both depend on mental representations of space and sequence. In play, the child must keep in mind the location of places (home, school) and plan a sequence of movements (path) to reach the goal. In the course test, exactly the same process occurs; the child must keep in mind the location of blocks and reproduce their sequence.
Button Classification Game	Procedural memory	Chain reaction time task	Both are based on implicit learning of motor sequences through repeated practice. In the game, the child practices a specific motor pattern repeatedly by repeating the categorization action (selecting a button and putting it in its place) to increase his speed and accuracy (automaticity). In the SRTT test, the child, without being aware of the hidden sequence, decreases his reaction time by repeatedly pressing the keys, which indicates procedural learning.

The Serial Reaction Time Task (SRT)) is one of the standard tools in cognitive neuroscience for assessing implicit learning and procedural memory. This task was first introduced by Nissen and Bullemer and involves the presentation of visual stimuli in four locations and rapid responses using corresponding keys [24]. In some blocks, the stimuli follow a hidden sequence, and changes in reaction time are considered an index of learning [25].

In this study, the task was performed using E-Prime software version 3.0. The participant pressed the four keys M, N, B, and V with the fingers of the right hand. In each trial, a visual stimulus (a star) was displayed in one of four corresponding positions on the screen, and the participant's task was to press the corresponding key as quickly as possible. The task consisted of 10 blocks of 100 trials. In blocks 1 to 8 and 10, the stimuli followed a repeating 12-item hidden sequence, while block 9 was presented randomly to evaluate sequence learning [26].

After conducting the baseline tests [pre-test], an educational model was used as the main intervention tool. This model was specifically designed to teach spatial concepts and navigation to children with intellectual disabilities. In terms of physical description, the model was built on a base board measuring 100 × 70 cm and included a simulated grid of environments familiar to the child. The main elements of the model included: house, school, store, bakery, street, traffic light, and a movable doll that acted as the navigator controlled by the child. The general instruction was: the child had to guide the doll from a starting point (e.g., home) to a specified destination (e.g., school). This model-based game simultaneously targeted two memory systems: spatial memory, by creating a cognitive map of spatial relationships between locations, and procedural memory, by learning the sequence of movements required to guide the doll from one point to another (**Figure 1)**. In addition, a colored button classification game was used to strengthen procedural memory.

In this game, the child had to sort colored buttons [green, blue, yellow] within a limited time into a box with matching-colored openings. This task gradually became more challenging by increasing the number of stimuli and reducing the time**(Figure 2)**.

Details of the intervention program are presented in Table 1.

.



Figure 1. Address Finder Game - The researcher-made Address Finder game consists of a cardboard on which streets, a store, a house, a bakery, and a school are drawn. Also, traffic lights, vehicles, and pedestrian lines are visible on it. A figurine with a magnet underneath it is placed on the cardboard. The cardboard is kept at a higher level from the ground, and a magnet is attached beneath it corresponding to the figurine. By moving the magnet, the participant can move the figurine on the cardboard and find the requested address. During the task, the participant is encouraged, and in case of success, they receive points.



Figure 2.: Button Classification Game - The researcher-made colored button game consists of a box that includes three colors of the main traffic light colors. In the middle of each color, a hole is made, and the participant is required to place each colored button into the matching-colored circle. At the end of the task, the box is opened and the number of correct buttons is counted, and based on the correct buttons, the participant receives a score. Inside the box, barriers are placed so that when a button is inserted into the box, each button enters the area of its corresponding color and the buttons are separated from each other

Table 2.Adlerian play therapy intervention program

Session	Intervention stage	Cognitive activities (spatial memory)	Core activities (Working memory)	Adlerian techniques	Duration
1-3	**Acquaintance**	Introducing the simple paths House school model Identifying spatial cues	Learning simple sequences of movements, such as pressing buttons in order	Creating a descriptive feedback relationship	30minutes
4-6	**Learning**	Complex routs with 4-3 station game Draw a draftsman path from memory	Repeat movement sequences with new additions to the magic buttons game stage	Encouragement based on effort	30minutes
7-9	**Installation**	The game the lost path retrieving unmarked route	Performing sequences with distractions-controlled mirror play, repeating the therapist's movements	Emphasis on progress	30minutes
10-12	**Generalization**	Learned implementing routes in the real school environment	Performing movement sequences in e.g., new situations school buffet	Social equality practice reflecting successes	30minutes

The collected data were analyzed using descriptive and inferential statistics [Shapiro–Wilk test to assess normality of data, independent t-test to compare spatial and procedural memory scores between the experimental and control groups, and effect size analysis of the intervention], using SPSS version 26 software. For the independent t-test, the assumptions of normal distribution of data (with Shapiro-Wilk test) and homogeneity of variances (with Levene test) were confirmed.

For the analysis of covariance (ANCOVA), the assumptions of normal distribution, homogeneity of variances, homogeneity of regression slope (by examining the absence of significant interaction between pre-test and group), and linearity of the relationship between pre-test and post-test were examined and confirmed. The significance level was considered to be 0.05. Both the course blocks (measuring spatial memory) and chain reaction time measuring procedural memory) tasks were designed), implemented, and performed using E-Prime software version 3.0.

Results

The present study included 30 children with mild intellectual disability, with a mean age of 10 years (range 8-12 years). 17 (56.7%)were boys and 13 (43.3%) were girls. 12 (40%)were only children, 14 (46.7%) had one sibling, and 4 (13.3%)had two or more siblings.

All p-value values were greater than 0.5, and the skewness values were also within the acceptable range. These results indicate that the distribution of data in none of the groups shows a significant deviation from normality. Therefore, the use of parametric tests for further analysis is permitted

There was no statistically significant difference between the intervention and control groups in spatial memory and procedural memory variables before the play therapy intervention ($P<0.05$).

The results indicated that, after adjusting for the effect of pre-test scores, there was a statistically significant difference between the two groups in spatial memory ($F(1, 27) = 60.45$, $P < .001$, $\eta^2 = .62$), indicating that the intervention could account for approximately 62% of the variance in spatial memory after controlling for pre-test scores. Moreover, the effect of the covariate [pre-test] on spatial memory was also significant ($F (1, 27) = 7.14$, $P < .001$, $\eta^2 = .25$).

Regarding the procedural memory component, after controlling for pre-test scores, a statistically significant difference was observed between the two groups ($1, 27) = 90.56$, $P < .001$, $\eta^2 = .68$], indicating that the intervention accounted for approximately 68% of the variance in procedural memory, and the pre-test effect on this component was also significant $F(1, 27) = 6.90$, $P = .005$, $\eta^2 = .26$). Overall, the findings demonstrate that the intervention had a strong and significant effect on both spatial and procedural memory components

Table 3. checking the normality of data distribution

Elongation	crookedness	interpretation	P-value	W statistic	Group	changeable
0/15	0/32	Normal	0/42	0/97	test	Spatial memory
-0/18	0/25	Normal	0/32	0/96	control	
0/22	-0/41	Normal	0/58	0/98	test	Procedural memory
-0/12	0/37	Normal	0/21	0/95	control	

Table 4.Results of Analysis of Covariance (ANCOVA) for the Effect of Intervention on Space and Procedural Memory

Dependent variable	Source of changes	Sum of squares	Degree of freedom	F-ratio	P-value	Effect size (η^2)
Space memory	**Pre-test**	**85/6**	**1**	**7/14**	**<0/001**	25
	Group (intervention)	**23/26**	**1**	**60/45**	**<0/001**	62
	Error	**90/12**	**27**	**-**	**-**	-
Procedural memory	**Pre-test**	**95/3**	**1**	**6/9**	**0/005**	26
	Group [intervention]	**45/23**	**1**	**90/56**	**<0/001**	68
	Error	**12/4**	**27**	**-**	**-**	-

Discussion

This study was a quasi-experimental design with a pre-test–post-test and control group conducted on 30 children (15 in the experimental group and 15 in the control group) diagnosed with mild intellectual disability. The main objective was to examine the effect of a combined intervention program of Adlerian play therapy based on the principles of individual psychology on improving spatial memory and procedural (motor)memory in these children. The findings of the present study showed that the designed intervention had a significant and strong effect on improving the performance of both types of memory. The present discussion interprets the above findings within the framework of the existing research literature and examines the possible mechanisms of effectiveness. The key findings of this study indicated a significant improvement in spatial memory scores of the experimental group after the intervention. The results of the present study are consistent with previous research in the field of play therapy, which has shown that Adlerian play therapy can improve cognitive functions including attention, executive functions, and memory in children, although the degree of effectiveness has been reported differently across studies [14]. In explaining these findings, it can be stated that Adlerian play therapy, by creating a structured, supportive, and motivational environment, provides opportunities for practicing cognitive skills and strengthening attentional processes. Such conditions can lead to increased information processing and strengthening of networks related to working memory and spatial memory. This explanation is consistent with the findings of Johari [15], who showed that Adlerian play therapy improves working memory in children with intellectual disabilities. The improvement in procedural memory observed in the present study can be explained within the framework of recent models of motor sequence learning. Computational evidence from Elteto [27] suggests that learning motor sequence skills is based on the gradual updating of prediction models and the use of environmental predictability, which plays a key role in the formation of procedural memory.

The results of the present study can be partially explained by the role of common therapeutic factors. A systematic review by Bent et al. [28] showed that the therapeutic relationship, sense of safety, therapist empathy, and quality of therapeutic interaction are important factors in the effectiveness of play therapy for individuals with intellectual disabilities. Therefore, part of the observed improvement in spatial and procedural memory in the present study may be due to the establishment of a supportive therapeutic relationship and increased active participation of the child in the therapeutic process. In contrast to the findings of the present study, systematic reviews by Roa et al. [29] reported that the effectiveness of memory training interventions is not always stable and generalizable, and in many cases the transfer of training effects to other cognitive functions is limited.

This difference may be due to the multidimensional nature of Adlerian play therapy, which involves not only cognitive components but also emotional, social, and motivational aspects. Likewise, Ravidor et al. [30] reported that although cognitive training may lead to improvement in trained tasks, the generalization of these improvements to other cognitive domains is limited. This finding differs from the results of the present study and may indicate that Adlerian play therapy, by simultaneously engaging cognitive, emotional, and social processes, has greater capacity to create broader changes in memory performance. The findings of the present study can be explained within the framework of Adlerian play therapy principles. Ashby et al. [31] emphasized that Adlerian interventions provide the ground for cognitive and emotional development by increasing active child participation, social interaction, learning experiences, and sense of belonging. Therefore, the improvement in spatial and procedural memory observed in the present study may partly be due to these processes. In the present intervention, the navigation game with a familiar environment model provided children with the opportunity to repeatedly engage and strengthen their egocentric spatial memory system by creating and using a cognitive map of relationships between places (home, school, store).

A safe, non-competitive, and encouraging environment consistent with Adlerian principles likely reduced anxiety and increased motivation, thereby providing an optimal context for spatial learning. The improvement observed in Corsi Block-Tapping Task performance, which is a standard tool for assessing visuospatial working memory, indicates an increase in the child's capacity to process, maintain, and manipulate spatial information. In explaining the improvement in procedural memory, which is a classic measure of procedural learning and skill automation, the observed improvement in procedural memory and motor efficiency of the experimental group can be interpreted within the framework of internalization of new motor patterns. Neuroimaging studies have shown that practice in virtual navigation environments (virtual maze)can improve spatial performance and increase the efficiency of neural networks associated with motor planning and spatial memory, such that after practice, reduced activity in some brain regions has been reported as an indicator of more efficient processing [32].

It seems that the present intervention also facilitates a similar process of internalization and automatization of motor sequences through the repetitive button classification task. This improvement can be attributed to the repetitive, structured, and stepwise nature of the designed Adlerian games. Practicing these sequences in a game format reduces cognitive load and anxiety related to performance and helps gradual consolidation of implicit memory in the relevant neural circuits [basal ganglia and cerebellum]. This result confirms and extends fundamental findings in the field of procedural learning, suggesting that a positive motivational and relational framework in Adlerian approach can enhance the efficiency of practice and repetition processes necessary for the formation of this type of memory. However, this study faced some limitations. First, the relatively small sample size and restriction to a single center limit the generalizability of the findings to all children with mild intellectual disabilities in other cities or different cultural-social contexts.

The approach taken was to use simple random allocation sampling from the available population to select a representative sample as much as possible in order to reduce systematic bias. A suggestion for future research is to conduct similar studies with larger sample sizes and in multi-center designs in different cities or regions. Second, the lack of a long-term follow-up phase made it impossible to judge the durability of the intervention effects. The approach used to address this limitation was that immediate and strong effects of the intervention were recorded. For future studies, it is recommended that one or more follow-up phases be included in study designs to examine the stability of effects. Third, although efforts were made to control intervening variables through randomization and protocol standardization, factors outside the researcher's control(such as parallel educational programs in the center or changes in the family environment with different levels of parental interaction) may have influenced the results. The approach used was random assignment of participants into two groups and homogenization of groups in terms of age and IQ, and efforts were made to minimize the effect of these variables. To overcome these limitations, it is suggested that in more controlled studies, these variables be recorded through questionnaires and controlled in statistical analyses.

Conclusion

The findings of this study showed that a combined intervention program based on Adlerian play therapy (including model orientation game and color button sorting game)can improve spatial and procedural memory in children with mild intellectual disability. The small sample size of thirty, the lack of a follow-up period to examine the persistence of effects, and the lack of complete control of intervening variables such as parallel educational programs and changes in the family environment can limit the generalizability of the results to the entire population of children with intellectual disability. Therefore, the results of this study are only generalized to a similar population of

children with mild intellectual disability aged 8 to 12 years in rehabilitation centers, and it is suggested that further . studies with a larger sample. size, follow-up period, and control of intervening variables be conducted to definitively confirm the effectiveness

Authorship contribution statement

All authors have reviewed and approved the final version of the manuscript. Y, C & W conducted the study and collected the data; C & W performed the data analysis and interpretation.

Ethical Considerations

This article was conducted in full compliance with ethical principles and after obtaining ethical code number IR.IAU.B.REC.1404.106 from the Ethics Committee of Research at Islamic Azad University, Boroujerd Branch.

Declaration of Competing Interest

No conflict of interest has been declared

Acknowledgments

The authors consider it necessary to thank all participating children and also appreciate the management and staff of the Navid Center for their cooperation in conducting this study

Funding

Th

Data Availability

The data supporting the findings of this study are available from the corresponding authors upon reasonable request.

Declaration of Generative AI

The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of tables, or their corresponding captions.

References

1. American Psychological Association. Diagnostic and statistical manual of mental disorders -5 (M. Nik-Khoo, Trans.). Arjmand Press.(Original work publishe).2020

2. Lavenex PB, Bostelmann M, Brandner C, Costanzo F, Fragnière E, Klencklen G, Lavenex P, Menghini D and Vicari S.Allocentric spatial learning and memory deficits in Down syndrome. Frontiers in Psychology.2015; 6:62. https://doi.org/10.3389/fpsyg.2015.00062

3. Iggena, D., Jeung, S., Maier, P. M., Ploner, C., Gramann, K., & Finke, C. Multisensory input modulates memory-guided spatial navigation in humans. Communications Biology.2023;6:1167. https://doi.org/10.1038/s42003-023-05522-6

4. Moser, E. I., Moser, M. B., & McNaughton, B. L.Spatial representation in the hippocampal formation: A history. Nature Neuroscience.2017;20(11):1448–1464. https://doi.org/10.1038/nn.4653

5. Bisbym J. A. spatial memory.In Encyclopaedia Britannica. Retrives Frbruary.2023: 25,2024.

6. Rao, P. T., & Solomon, J. M.Training Response Abilities of Children With Intellectual Disabilities: A Randomized Controlled Trial. Journal of Motor Behavior.2024;56(4):439-452. https://doi.org/10.1080/00222895.2024.2322555

7. Kandel, E. R., Koester, J. D., Mack, S. H., & Siegelbaum, S. A. Principles of neural science (6th ed.). McGraw-Hill.2021.

8. Doody O, Cithambaram K, Ryan J, et al.Indicators for Intellectual Disability Where No Formal Diagnosis Exists but Nursing Knowledge Demonstrates Grounds for a Formal Assessment: A Scoping Review. Healthcare. 2025;13(13):1489. https://doi.org/10.3390/healthcare13131489

9. Soltani S, Khosravi B, Salehiniya H. Prevalence of intellectual disability in Iran: Toward a new conceptual framework in data collection. Journal of Research in Medical Sciences. 2015;20(7):715-716. https://doi.org/10.4103/1735-1995.166234

10. Zwart, F. S., Vissers, C. T. W. M., Kessels, R. P. C., & Maes, J. H. R.Procedural learning across the lifespan: A systematic review with implications for atypical development. Journal of Neuropsychology.2019;13(2):149-182. https://doi.org/10.1111/jnp.12139

11..Kottman T, Meany-Walen K. Partners in Play: An Adlerian Approach to Play Therapy. 3rd ed. Alexandria, VA: American Counseling Association.2016. https://doi.org/10.1111/jnp.12139

12. Johari N, Mirzai H, Allah Haghgoo H, Hosseinzadeh S. The effect of Adlerian play therapy on working memory of female students seven to twelve years old with mild intellectual disability. Archives of Rehabilitation.2022;23(2):240-255. http://dx.doi.org/10.32598/RJ.23.2.3305.1

13. Rathnakumar D. Play Therapy and Children with Intellectual Disability. Shanlax International Journal of Education. 2020;8(2):35-42. https://doi.org/10.34293/education.v8i2.2299

14. Sertkaya Fidan B, Ulusoy Doğmuş Y. The Effectiveness of Cognitive Behavioral and Adlerian Play Therapies in Children Aged 3–12 Years: A Systematic Literature Review. Research on Social Work Practice. 2026;36(3):248-267. https://doi.org/10.1177/10497315251316182

15. Meany-Walen KK, Kottman T. Group Adlerian play therapy. International Journal of Play Therapy. 2019;28(1):1-12. https://psycnet.apa.org/doi/10.1037/pla0000079

16. Sweeney TJ. Adlerian Counseling and Psychotherapy: A Practitioner's Wellness Approach. 6th ed. New York: Routledge.2019.

17. Meany-Walen KK. The current state of Adlerian play therapy published research. Journal of Individual Psychology. 2020;76(2):176-186. https://doi.org/10.1353/jip.2020.0005

18. Ashby JS, Kadosh Tobin G, Jin MK. Adlerian Play Therapy and Adventure Therapy: Complementary Interventions for Comprehensive Theory. Journal of Individual Psychology. 2020;76(2):188-203. https://doi.org/10.1353/jip.2020.0000

19. Kottman, T., & Meany-Walen, K.Partners in Play: An Adlerian Approach toPlay Therapy (3rd ed). American Counseling Association.2016 .

20. Anderson DI, Lohse KR, Lopes TCV, Williams AM. Individual differences in motor skill learning: Past, present and future. Human Movement Science.2021;78:102818. https://doi.org/10.1016/j.humov.2021.102818

21. Sertkaya Fidan B, Ulusoy Doğmuş Y. The Effectiveness of Cognitive Behavioral and Adlerian Play Therapies in Children Aged 3–12 Years: A Systematic Literature Review. Research on Social Work Practice . 2025;35(1):45. https://doi.org/10.1177/10497315251316182

22. Haghgoo H, Hosseinzadeh S. The Effect of Adlerian Play Therapy on Working Memory of Female Students Seven to Twelve Years Old With Mild Intellectual Disability. Archives of Rehabilitation 2022; 23(2) :240-255. http://dx.doi.org/10.32598/RJ.23.2.3305

23. Capio CM, Eguia KF. Object Control Skills Training for Children With Intellectual Disability: An Implementation Case Study. SAGE Open. 2021;11(3):1-12. https://doi.org/10.1177/21582440211030603

24. Capio CM, Eguia KF. Object control skills training for children with intellectual disability: an implementation case study. SAGE Open. 2021;11(3):21582440211030603. https://doi.org/10.1177/21582440211030603

25. Nissen MJ, Bullemer P. Attentional requirements of learning: evidence from performance measures. Cognitive Psychology. 1987;19(1):1-32. https://doi.org/10.1016/0010-0285(87)90002-8

26. Schwarb H, Schumacher EH. Generalized lessons from the serial reaction time task. Behavior Research Methods. 2012;44(3):735-751. https://doi.org/10.2478/v10053-008-0113-1

27. Éltető N, Nemeth D, Janacsek K, Dayan P. Tracking human skill learning with a hierarchical Bayesian sequence model. PLOS Computational Biology.2022;18(11):e1009866. https://doi.org/10.1371/journal.pcbi.1009866

28. Bent D, Schalk R, Van Regenmortel T, Noordegraaf M. Systematic review of common and specific factors in play therapy for young people with intellectual disability. International Journal of Developmental Disabilities. 2024;70(3):315-328. https://doi.org/10.1080/20473869.2022.2086433

29. Rao PS, Pandey MK, Mishra P, Deshmukh S, Jahan M, Manohar SJ. Is training working memory in children with learning disabilities a viable solution? A systematic review. Annals of Neurosciences. 2024;31(2):124-131. https://doi.org/10.1177/09727531231198639

30. Ben Izhak S, Lavidor M. Strategy and core cognitive training effects on working memory performance: A systematic review and meta-analysis. Journal of Cognition and Development.2023;24(4):486-513. https://doi.org/10.1080/15248372.2023.2172413

31. Ashby JS, Tobin GK, Jin MK. Adlerian play therapy and adventure therapy: complementary interventions for comprehensive theory. Journal of Individual Psychology. Individual psychology.2020;76(2):187-200. https://doi.org/10.1353/jip.2020.0000

32. Hötting K, Holzschneider K, Stenzel A, Wolbers T, Röder B. Effects of cognitive training on spatial learning and associated functional brain activations. BMC Neuroscience.2013;14:73.