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COGNITIVE REHABILITATION FOR REDUCED COGNITIVE IMPAIRMENT: EFFICACY ASSESSMENT IN PATIENTS WITH TRAUMATIC BRAIN INJURY

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Abstract
The present study assessed the effectiveness of a 12-week cognitive rehabilitation program in improving cognitive functions for people who have suffered traumatic brain injury (TBI). To conduct this study, 40 patients with TBI were selected using purposive sampling from hospitals in Lahore, Pakistan, and divided into 2 groups based on random assignment. One group was named as the experimental group (n=20) and received cognitive rehabilitation in addition to their standard medical care. The other group served as the control group (n=20) and received only standard medical care. Participants in both groups were assessed on Mini-Mental State Examination (MMSE) to assess their level of cognitive impairment at baseline and at post intervention levels. The main findings from this research showed there were statistically significant improvements in the intervention group's performance when assessed on the MMSE at post intervention level, specifically in the domains of Registration, Attention, Memory, and Language, but not in Orientation domain. There were no statistically significant pre-post differences for the control group's scores on the assessed cognitive domains. This research provides evidence that structured cognitive rehabilitation is beneficial for improving cognitive functions in patients with TBI and therefore emphasizes the importance of cognitive rehabilitation in Pakistan's neurorehabilitation practice
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Keywords: Cognitive Rehabilitation; Traumatic Brain Injury; Cognitive Function; MMSE

Introduction

Traumatic Brain Injury (TBI) is an injury to the brain caused by concussions, contusion, or diffuse axonal injury (Giza & Hovda, 2014). Global reports state that TBI is one of the largest global health problems, primarily in low- and middle-income countries, where there are limited protections for road safety and workplace injuries (Righy et al., 2025). The severity of TBI can fall anywhere on a spectrum from mild concussion to severe injury resulting in lasting disability or death (Menon et al., 2010). Not every blow to the head will lead to a TBI; however, if the brain's ability to function has been altered, a person may demonstrate cognitive, emotional, and behavioral changes. The extent of these changes will vary, according to the location and pathways within the brain that were affected by the injury (Menon et al., 2010).

Current State of Health Care for Patients with TBI in Pakistan

TBI is becoming an increasingly significant global health issue. James et al. (2016) estimated that the worldwide standardized incidence rate of TBI was approximately 259 per 100,000 people. The South Asian region, which includes Pakistan, represents a substantial proportion of the overall global TBI burden. However, large gaps exist in our knowledge regarding TBI victims in Pakistan that limit our ability to understand and assist TBI survivors. Currently, there are no nationwide records of TBI percentage per year available.

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Therefore, most of the information that can be accessed regarding TBI victims has come from hospital admissions data or from few studies based on specific regional areas or a hospital. A study conducted at a tertiary care hospital identified that 73% of the 5546 patients with head injuries suffered from mild TBIs. Among them, 39 % brain injuries were due to road traffic accidents and 32% were due to accidental falls. Yet the record represents only patients with hospital admission excluding those who never saw a doctor or received treatment (Yaqoob et. al, 2021). In addition, most studies only report short term treatment outcomes. Little to no published information is currently available regarding the long-term cognitive outcomes in TBI patients in Pakistan. As a result, it is difficult for both researchers and clinicians to accurately evaluate the number of TBI patients who develop chronic disabilities or evaluate the overall effectiveness of various rehabilitation techniques. Most available studies are only concerned with the diagnosis and treatment of acute TBI such as skull fractures and hemorrhages. For example, in a recent report of sub-arachnoid hemorrhage & associated outcomes, the cognitive functioning of the patient after a month was not evaluated (Qadir et al., 2024).

Cognitive Impairment Following TBI

Neurological disorders including TBI are often associated with neurocognitive deficits (e.g., Fatima, 2019a,b; Fatima & Sharif, 2019; Iftikhar et al., 2025). Depending on the severity and cause of the injury, cognitive functioning may be severely impaired in some situations or only slightly affected in others (Maas et al., 2017). Cognitive impairment refers to impaired capacities in diverse cognitive domains including attention focusing, decision-making, language, memory, and visuospatial abilities (Lees et al., 2014). Fatima and Zubair (2025) describe 6 neurocognitive domains that are likely to be impaired due to clinical neurological conditions. These domains include orientation, attention concentration, language, memory, visual abilities, and executive functioning. These cognitive functions have significant implications for general wellbeing, quality of life, and other important life outcomes (Fatima, Hassan et al., 2024; Fatima, Jamil et al., 2019; Fatima, Mehmood et al., 2022; Meher et al., 2024). Impairment of neurocognitive functions leads to complications in daily life functioning (Fatima & Zubair, 2025). Hence, it is important to develop cognitive rehabilitation programs focusing on improvement of cognitive functions in patients with TBI. Menon et al., (2010) describe that depending on the nature of the damage, a TBI may also manifest as cognitive slowing, difficulty recalling information, emotional instability, or changes in language and communication abilities. After experiencing TBI, many people face cognitive challenges in focusing attention, following directions, remembering facts, and communicating effectively. They may show an inability to deal with stress, a slower rate of processing, and inability to make decisions.

Neuroplasticity and Cognitive Rehabilitation

Cognitive rehabilitation is used to support the recovery of cognitive abilities that have been affected as a result of trauma to the head due to TBI, stroke, multiple sclerosis, or any other neurological condition. Cognitive rehabilitation develops, enhances, and maintains cognitive functions by using specific activities and structured exercises to improve attention, memory, language, reasoning, and problem solving (Cicerone et al., 2019). Cognitive rehabilitation also helps individuals regain their independence enabling them to return to their normal daily activities with improved confidence.

The basis for cognitive rehabilitation is the principle of neuroplasticity; the brain's ability to reorganize itself and create new neural connections throughout life. The ability of the brain to reorganize allows it to learn new experiences, skills, and recover from brain injury (Mateos-Aparicio & Rodríguez-Moreno, 2019; Pekna et al., 2012). The structure and function of the brain are not permanent and undergo changes as the brain responds to new

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challenges. Once the brain learns to respond to a specific challenge, the brain will establish new pathways to improve the efficiency of that response, through repeated practice and stimulation. Thus, the ability of the brain to adapt through neuroplasticity provides the means to regain cognitive functions, such as attention, memory, and language, following an injury, such as TBI. When an individual practices certain cognitive rehabilitation exercises repeatedly over time, the brain will learn to process that information more efficiently than before, thereby compensating or providing support for the impaired brain region. Evidence from existing research highlights the importance of cognitive rehabilitation for improved brain functions at all levels from the molecular level of brain chemistry to levels of communication within and among the brain's higher order systems (Cicerone et al., 2019).

Interventions incorporating neuroplasticity principles have been shown to be most effective when tailored specifically to the patient's needs determined on the basis of severity, cognitive baseline, and age. Using tailored rehabilitation plan, recipients of cognitive rehabilitation therapy build their cognitive capacities through repeated, systematic stimulation of their Cerebral Cortex to learn adaptive strategies to compensate for cognitive deficits (Cappa et al., 2011). Such rehabilitation strategies can be restorative or compensatory (Reinkensmeyer et al., 2016). Restorative rehabilitation targets the restoration of the compromised brain functions. Such adaptive techniques help patients adapt in important activities and life responsibilities (Cheeran et al., 2009). Compensatory interventions focus on enhancing patients' ability to use tools and aids to supplement their disabilities in order to adjust in their lives. Pashang et al. (2021) provide evidence of the effectiveness of cognitive rehabilitation based on a quasi-experimental study for improved cognitive capacities in patients with stroke. Moreover, Vafa et al. (2024) also support the efficacy of cognitive rehabilitation based on a quasi-experimental research design that both computer-based and conventional-based therapy are effective for improving memory in neurological patients.

Objective and Hypothesis

Based on the reviewed literature, the objective of the study is the efficacy assessment of cognitive rehabilitation for decreasing the level of cognitive impairment following brain injury. Specifically, it aims to determine if structured cognitive rehabilitation exercises have an impact on decreasing the cognitive impairments in TBI patients, and if formal intervention improves functioning in neurocognitive domains of orientation, registration, attention/calculation, recall (memory), and language among TBI survivors.

Method

Research Design and participants

The study uses repeated measure research design to evaluate the effectiveness of cognitive rehabilitation. A total sample of forty patients with traumatic brain injury were selected using purposive sampling strategy from neurology wards of different hospitals. Participants were randomly assigned to two groups including experimental and control groups with twenty participants in each group. In control group there were twenty participants. Inclusion criteria were set to include adult patients between 18-60 years of age, both genders, and experiencing traumatic brain injury within the past six months. Their demographic characteristics have been presented in Table 1.

Assessments

Demographics Information sheet

Participants reported their demographics on a structured demographics form including items about their demographic, educational, professional, and personal variables. Also, the form included items asking for the clinical history of the patient. educational background.

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Cognitive Impairment

For assessment of general cognitive impairment, Mini Mental State Examination (MMSE) was used (Awan et al., 2015). The MMSE is an 11-item assessment questionnaire assessing level of general cognitive impairment in participants. It assesses cognitive impairment in six cognitive facets tapping orientation, attention, memory, language, and visual skills. The current study had used its Urdu version (Awan et al., 2015). The assessment measure is widely used in the research and clinical settings in Pakistan (Fatima & Batool, 2024; Iftikhar et al., 2025). The composite score by adding domains scores provides a maximum likely score of 30 representing no cognitive impairment and the lower scores represent higher cognitive impairment.

Table 1

Sample Demographics for the Two Groups

Variables	Control group (n=20)		Intervention group (n=20)	
	M (SD)	F (%)	M (SD)	F (%)
Gender				
Men		4(20)		5 (25 %)
Women		16(80)		15 (75%)
Age in Years	46.50 (12.35)		46.85 (7.63)	
Education in Years	8.80 (5.06)		8.80 (5.66)	
Type of Brain Injury				
Concussion		11 (55 %)		10 (50 %)
Contusion		3 (15 %)		5 (25 %)
Diffuse Axonal Injury		6 (30 %)		5 (25 %)
Affected Hemisphere				
Left		12 (60 %)		5 (25 %)
Right		8 (40 %)		15 (75 %)
Time since Injury in months	77.10 (23.75)		69.65 (22.89)	
Family History of TBI				
Yes		12 (60 %)		10 (50 %)
No		8 (40 %)		10 (50 %)
Psychiatric History				
Yes		5 (25 %)		2 (10 %)
No		15 (75 %)		18 (90 %)

Procedure

Ethical approval for the study was obtained from the Departmental Advisory Committee, Department of Humanities, COMSATS University Islamabad. Then, a cognitive rehabilitation intervention was designed spanning for a 12-week period. Effectiveness of the rehabilitation exercises was assessed on all six cognitive domains in improving the cognitive functioning in the sample. After initial formalities, participants were selected from different hospitals. Participants and their attendants were briefed about the study duration. Only those participants were included in the study who consented to participate in this intervention study and agreed to attend the study sessions for 12 weeks. After obtaining their consent, the participants were randomly assigned to control and experimental groups. Participants in both groups were assessed on MMSE in addition to a demographic sheet at baseline level of assessment. After baseline assessment, participants in the experimental group received cognitive rehabilitation intervention in addition to their regular medical treatment for 12

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weeks. The participants in the control group received only regular medical treatment. After 12 weeks, participants in both groups were reassessed on MMSE at post intervention level. The study observed all ethical considerations including study approval from university, informed consent from participants, and briefing about the study to them. Anonymity of their data was ensured. All participants were thanked for their voluntary participation in the intervention study.

Data Analysis and Results

Data set was analyzed using SPSS V23.0. Initially, data was screed for coding errors and outliers. Descriptive statistics were calculated for demographics and study variables at pre and post assessment levels. Then, repeated measure t test was analyzed to compare level of cognitive function at pre and post assessment. Pre-post analysis was conducted for both groups.

The results in Table 2 represent the level of cognitive impairment at baseline assessment for both groups in all domains. It is evident from the Table 2 that participants in both groups showed comparable levels of cognitive impairment at the baseline level before the start of intervention.

Table 2

Level of Cognitive Impairment at Baseline Assessment for the Two Groups

Dependent Variables	**Control Group (n=20)**	**Experimental Group (n=20)**
	M (SD)	***M(SD)***
Registration	1.85 (0.93)	1.60 (0.94)
Attention	1.55 (0.68)	1.35 (1.08)
Memory	0.65 (0.48)	0.75 (0.71)
Language	3.40 (1.31)	3.85 (1.30)
Orientation	3.25 (1.16)	2.85 (1.18)

After baseline assessment, only experimental group received cognitive rehabilitation intervention. Following the rehabilitation sessions, both the experimental and control groups were reassessed on MMSE for level of cognitive improvement. The pre-post differences in level of cognitive impairment were assessed using repeated measure t test in SPSS. The t-tests were analyzed for the two groups. The results have been presented in Table 3. The findings from Table 3 showed that participants in the experimental group showed a significant improvement in cognitive functioning in 4 out of 5 assessed cognitive domains. Their scores improved at post assessment level on registration, attention, memory, and language but not on orientation. For control group, no significant improvement was observed in any of the assessed cognitive domains. They scored similarly at post assessment level on re registration, attention, memory, and language. Unexpectedly, at post assessment level, their scores worsened on orientation domain.

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Table 3

Pre-Post Differences Assessing Level of Cognitive Functioning for the Two Groups

	Baseline-assessment	Post-assessment		
Groups	*M (SD)*	*M (SD)*	*t(df=19)*	*p-value*
Control group				
Registration	1.85 (0.93)	1.75(.85)	0.81	0.43
Attention	1.55 (0.68)	1.50 (1.05)	0.23	0.81
Memory	0.65 (0.48)	0.90 (0.71)	-1.75	0.96
Language	3.40 (1.31)	3.70 (1.71)	- 0.86	0.40
Orientation	3.25 (1.16)	2.65(1.23)	2.11	0.04
Experimental group				
Registration	1.60 (0.94)	2.10(.96)	-2.36	0.03
Attention	1.35 (1.08)	2.60 (1.09)	-5.48	0.001
Memory	0.75 (0.71)	1.05 (0.75)	-2.34	0.03
Language	3.85 (1.30)	4.90 (1.33)	-2.98	0.00
Orientation	2.85 (1.18)	3.00 (1.21)	-0.69	0.50

Discussion

The aim of this research was to evaluate whether cognitive rehabilitation had an impact on improving cognitive functions following TBI. Cognitive ability was measured pre- and post-intervention with a standardized measure of cognitive function that assessed general cognitive performance of participants. For those who received cognitive rehabilitation, there was a marked increase in cognitive functions post-rehabilitation in comparison to the control group participants, who exhibited little to no pre-post differences. As such, the results of this study indicate that cognitive rehabilitation is effective for improving overall cognitive functioning after sustaining a TBI, as supported by numerous studies demonstrating that cognitive recovery after TBI can be optimized through structured therapeutic programming (Cicerone et al., 2019; Johansson & Tornmalm, 2012).

Specific findings from the study showed that participants in the intervention group reported significant improvement compared to the control group in attention at post intervention level. This supports the idea that cognitive rehabilitation is an effective approach to enhancing attentional control following TBI. Cognitive deficits related to attention are among the most prevalent cognitive impairments as a result of TBI and may have a detrimental effect on both daily life. The findings support the literature on benefits of targeted attention retraining programs on selective, sustained, and divided attention for individuals with brain injury, which have received significant attention from researchers (Ponsford et al., 2014). The results of these studies have been duplicated in South Asian clinical environments, providing further evidence that attention-related cognitive rehabilitation techniques can be used effectively in various cultural contexts (Iftikhar et al., 2025; Waqar et al., 2022).

In addition, the rehabilitation exercises produced a marked improvement in the memory function among participants in the intervention group. Individuals with TBI commonly experience memory impairment, which can be aided by developing compensatory strategies and improving memory function through the practice of memory techniques. The

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findings of this study support the previous findings of meta-analyses and systematic reviews that indicate that cognitive rehabilitation assists in improving short-term and working memory via cognitive strategies, practice, and the use of cognitive exercises (Cicerone et al., 2011). Additionally, evidence from the Pakistani studies suggests that structured cognitive rehabilitation programs can enhance post-traumatic memory performance even within limited-resource clinical settings (Naeem et al., 2022; Rathore & Mansoor, 2016).

Participants who received the intervention had a more significant improvement in language compared to their control group counterparts. These findings agree with other studies indicating that cognitive rehabilitation focused on improving language abilities enhanced individuals' ability to communicate effectively and use functional language after acquiring a brain injury (Brady, et al., 2016). The results also correlate with numerous studies from local rehabilitation facilities demonstrating that rehabilitation programs that focus on communication abilities and early intervention have been found to be beneficial to the recovery of individuals' ability to communicate (Rathore, et al., 2019). Based on the principle of neuroplasticity, cognitive improvements following rehabilitation exercises are not an unexpected finding. Neuroplasticity explains that brain retains the capability of reorganization and forming new neural connections post-injury. Exercising the brain through cognitive rehabilitation will produce activity-dependent functional neuroplasticity through repeated cognitive engagement, strategies learned, and exposure to their environment. Evidence shows that when training is based on tasks, improving cortical reorganization and functional recovery occurs (Kleim & Jones, 2008; Robertson & Murre, 1999). The findings from the current study validate and support the relevance of theories of neuroplasticity concerning the recovery of the brain.

Limitations, Strengths, and Future Recommendations

This study is among the first few organized research studies conducted to examine the effectiveness of cognitive rehabilitation on TBI survivors in Pakistan. There are not much neurocognitive rehabilitation services available or research being done in Pakistan (Ishtiaq et al., 2022; Khan et al., 2023). Therefore, this study provides initial evidence for the efficacy of rehabilitation aimed at improving cognitive abilities. These rehabilitation exercises may help to better improve TBI survivors' attention, memory, and language skills. This study also demonstrated that cognitive rehabilitation programs could successfully be implemented within hospitals in Pakistan.

Several limitations should be acknowledged in this study. The first limitation is the small sample size in each group limiting the generalizability of the findings. The second limitation is that the cognitive improvements assessed in this study were measured only at the post intervention level and long-term sustainability of cognitive gains could not be established. The third limitation is associated with participants' dropout rate due to various reasons including socioeconomic barriers, travel difficulties, and lack of awareness about the potential benefits of rehabilitation programs (Siddiqui et al., 2014; Yaqoob et al., 2021). Additionally, accessibility to standardized cognitive rehabilitation programs and cultural adaptation of these standardized programs is another point which needs consideration and attention of future researchers and clinicians.

Overall, this study is important because it represents a significant step for establishing the potential benefits that cognitive rehabilitation can provide for TBI survivors in Pakistan. By understanding and addressing these suggestions, state of cognitive rehabilitation programs at Pakistan will be improved and lead to better quality of life of people affected by TBI.

Implications

The implications of this study are very valuable to clinical practice, future research, and policy regarding TBI rehabilitation in Pakistan. The results of this research demonstrate

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that structured cognitive rehabilitation programs can improve cognitive functioning. The study has shown that including cognitive rehabilitation methods as part of the regular treatment plan for individuals who have sustained traumatic brain injuries may help individuals recover and regain critical cognitive functions and subsequently improve their ability to live independently and do their daily tasks. Moreover, this information can also assist hospitals and rehabilitation centers in their effort to launch systematic cognitive rehabilitation subunits for better improvement of patients with neurological conditions. Furthermore, there needs to be adequate provision for training and capacity-building for professionals involved in TBI rehabilitation. Hospitals and rehabilitation centers should incorporate structured cognitive rehabilitation programs and train professionals working in neurocognitive recovery to better meet the needs of this population and alleviate gaps identified in the literature (Ishtiaq et al., 2022; Khan et al., 2023). Additionally, rehabilitation programs must consider barriers related to literacy levels, language preferences, and financial considerations so that rehabilitation services are accessible to all traumatic brain injury patients, including those who reside in rural areas and/or have lower-income levels. Given that the efficacy of specific tailored interventions for improved cognitive functioning is established from past intervention studies (Iftikhar et al., 2025; Mahmood et al., 2025; Saif et al., 2025), specific modules targeting specific neurocognitive domains may incorporate culturally congruent elements to enhance its efficacy.

Conclusion

This research investigated the effectiveness of cognitive rehabilitation for improvement of cognitive functions following TBI. In general, the study findings showed that cognitive rehabilitation intervention improved cognitive functions in patients with TBI patients at post-assessment level. The patients with TBI receiving intervention showed significant improvement in specific cognitive domains including registration, attention, memory, and language. Based on the findings, it is recommended that healthcare professionals working with TBI patients may make it to provide cognitive rehabilitation to TBI patients as part of their standard treatment procedure. Future studies should provide evidence of the longer-term efficacy of cognitive rehabilitation for TBI patients.

References

Awan, S., Shahbaz, N., Akhtar, S. W., Ahmad, A., Iqbal, S., Ahmed, S., Naqvi, H., & Wasay, M. (2015). Validation study of the Mini-Mental State Examination in Urdu language for Pakistani population. *Open Neurology Journal, 26*(9), 53-58. https://doi.org/10.2174/1874205X01509010053.

Brady, M. C., Kelly, H., Godwin, J., Enderby, P., & Campbell, P. (2016). Speech and language therapy for aphasia following stroke. *Cochrane Database of Systematic Reviews, 2016*(6), CD000425. https://doi.org/10.1002/14651858.CD000425.pub4

Cappa, S. F., Benke, T., Clarke, S., Rossi, B., Stemmer, B., Van Heugten, C. M., ... & Brainin, M. (2011). Cognitive rehabilitation. *European Handbook of Neurological Management,* 545–567. https://doi.org/10.1002/9780470753279.

Cheeran, B., Cohen, L., Dobkin, B., Ford, G., Greenwood, R., Howard, D., ... & Rothwell, J. (2009). The future of restorative neurosciences in stroke: Driving the translational research pipeline from basic science to rehabilitation of people after stroke. *Neurorehabilitation and Neural Repair, 23*(2), 97–107. https://doi.org/10.1177/1545968308326636.

Cicerone, K. D., Goldin, Y., Ganci, K., Rosenbaum, A., Wethe, J. V., Langenbahn, D. M., Malec, J. F., Bergquist, T. F., Kingsley, K., Nagele, D., Trexler, L., & Fraas, M. (2019). Evidence-based cognitive rehabilitation: Systematic review of the literature

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.04 (2025)

from 2009 through 2014. *Archives of Physical Medicine and Rehabilitation, 100*(8), 1515–1533. https://doi.org/10.1016/j.apmr.2019.02.011

Cicerone, K. D., Langenbahn, D. M., Braden, C., Malec, J. F., Kalmar, K., Fraas, M., Felicetti, T., Laatsch, L., Harley, J. P., Bergquist, T., Azulay, J., Cantor, J., & Ashman, T. (2011). Evidence-based cognitive rehabilitation: Updated review of the literature from 2003 through 2008. *Archives of Physical Medicine and Rehabilitation, 92*(4), 519–530. https://doi.org/10.1016/j.apmr.2010.11.015

Fatima, S., Hassan, S., & Jameel, F. (2024). A moderated mediation model of age-related decline in selective executive functions and quality of life in men with substance use disorder. *Clinical Neuropsychiatry, 21*(2), 143-152. doi: 10.36131/cnfioritieditore20240203.

Fatima, S. (2019a). Executive Dysfunctions in Autism Spectrum Disorders. In: Ardila, A., Fatima, S., Rosselli, M. (eds) Dysexecutive Syndromes: Experimental and Clinical Perspectives(Pp 61-79). Springer. https://doi.org/10.1007/978-3-030-25077-5_4

Fatima, S. (2019b). Executive Dysfunctions in Attention-Deficit Hyperactivity Disorder. In: Ardila, A., Fatima, S., Rosselli, M. (eds) Dysexecutive Syndromes: Experimental and Clinical Perspectives(Pp 45-59). Springer. https://doi.org/10.1007/978-3-030-25077-5_3

Fatima, S., & Batool, F. (2024). "Negative affectivity distorts thinking": a multilevel analysis of criminogenic thinking among Pakistani incarcerated offenders. *The Journal of Forensic Psychiatry & Psychology*, *35*(5), 744–769. https://doi.org/10.1080/14789949.2024.2376666

Fatima, S., Jamil, M. & Ardila, A. (2019). Cognitive Control and Criminogenic Cognitions in South Asian Gamblers. *Journal of Gambling Studies, 35,* 501–516. https://doi.org/10.1007/s10899-018-9805-8

Fatima, S., Mehmood, N. & Shakil, M. (2022). Mediated Associations Between Religious Coping, Self-Regulation, and Psychological Distress Vary for Young Muslim Men and Women in Lahore, Pakistan. *Journal of Religion and Health, 61,* 109–124. https://doi.org/10.1007/s10943-021-01413-4

Fatima, S., Sharif, H. (2019). The Assessment of Executive Functions in Cross-Cultural Context. In: Ardila, A., Fatima, S., Rosselli, M. (eds) Dysexecutive Syndromes: Experimental and Clinical Perspectives (Pp 317-336). Springer. https://doi.org/10.1007/978-3-030-25077-5_16

Fatima, S., Zubair, T. (2025). Development and preliminary validation of a Pakistani neuropsychological test assessment battery- PANTAB. *Clinical Neuropsychiatry, 22*(6). 485-497. https://doi.org/10.36131/ cnfioritieditore20250606

Giza, C. C., & Hovda, D. A. (2014). The Neurometabolic Cascade of Concussion. Journal of Athletic Training. 36(3), 228–235.

Iftikhar, T., Fatima, S. Farooq, Z., Ahmad, M. (2025). Effectiveness of Cognitive Exercises on improvement in General Cognitive Functioning. *Frontiers in Medical and health Research, 3*(3), 195-206. https://fmhr.org/index.php/fmhr/article/view/228

Ishtiaq, S., Ahmed, I., Ullah, H., Ullah, A., & Alam, M. (2022). Prevalence of traumatic brain injury in multiple trauma evaluations at the emergency department of Hayatabad Medical Complex, Peshawar. *Journal of Gandhara Nursing and Allied Health Sciences, 5*(1), 119–122.

James, S. L., Theadom, A., Ellenbogen, R. G., Bannick, M. S., Montjoy-Venning, W., Lucchesi, L. R., Abbasi, N., Abdulkader, R., Abraha, H. N., Adsuar, J. C., Afarideh, M., Agrawal, S., Ahmadi, A., Ahmed, M. B., Aichour, A. N., Aichour, I., Aichour, M. T. E., Akinyemiju, T., Alahdab, F., … Murray, C. J. L. (2019). Global, regional, and

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.04 (2025)

national burden of traumatic brain injury and spinal cord injury, 1990–2016: A systematic analysis for the Global Burden of Disease Study 2016. *The Lancet Neurology, 18*(1), 56–87. https://doi.org/10.1016/S1474-4422(18)30415-0

Johansson, B., & Tornmalm, M. (2012). Working memory training for patients with acquired brain injury. *Brain Injury, 26*(13–14), 1688–1700. https://doi.org/10.3109/02699052.2012.698362

Khan, A. U., Ali, M., Khan, M. M., & Khan, H. M. (2023). Clinical management and outcomes of traumatic brain injury: A comparative study of high resource and low resource hospital settings. *Pakistan Journal of Neurological Surgery, 29*(1), 1–8.

Kleim, J. A., & Jones, T. A. (2008). Principles of experience-dependent neural plasticity. *Journal of Speech, Language, and Hearing Research, 51*(1), S225–S239. https://doi.org/10.1044/1092-4388(2008/018)

Lees, R., Selvarajah, J., Fenton, C., Pendlebury, S. T., Langhorne, P., Stott, D. J., & Quinn, T. J. (2014). Test accuracy of cognitive screening tests for diagnosis of dementia and multidomain cognitive impairment in stroke. *Stroke, 45*(10), 3008-3018. https://doi.org/10.1161/STROKEAHA.114.005842.

Mahmood, T., Fatima, S., & Saeed, B. (2025). Impact of school readiness intervention on school skills of children with autism spectrum disorder. *Contemporary Journal of Social Science Review, 3*(2). https://doi.org/10.63878/cjssr.v3i2.592

Mateos-Aparicio, P., & Rodríguez-Moreno, A. (2019). The impact of studying brain plasticity. *Frontiers in Cellular Neuroscience, 13*, 66. https://doi.org/10.3389/fncel.2019.00066.

Meher, K., Mushtaq, M., & Fatima, S. (2024). Death anxiety and wellbeing in doctors during covid-19: the explanatory and boosting roles of sleep quality and work locality. *OMEGA - Journal of Death and Dying, 89*(2), 667-682. https://doi.org/10.1177/00302228221078074

Menon, D. K., Schwab, K., Wright, D. W., & Maas, A. I. R. (2010). Position statement: Definition of traumatic brain injury. *Archives of Physical Medicine and Rehabilitation, 91*(11), 1637–1640. https://doi.org/10.1016/j.apmr.2010.05.017

Naeem, U., Jawed, A., & Jawed, A. (2022). Navigating neurotrauma management in Pakistan. *Journal of the Pakistan Medical Association*, 72(1), 200–200. https://doi.org/10.47391/JPMA.4110

Pashang, S. H., Zare, H., Alipour, A., & Sharif-Alhoseini, M. (2021). The effectiveness of cognitive rehabilitation in improving visual and auditory attention in ischemic stroke patients. *Acta Neurologica Belgica, 121*(4), 915–920. https://doi.org/10.1007/s13760-020-01288-4

Pekna, M., Pekny, M., & Nilsson, M. (2012). Modulation of neural plasticity as a basis for stroke rehabilitation. *Stroke, 43*(10), 2819–2828. https://doi.org/10.1161/STROKEAHA.112.654228

Ponsford, J., Bayley, M., Wiseman-Hakes, C., Togher, L., Velikonja, D., McIntyre, A., … Ingleton, C. (2014). INCOG recommendations for management of cognition following traumatic brain injury. *Journal of Head Trauma Rehabilitation, 29*(4), 290–306. https://doi.org/10.1097/HTR.0000000000000074

Qadir, R., Fatima, K., Ali, R., Jummani, M. M., Bokhari, I., & Hasan, M. (2024). Frequency and outcome of traumatic subarachnoid hemorrhage in patients presenting with traumatic brain injury at a tertiary care hospital, Karachi. *Pakistan Journal of Medical & Health Sciences, 17*(9), 5300–5305. https://doi.org/10.53350/pjmhs20231795300

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.04 (2025)

Rathore, F. A., & Mansoor, S. N. (2016). Neurorehabilitation in Pakistan: Needs, challenges and opportunities. *Khyber Medical University Journal*, *8*(2), 59–60. https://www.kmuj.kmu.edu.pk/article/view/16464

Rathore, F. A., Mansoor, S. N., Qureshi, A. R., & Farooq, F. (2019). Cognitive and functional outcomes of multidisciplinary rehabilitation in acquired brain injury. *Pakistan Journal of Neurological Sciences, 14*(3), 12–18.

Reinkensmeyer, D., Burdet, E., Casadio, M., Differt, T., Lamola, G., & Lambercy, O. (2016). Computational neurorehabilitation: Modeling plasticity and learning to predict recovery. *Journal of NeuroEngineering and Rehabilitation, 13*(1), 42. https://doi.org/10.1186/s12984-016-0148-3.

Righy, C., Rynkowski, C. B., & Turon, R. (2025). Global insights into traumatic brain injury. The low- and middle-income countries' perspective. *Critical Care Science, 11*(37). e20250255. https://doi.org/10.62675/2965-2774.20250255.

Robertson, I. H., & Murre, J. M. J. (1999). Rehabilitation of brain damage: Brain plasticity and principles of guided recovery. *Psychological Bulletin, 125*(5), 544–575. https://doi.org/10.1037/0033-2909.125.5.544

Saif, U. U. & Fatima, S. (2025). The impact of applied behavior analysis on basic learning and academic skills in children with autism: An intervention study. *Contemporary Journal of Social Sciences Review, 3*(3). 1247-1258, https://doi.org/10.63878/cjssr.v3i3.1091

Siddiqui, A., Shamim, M. S., & Rehman, Z. U. (2014). Traumatic brain injuries: Experience from a tertiary care centre in Pakistan. *World Neurosurgery, 82*(1–2), 94–99. https://doi.org/10.1016/j.wneu.2013.02.065

Vafa, M. A., Shalchi, B., Farhodi, M., Nazari, M. A., & Horolar, L. A. (2024). A comparative study of the effectiveness of non-computer and computer-based cognitive rehabilitation interventions on auditory/visual working memory of stroke patients. *Medical Journal of Tabriz University of Medical Sciences, 46*(2). https://doi.org/10.34172/mj.2024.019

Waqar, H., Tanveer, F., Arslan, S. A., Ahmad, A., Sarfraz, S., & Fatima, K. (2022). Effects of sensorimotor stimulation on cognitive performance in mild traumatic brain injury. *Pakistan BioMedical Journal, 5*(7), 197–201. https://doi.org/10.54393/pbmj.v5i7.684

Yaqoob, U., Javeed, F., Rehman, L., Pahwani, M., Madni, S., & Muizz-ud-Din, M. (2021). Emergency department outcome of patients with traumatic brain injury: A retrospective study from Pakistan. *Pakistan Journal of Neurological Surgery, 25*(2), 196–200. https://doi.org/10.36552/pjns.v25i2.540