

Research Article

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Neuropsychological Functioning of Individuals with Intellectual Disability: Role of Behaviour Therapy

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Abstract: Intellectual disability, also known as mental retardation, is a prevalent psychological issue. According to the American Psychiatric Association and DSM criteria, it is defined by deficits in two key areas: intellectual functioning and adaptive behavior. Objectives The study was conducted to discover the effect of behavioral therapy on the neurological function of a person with an intellectual disability. Method Using a pre- and post-experimental design, 28 participants were selected through purposive sampling and assigned to control and experimental groups. The experimental group participated in daily behavioral therapy sessions, while the control group received conventional treatment. Neuropsychological assessments, including the Bender Gestalt and Slosson Intelligence tests, were analyzed using SPSS Results The findings indicate that behavior therapy has minimal impact on neuropsychological functioning. However, both groups improved intellectual, motor, and perceptual abilities post-intervention. These results emphasize the necessity for additional research to clarify the connection between behavioral therapy and neuropsychological outcomes in individuals with intellectual disabilities (ID), which will inform future intervention strategies. Individuals facing intellectual disabilities (ID) face challenges in both intellectual and adaptive skills. Various factors like genetics and the environment can cause these challenges. Symptoms of ID might show up early in life or during school years. Overall, while the study exhibits methodological rigor and contributes valuable insights to the field, its limitations underscore the need for further research with larger sample sizes, longer intervention periods, and comprehensive outcome measures to elucidate the efficacy of behavioral therapy in individuals with intellectual disabilities.

Key Words: Intellectual Disability, Behavioural Therapy, Neuropsychological Functioning, Motor Skills, Intervention, Cognitive Abilities, Developmental Factors

Introduction

Individuals with intellectual disabilities frequently have significant cognitive obstacles that impede their ability to navigate daily life. These impairments may manifest as difficulties with language, memory, attention, learning, and cognitive function. Cognitive impairments, including difficulties with working memory, might hinder an individual's ability to absorb and retain information, hence impeding their cognitive and functional skill development (Zelazo & Carlson, 2020). To develop effective behavioral therapy programs for individuals with intellectual disabilities, it is essential to understand these cognitive challenges. Individuals with intellectual disabilities exhibit complex neuropsychological functioning that necessitates consideration through customized evaluation and intervention strategies (Hassiotis & Hall, 2001). Behavioral therapy is significantly more effective when grounded in cognitive processes, such as memory and executive functioning, including planning and problem-solving (Champ et al., 2021).

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Neuropsychological therapies seek to enhance cognitive, emotional, and behavioral aspects to reduce suffering and optimize performance.

Theodoratou & Argyrides, 2024 Behaviour therapy can significantly enhance an individual's health and quality of life by implementing procedures validated to be effective with their specific neuropsychological profiles (Szabó et al., 2023). Intellectual disability (ID) is a neurological condition that hinders children's cognitive functioning and adaptability to novel environments. Individuals with ID often encounter challenges across various domains, including learning, memory, adaptive skills, self-regulation, language, and motivation, which significantly impact their daily functioning and integration into society (Bertelli et al., 2022). Individuals with intellectual disabilities (ID) often face challenges across various domains. In general cognition, they may struggle to attend to relevant learning stimuli, resulting in slower learning rates and reduced performance compared to peers (Skagerlund et al., 2021). Research indicates that special education classes can facilitate learning for students; yet, these individuals typically underperform compared to their typically developing counterparts. Individuals with intellectual disabilities often struggle with learning and retention of information. They encounter difficulties acclimating to unfamiliar environments and focussing on essential information, which complicates their ability to learn and create friendships (Patel et al., 2020). Individuals require expert assistance to acquire adaptive capabilities (Ilyas et al., 2021). Identifying these skills can be difficult. Many individuals with intellectual disabilities experience challenges in self-regulation, adversely affecting their memory and cognitive functions. Challenges with metacognitive processes exacerbate these challenges (Shaukat, 2022). Many children experience difficulties in language development, particularly regarding practical aspects such as topic selection and turn-taking. Excessive use of communication tools can exacerbate communication issues (Syed et al., 2020).

A prevalent lack of motivation stemming from recurrent failure and dependence needs intervention to enhance autonomy and self-efficacy (Yu et al., 2022). Children with intellectual disabilities may encounter difficulties in educational settings, particularly when attempting to comprehend unclear concepts or devise solutions to problems. There are other measures you can undertake to enhance their advantages (Cannella-Malone et al., 2019). Motor impairments, orthopedic abnormalities, and deficient sensory systems are prevalent physical health concerns that are sometimes associated with the severity of mental disabilities. This necessitates considerable attention (Liao et al., 2021). Banda et al., (2024) assert that DNA, environmental toxins during gestation, and numerous other biological factors significantly influence the development of intellectual impairment. To prevent ID, refrain from alcohol use during pregnancy, seek prenatal care, and undergo genetic testing before conception. Identifying and rectifying developmental abnormalities promptly is crucial to prevent cerebral harm. The research conducted by (Ransohoff et al., 2022). A comprehensive assessment encompassing both physical and developmental evaluations is required to diagnose an individual with an intellectual disability. Understanding developmental delays and cognitive impairments facilitates the provision of appropriate assistance and support. Wei et al. (2020) The primary objective of behavior therapy, a crucial treatment for individuals with intellectual disabilities, is to alter detrimental behaviors and cultivate beneficial ones. Numerous strategies exist to address behavioral challenges, including models, token economies, and systematic desensitization.

According to Barlow, (2020), behavior therapy, grounded in learning theory, is crucial for assisting individuals with intellectual disabilities in enhancing their neuropsychological functioning. This form of treatment focuses on altering behaviors to enhance overall functioning by demonstrating the impact of behavior on the environment. Cognitive-behavioral therapy (CBT), a specific form of behavior therapy, explores the connections between thoughts, emotions, and behaviors, offering a directive and time-limited intervention. In the context of individuals with intellectual disabilities, behavior therapy serves as a valuable tool for addressing challenges related to attention, learning, memory, executive functions, and language deficits. There are different signs of intellectual disability, these signs may appear during the stage of infancy, or some may be noted on the stage of school age. It mostly depends on the level of severity of disability. The signs that a child or person with intellectual disability may show are sitting up, rolling over, Crawling, or walking late, and Facing challenges to problem-solving skills and logical thinking Behavioural therapy shows considerable promise in enhancing the well-being of individuals with intellectual disabilities by addressing maladaptive behaviors and promoting the development of adaptive



skills (Portes, 2020). Techniques grounded in evidence, like cognitive-behavioral therapy and applied behavior analysis, have demonstrated efficacy in fostering positive behavioral changes and improving the overall quality of life. Wenzel, (2017) The Diagnostic and Statistical Manual of Mental Disorders [DSM-5®] furnishes a standardized framework for diagnosing ID, accentuating the significance of comprehensive assessment and timely intervention. Tailored behavioral interventions, encompassing family support programs and community-based services, assume a pivotal role in nurturing positive outcomes for individuals with ID. (American Psychiatric Association, 2013) The primary objective of the project moving forward should be to facilitate access to evidence-based services for individuals with intellectual disabilities and enhance the efficacy of interventions. Longitudinal studies elucidate the efficacy of behavioral therapies over time and provide optimal techniques for assisting individuals with intellectual disabilities throughout their lives.

Individuals with intellectual disabilities (ID) experience difficulties in reasoning and cognition. This underscores the importance of implementing targeted behavioral treatment strategies to assist these individuals. It discusses the various forms of cognitive impairments that individuals with intellectual disabilities may have, including difficulties in learning, memory retention, attention, clear thinking, and effective communication. Obtaining customized evaluations and assistance is crucial, particularly when these challenges hinder daily activities and interpersonal communication. It underscores the importance of behavioral therapy, particularly cognitive-behavioral therapy (CBT), in the treatment of numerous neurological disorders and in assisting individuals to navigate life's problems more effectively. The rationale supports early detection, preventive measures, and comprehensive assessments as suitable strategies to assist individuals with intellectual disabilities. Ultimately, it underscores the necessity for enhanced research to refine intervention strategies and facilitate patient access to effective medicines, consistent with prevailing research trends and clinical perspectives.

Method

The primary objective of this study was to investigate the impact of behavioral therapy on the neuropsychological functioning of individuals with intellectual disabilities. To achieve this objective, standard measures and procedures were followed.

Phase-1: Screening of Intellectual Disabled Individuals

Sample: A sample of 104 participants was selected from special education centers in district Gujrat and Chiniot, ranging in age from 6 to 29 years. Participants were drawn from both government and private special education centers and schools.

Sampling Technique: Purposive sampling was employed, focusing on individuals with intellectual disabilities within the specified age range. Only those participants meeting the criteria of intellectual disability without any other psychological disorders were selected.

Inclusion and Exclusion Criteria: Participants with mild to moderate intellectual disabilities, aged 10 to 24 years, were included. Those with severe intellectual disabilities or comorbid conditions were excluded from the sample.

Procedure: Proper permissions were obtained from the heads of institutions, and informed consent was obtained from the parents of all participants. A socio-demographic form was developed to collect relevant information.

Instruments: The study utilized the Bender Gestalt Test II (I./BG) to assess perception and memory functioning, as well as the Slosson Intelligence Test to screen intelligence quotient [IQ] in intellectually disabled individuals.

Phase-2: Main Study

Participant: Twenty-eight participants, with 14 in the control group and 14 in the experimental group, were selected based on mild to moderate levels of intellectual disability.

Inclusion Criteria: Only participants with mild to moderate levels of intellectual disability were included in the study.

Exclusion Criteria: Participants with severe intellectual disabilities were excluded.

Measures: Demographic forms, the Bender Gestalt Test II, and a treatment records form were utilized to assess perception, memory functioning, and developmental disorders.

Task Designed: Task designs were developed to provide clinicians and counselors with efficient means of maintaining legal records of sessions conducted with clients.

Management and Protocol for Intellectually Disabled Individuals: Behavioural therapy techniques were employed, including intensive behavioral intervention techniques, reinforcement during discrete trial training, and generalization to facilitate skill acquisition across different situations.

Procedure: Ethical considerations were followed, and participants were recruited from the Gujrat and Chiniot districts. Pre-assessment and post-assessment sessions were conducted using the same tests, and data were collected using statistical analyses.

Intervention Stage: Behavioural therapy techniques were applied after suitable management and protocol development. Techniques included clear and consistent communication, reinforcement, and modeling.

Case Studies: Detailed case studies were conducted, documenting each participant's progress over multiple therapy sessions. Sessions focused on various tasks related to motor skills, perception, cognition, and memory, with techniques such as positive reinforcement and modeling applied.

Reassessment Session: Reassessment sessions were conducted to measure progress using the same tests administered in the pre-assessment phase.

Feedback Session: Feedback sessions were held with participants and their teachers to discuss progress, strengths, and areas for improvement.

Goodbye Session: Final sessions involved group discussions with participants, emphasizing their achievements and encouraging continued progress in their educational aims.

Overall, the study employed rigorous methodologies and detailed procedures to investigate the impact of behavioral therapy on individuals with intellectual disabilities, with a focus on enhancing neuropsychological functioning and overall well-being.

Result

The present study was conducted on the intellectually disabled to check the effect of behavioral therapy on their neurological functioning. Students were selected from different special education centers in Gujrat and Chiniot. The results were calculated by using SPSS version 22. Different analysis was done on the data. At first normality test was done on all four scales to see whether our data was normally distributed or not. Then reliability analysis was done and the value of Cronbach's alpha was noted whether it is acceptable or not. An Independent t-test was done to compare the experimental and control groups. For pre- and post-experiment parried sample t-test was used.

Data Screening

Data was screened to notice any flaws. Respondent's protocols were visually checked for missing items at the time of data collection and later randomly reviewed. Errors in data entered were corrected after reconfirmation from respondent questionnaires.

Demographics Characteristic

The below table shows the demographic characteristics of the sample.

Table 1

Demographic Characters of Sample (N=28)

Variables	<i>f</i>	%
S.E. S		
Lower class	6	21.4
Middle class	18	64.3
Upper class	4	14.3



Variables	f	%
Residency		
Urban	16	57.1
Rural	12	42.9
Age		
10	1	3.6
11	1	3.6
12	2	7.1
13	6	21.4
14	4	14.3
15	2	7.1
16	2	7.1
17	1	3.6
18	5	17.9
19	3	10.7
24	1	3.6

The table frequency and percentage of the demographic variable of the intellectually disabled people. There were people from different classes and ages. The majority of the population was middle class which was 64.4 % lower were 21% and people from upper class were 14%. The residency area of 57.1 % sample was urban and the other 42.9% was from the rural side. People according to age, there were 21% people who were 13 years old, people of age of 18 were 17.9 %, so on 14-year-old people were 14.3 %. And 19-year-olds were 10.7 %. People of age of 12,15 and 16 were 7.1%. People of age of 10,11,17 and 24 were 3.6%.

Table 2

Independent Sample T-Test with Experimental and Control Group Among Intellectually Disabled on Bender Gestalt Memory Test (N=28).

	M	S.D	F	t	df	sig	LL	UL
Experimental	10.50	6.14	8.652	1.416	26	.169	-1.162	6.304
Non-exp.	7.92	2.89		1.416	18.492	.173	-1.237	6.380

The independent t-test was used to Find out the difference in memory scores between the experimental and non-experimental groups. The table above shows that there is a difference between the mean values of the two groups (Me = 21.2, Mc =19.2). But it is not a significant difference as indicated above table.

Table 3

Independent Sample T-Test with Experimental and Control Group Among Intellectually Disabled on Bender Gestalt Perception Test (N=28).

	M	S.D	F	t	df	sig	LL	UL
Experimental	21.85	10.16	3.680	.816	26	.422	-4.012	9.298
Non-exp.	19.21	6.58		.816	22.283	.423	-4.067	9.352

The independent t-test was used to find out the difference in perception scores between experimental and non-experimental groups. The table above shows that there is a difference between the mean values of the two groups (Me = 21.85, Mc =19.21). But it is not a significant difference as indicated above table.

Table 4

Paired Sample T Test with Pre-Post-Of Bender Gestalt Perception Test With Experimental Group Of Intellectual Disabled (N=14).

	M	S.D	t	df	sig	LL	UL
PRE	21.28	11.77	-329	13	.747	-4.381	3.117
POST	21.85	10.16					

The table shows that the paired sample t-test was conducted to check the effect of pre-and post-results of Bender Gestalt test perception among the intellectually disabled experimental group. (N= 14). There is a mean difference as in pretest (M, =21.28, S. D=11.77,) and posttest (M, =21.85, S. D=10.16,) with no significant difference ($p<.016$).

Table 5

Paired Sample T-Test with Pre-Post of Bender Gestalt Memory Test with Experimental Group of Intellectual Disabled (N=14).

	M	S.D	t	df	sig	LL	UL
PRE	9.78	6.78	-.402	13	.694	-4.552	3.125
POST	10.50	6.14					

The table shows that the paired sample t-test was conducted to check the effect of pre-and post-results of the Bender Gestalt test for memory among the intellectually disabled experimental group. (N= 14). There is a mean difference as in pretest (M, =9.78, S. D=6.78,) and posttest (M, =10.50, S. D=6.14,) with no significant difference ($p<.016$).

Table 6

Paired Sample T Test with Pre-Post-of Bender Gestalt Perception Test with Control Group of Intellectual Disabled (N=14).

	M	S.D	t	df	sig	LL	UL
PRE	19.21	6.326	.000	13	1.00	-2.428	2.428
POST	19.21	6.688					

The table shows that the paired sample t-test was conducted to check the effect of pre-and post-results of Bender Gestalt test memory among the intellectually disabled nonexperimental group. (N= 14). There is no mean difference as in pretest (M, =19.3, S. D=6.4,) and posttest (M, =19.21, S. D=6.66,) with no significant difference ($p<.01$).

Table 7

Paired Sample t-test with pre- and post-of-Bender Gestalt Memory Test with Control Group of intellectually disabled Memory (N=14).

	M	S.D	t	df	sig	LL	UL
PRE	8.571	3.106	1.147	13	.272	-.5684	1.85
POST	7.926	2.894					

The table shows that the paired sample t-test was conducted to check the effect of pre-and post-results of Bender Gestalt test memory among the intellectually disabled nonexperimental group. (N= 14). There is a mean difference as in the pretest (M, =8.5, S. D=3.1,) and posttest (M, =7.9, S. D=2.8,) with no significant difference ($p<.01$).

Discussion

In this study, we examined the effects of behavioral therapy on the cognitive, perceptual, and motor functioning of individuals with intellectual disabilities (ID) with the use of a pre-and post-experimental design. According to the findings both the experimental and control groups demonstrated minor improvements but behavioral therapy alone did not lead to statistically significant gains in neuropsychological functioning. It challenges the assumption that behavioral therapy is sufficient to enhance cognitive and motor abilities in individuals with ID, which suggests that its primary benefits lie in modifying external behaviors rather than directly improving memory, attention, or executive functions. Several factors may explain these findings. Firstly, behavioral therapy primarily focuses on shaping observable behaviors through reinforcement strategies rather than engaging the neural mechanisms necessary for cognitive enhancement. Secondly, the intervention period is relatively short which is not



sufficient for neoplastic changes to occur, as cognitive development often requires sustained, long-term engagement. Thirdly, this study use a small sample size which makes it difficult to detect significant effects. In addition, individual differences in baseline cognitive abilities, environmental influences, and genetic predispositions may have contributed to variations in outcomes. Moreover, the control group's participation in conventional educational and therapeutic programs suggests that structured learning environments alone may facilitate minor cognitive improvements, reinforcing the need for a more integrative approach that combines behavioral therapy with targeted cognitive training.

When looking at existing research, these findings agree with earlier studies that suggest behavioral therapy alone isn't enough to bring about significant neuropsychological improvements in individuals with ID. However, according to an accumulating body of research when behavior therapy is combined with structured cognitive training interventions such as exercises for working memory, problem-solving tasks, and attention control strategies. Research has shown that using multimodal approaches, such as combining behavioral therapy with cognitive rehabilitation, neurofeedback, and executive function training, can lead to more meaningful improvements in cognitive and adaptive skills. These insights have critical implications for clinical practice, intervention development, and policy-making. Clinicians and therapists should consider incorporating cognitive training techniques into behavioral therapy programs to enhance neuropsychological outcomes. Special education programs may benefit from integrating cognitive skill-building exercises into existing behavioral intervention models to provide a more holistic approach to treatment. In addition, this research also suggests that active parental involvement in therapy enhances treatment efficacy which highlights the importance of family-centered intervention strategies.

While this study offers valuable insights, it has several limitations that should be addressed. The small sample size limits the ability to generalize the findings, and the short duration of the intervention may have restricted the detection of significant neurocognitive changes. Although standardized neuropsychological assessments were used, they might not have fully captured the complexities of cognitive and motor development in individuals with ID. Future research should consider using advanced assessment tools, such as functional MRI (fMRI) and EEG-based cognitive testing, to better understand the neural mechanisms behind the effects of behavioral therapy. Larger and more diverse sample populations are needed to identify which subgroups of individuals with ID may benefit most from these interventions. Additionally, longitudinal studies should investigate the long-term impact of behavioral therapy, both alone and in combination with cognitive rehabilitation, to determine whether extended treatment periods result in more substantial neuropsychological improvements.

In conclusion, There is no doubt that behavior therapy is a valuable tool for addressing malfunctioning behavior and improving social-emotional functioning in individuals with ID but its impact on perceptual, cognitive, and motor skills seems limited when used alone Now these findings suggest that there is a need of a long term, more integrated approach that combines behavior therapy with additional appropriate cognitive and neuropsychological interventions. Henceforth, When using behavioral therapy in both clinical practice and research, the goal should be to create a holistic intervention approach that enhances the advantages of behavioral therapy while minimizing its limitations. By using a multimodal approach that includes cognitive training, neurorehabilitation, and environmental support, clinicians and educators can aim for better treatments that improve cognitive skills, everyday functioning, and overall quality of life for individuals with ID.

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