


# Functional Independence Among Young Adults with Post-Concussion Syndrome

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Gestational post-concussion syndrome, Traumatic Brain Injury, Functional Independence, Glasgow Outcome Scale Extended

## Disclaimers

Authors' Contributions Isha Asghar and Aimon Rizwan designed the study, collected and analyzed data, and drafted the manuscript. Syed Hamza Maqbool, Abdullah Pirzada, Asad Azam, and Muhammad Zubair assisted with data collection, analysis, and manuscript revisions. All authors approved the final manuscript.

## Conflict of Interest

None declared

## Data/supplements

Available on request.

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N/A

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## ABSTRACT

**Background** Post-concussion syndrome (PCS) significantly impacts the functional independence of young adults following mild traumatic brain injuries (mTBI). Understanding these effects is essential for developing effective treatment strategies and improving the quality of life for affected individuals.

**Objective:** The objective of this study was to investigate how PCS affects the functional independence of young adults who have experienced mild traumatic brain injuries.

**Methods:** A descriptive cross-sectional survey was conducted over six months at Lahore College of Physical Therapy (LMDC). The study included 61 participants aged 18-25 years, recruited from the Punjab Institute of Neurosciences and Facebook Online Neuro Rehab Groups. Data collection involved the Extended Glasgow Outcome Scale (GOSE) questionnaire, adapted into a digital format using Google Forms for online distribution. Participants completed the questionnaire independently, and data were analyzed using SPSS software version 25. Descriptive statistics, including means and standard deviations for continuous variables, and frequencies and percentages for categorical variables, were used to summarize the data. Ethical approval was obtained from the Ethics Committee of Lahore College of Physical Therapy, LMDC, and informed consent was secured from all participants.

**Results:** The mean age of participants was 22.13 years (SD = 2.59). Of the participants, 37.7% required daily assistance at home, 19.7% needed frequent help at home, and 50.8% experienced reduced work capacity. Additionally, 45.0% required assistance outside the home, and only 44.3% reported no other injury-related problems. Significant proportions faced restrictions in their functional independence, highlighting the pervasive impact of PCS on their daily lives.

**Conclusion:** The study concluded that PCS markedly affects the functional independence of young adults, necessitating assistance with daily activities and work. Early, standardized assessments and multidisciplinary interventions are critical for improving outcomes and quality of life for this population. management.

## INTRODUCTION

The intricate pathophysiological process of concussion, or mild traumatic brain injury (mTBI), is characterized by biomechanical forces impacting the brain (1). The incidence of mTBI/concussion in industrialized nations is estimated to range from 100 to 300 per 100,000 people, although significant underreporting suggests the actual numbers may be higher (2). Post-concussion syndrome (PCS), a condition marked by a constellation of physical, cognitive, and emotional or behavioral problems, frequently occurs in individuals with mild traumatic brain injuries. Common PCS symptoms include headache, dizziness, poor concentration, memory issues, irritability, exhaustion, vision disturbances, judgment issues, depression, and anxiety. While these symptoms typically resolve within a month, in some individuals, PCS can persist for months or even years, leading to chronic disability (3). The term “post-

concussion syndrome” or “persistent PCS” is often used to describe this prolonged cluster of symptoms.

Traumatic brain injury (TBI) is defined by the Centers for Disease Control and Prevention (CDC) as a disruption in normal brain function caused by an external force such as a collision, shock, concussion, or penetrating head injury (4). Globally, the annual incidence of mild TBI is estimated to be between 100 and 550 per 100,000 people (5). PCS predominantly affects individuals with mild TBI, although it can occur at any injury severity level (6). Several factors influence the risk of developing PCS, including age, gender, education level, mechanism of injury (e.g., assault vs. other mechanisms), injury severity scale (ISS), abbreviated injury score of the head (AISH), comorbidities, traumatic abnormalities observed in head CT scans, and whether the patient was hospitalized (7- 9).

Functional independence is the ability to perform activities of daily living (ADLs) autonomously, ensuring the capacity to live independently in a home environment (10). Among

young adults with PCS, the degree of functional independence can vary significantly depending on the severity of their symptoms. The Glasgow Outcome Scale Extended (GOSE) is a functional measurement tool that evaluates outcomes across eight categories, including awareness, independence at home and away from home, employment, social and recreational activities, relationships with family and friends, and return to normal life (11, 12). Addressing these challenges is crucial for fostering a positive research culture among future healthcare professionals.

## MATERIAL AND METHODS

The study utilized a descriptive cross-sectional design conducted over a six-month period from June to December 2023 at the Lahore College of Physical Therapy, LMDC. The data collection involved non-probability purposive sampling, targeting young adults aged 18-25 who had experienced falls or road traffic accidents, while excluding survivors of domestic violence, pediatric, geriatric, and athletic populations. The sample comprised 61 participants recruited from the Punjab Institute of Neurosciences and various Facebook Online Neuro Rehab Groups, ensuring a representative sample through diverse recruitment methods including social media platforms, email invitations, and relevant online communities.

Data collection was carried out using the Extended Glasgow Outcome Scale (GOSE) questionnaire, which was adapted into a digital format using Google Forms to facilitate online distribution. Participants were provided with an informed consent form detailing the study's objectives, data usage, and participant rights, which they electronically acknowledged before participating. The questionnaire assessed functional independence across various levels, including home assistance, outdoor assistance, work

**Table 1: Age of Participants**

Statistics	Mean	SD	Maximum	Minimum
Age	22.13	2.59	25.00	18.00

**Table 2: Independence at Home After PCS**

Variables	Yes	No	Not Applicable
Is the assistance of another person at home essential every day for some ADLs?	23 (37.7%)	38 (62.3%)	
Do they need frequent help of someone to be around at home most of the time?	12 (19.7%)	13 (21.3%)	36 (59.0%)
Was the patient independent at home before the injury?	24 (39.3%)	1 (1.6%)	36 (59.0%)

The results showed that 37.7% of participants required daily assistance at home for some activities of daily living (ADLs), while 62.3% did not require such assistance (Table 2). Additionally, 19.7% needed frequent help at home, 21.3%

capability, and overall recovery. Participants completed all sections of the questionnaire independently, and responses were securely stored in digital format to minimize risks associated with manual data entry.

The study adhered to the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of Lahore College of Physical Therapy, LMDC. Informed consent was obtained from all participants, with assurances of strict confidentiality and anonymity to protect their identities. The research ensured no harm to participants and aimed to derive meaningful conclusions to enhance understanding and management of post-concussion syndrome among young adults.

Following data collection, responses were transferred to SPSS software version 25 for statistical analysis. Incomplete responses were excluded from the analysis. Descriptive statistics, including means and standard deviations for continuous variables, and frequencies and percentages for categorical variables, were used to summarize the data. Inferential statistics were applied as appropriate to explore relationships and draw conclusions based on the collected data(13-15).

Overall, the methodological approach was designed to provide a comprehensive assessment of functional independence among young adults with post-concussion syndrome, ensuring rigorous data collection, ethical considerations, and robust statistical analysis to inform clinical practice and healthcare strategies.

## RESULTS

The study analyzed data from 61 participants aged 18–25 years who had experienced mild traumatic brain injuries (mTBI) resulting in post-concussion syndrome (PCS). The mean age of the participants was 22.13 years (SD = 2.59), with a range from 18 to 25.

did not, and for 59.0%, this question was not applicable. Before the injury, 39.3% were independent at home, 1.6% were not, and for 59.0%, this was not applicable.

**Table 3: Extent of Restriction at Work**

Variables	Frequency	Percent
Reduced work capacity	31	50.8%
Able to work only in a sheltered workshop or non-competitive job or currently unable to work	4	6.6%
Not Applicable	26	42.6%

The data indicated that 50.8% of participants experienced reduced work capacity, 6.6% were able to work only in sheltered workshops or non-competitive jobs or were currently unable to work, and 42.6% found this question not applicable (Table 3).

Out of the 61 participants, 19.7% required frequent assistance at home, 45.0% needed assistance outside the home, and 50.8% faced restrictions at work. Only 44.3% of participants reported no other problems related to their injury.

**Table 4: Functional Independence**

Variables	Frequency	Percent
Frequent home assistance needed	12	19.7%
Assistance needed outside home	27	45.0%
Restrictions faced at work	31	50.8%
No other injury-related problems	27	44.3%

These findings highlight the significant impact of PCS on the functional independence of young adults, particularly in their home and work environments. The study underscores the need for targeted interventions to support this population in regaining their independence and improving their quality of life.

## DISCUSSION

The primary objectives of this research are to determine the factors that help or hinders young adults with post-concussion syndrome from leading independent lives and to assess their degree of functional independence. Recent studies illustrate that recovery from mTBI is a non-linear process, with subgroups of patients failing to fully rebound from their injury. This variability allows for the construction of prognostic models using pre-injury risk factors to guide post-injury management (14). The findings highlight the need for a standardized assessment of functional disability and post-concussive symptoms at multiple and earlier time points. Early interventions post-injury may decrease maladaptive coping methods, loss of livelihood/productivity, and healthcare costs (15).

In 2021, Brazinova, A., V. Rehorcikova, described that the common causes of traumatic brain injury include road accidents, falls, sports injuries and assaults. Falls are the leading cause of TBI in young children and the oldest age groups (16). In a 2017 study in New Zealand falls were identified as the primary cause of TBI in the young children and oldest age group (17).

In 2006, Drake and McDonald conducted the study which suggested that the GCS-E is a useful tool for the prediction of symptoms associated with mild TBI (18). The GOS-E is a functional measurement scale specifically designed for TBI providing a global scale for functional outcome that rates patient status into eight categories by subdividing severe disability, moderate disability and good recovery into upper and lower categories (19) (20). In 2000, Nell and Yates concluded that wide use of the GCS-E would keep mild traumatic brain injury cases in the treatment loop, improve access to counseling, rehabilitation services, and personal injury compensation, and reduce the “cognitive dissonance” between victims of mild traumatic brain injury and treating professionals (21). The Extended GOS (GOSE) is a global scale for functional outcome that rates patient status into eight categories by subdividing the categories of

severe disability, moderate disability and good recovery into a lower and upper category (22).

The main findings of this study provide insight into the complex relationship between functional independence and post-concussion syndrome in young adults. These findings have significant implications for clinical practice, rehabilitation, and public health. The GOS-E's comprehensive insights enable personalized therapy plans that target cognitive, physical, and psychosocial factors separately by providing a sophisticated understanding of particular issues. These results can also guide policy decisions by supporting the use of multidisciplinary strategies and resource allocation in the comprehensive management of post-concussion syndrome. Ultimately, this study offers valuable information for enhancing the overall health and therapeutic care of this population.

## CONCLUSION

In conclusion, the findings of the current study concluded that majority of the young adults with post-concussion syndrome needs assistance of some other person for activities of daily living and perform activities at work with difficulty.

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