

# Surveying the Landscape of Persistent Concussive Symptoms in Adults Through an Occupational Lens

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**Importance:** Little is known about how and to what extent persistent concussive symptoms affect occupational performance in adults.

**Objective:** To evaluate the impact of persistent postconcussive symptoms on occupational performance.

**Design:** A cross-sectional study design was used in which the occupational performance needs of adults with persistent concussion symptoms were identified by a trained occupational therapist via semistructured interview.

**Setting:** University research space.

**Participants:** Adults ages 18 to 60 yr experiencing persistent concussion symptoms.

**Outcomes and Measures:** Occupational performance was evaluated using the Canadian Occupational Performance Measure. Data were then categorized by two researchers using the *Occupational Therapy Practice Framework: Domain and Process* (4th ed.).

**Results:** The most commonly affected occupational performance areas included education and work, social participation, and performance of instrumental activities of daily living.

**Conclusions and Relevance:** Aligning with prior knowledge of the impact of psychosocial difficulties and higher order cognitive deficits on daily life, performance of complex occupations is heavily affected in adults with persistent concussive symptoms.

**Plain-Language Summary:** The functional impact of symptoms that adults experience postconcussion becomes apparent as they return to their life occupations. The results of this study showed that adults with persistent concussive symptoms more commonly experienced occupational challenges with participation in education, social activities, and the performance of instrumental activities of daily living, with subtle, important variations in symptoms across adults. Detailed, client-centered evaluation of occupational performance changes postconcussion is an area of potential growth for occupational therapy practice and research.

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Concussion is one of the most frequently reported diagnoses in the health care system, with nearly 2 million cases each year in the United States alone (Taylor et al., 2017). More than half of people who experience a concussion do not report their symptoms and, consequently, do not receive medical care including rehabilitation services (Finch et al., 2013; Veliz et al., 2017). People with concussion experience a wide range of symptoms, including physical, cognitive, emotional, and sleep disturbances (Dischinger et al., 2009; Eisenberg et al., 2014). Many of these people demonstrate a full recovery after 1 to 3 mo (Polinder et al.,

2018); however, as many as half of these people experience symptoms more than 1 yr after concussion occurrence (i.e., persistent concussive symptoms; PCS; Fourtassi et al., 2011).

One of the most important priorities for people postconcussion is regaining their previous level of occupational engagement (Roelke et al., 2022; Taylor Postma et al., 2022). However, most concussion rehabilitation has focused on assessment and remediation of impairments with little consideration of occupational performance (Moen et al., 2022). Collectively, PCS appear to impede a return to performing life

activities and even contribute to societal and economic burdens (Polinder et al., 2018; Stålnacke, 2007). Literature on youths with PCS suggests that returning to sports, academics, and social activities is often problematic (Acord-Vira et al., 2021; Moen et al., 2022; Sang et al., 2020). Knowledge of specific symptoms at times can better inform the structuring of occupation-based intervention (e.g., type of cognitive strategy selected); however, there is also a need for direct measurement of occupational performance to inform intervention and evaluate meaningful change.

Research on the impact of PCS on adult occupational performance is limited and has exclusively used brief, fixed-item, self-report measures. Data from these fixed-item measures suggest that social activities, returning to work, and instrumental activities of daily living may be affected by PCS (Erez et al., 2009; Cooksley et al., 2018; Stålnacke, 2007). The use of fixed-item measures limits evaluation to only those occupations reflected in the items listed; thus, it does not allow for the measurement of all affected occupations or provide the individualized context for how they are affected. Additional work is needed to better establish the breadth and depth of occupational performance difficulties in adults with PCS with the use of a client-centered measure of occupational performance. Therefore, the aim of this study is to evaluate the occupational performance limitations of adults with PCS using a semistructured interview tool.

## Method

The data for this study came from a larger project evaluating the feasibility and effect of the Cognitive Orientation to daily Occupational Performance (CO-OP) intervention in adults who are experiencing PCS (Boone et al., 2024). All participants provided written informed consent. This project was approved by the University of Missouri Institutional Review Board.

## Design

We performed a secondary analysis of cross-sectional data gathered before the intervention in the larger study. All assessment data, including data from screening measures and the Canadian Occupational Performance Measure (COPM) reported here, were gathered by a trained rater (Anna E. Boone or Whitney L. Henderson) within a single session in a quiet, university laboratory setting.

## Participants

We recruited 14 participants through word of mouth and university e-mail advertisements that reached students, staff, faculty, and members of the community. Participants were included if they

- received a physician's diagnosis of a mild traumatic brain injury or concussion,

- had one or more postconcussive symptoms persisting for 4 wk or longer that inhibited the performance of one or more daily activities, and
- were ages 18 to 60 yr.

Participants were excluded if they had

- any additional severe neurological or psychiatric conditions;
- severe depressive symptoms, as indicated by a score higher than 21 on the nine-item Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001); or
- an inability to read, write, and speak English fluently.

## Outcome Measures

The COPM is a semistructured interview used to evaluate occupational performance limitations in the areas of self-care, leisure, and productivity (Law et al., 2014). Because of this open-ended format, the COPM may be used to identify a wide array of affected occupations and the contextual factors that are relevant to a specific client. The COPM has been used in various populations to assess occupational performance, inform goal setting, and measure change. The COPM evaluates the importance, performance, and satisfaction levels for each goal on a scale ranging from 1 (*not important at all*) to 10 (*extremely important*). The COPM has demonstrated high levels of reliability and validity (Carswell et al., 2004).

## Data Analysis

We calculated descriptive statistics to describe sample demographics and COPM performance and satisfaction levels. Using the COPM, two researchers (Boone or Sepideh Zenoozi) gathered occupational performance data and classified the data according to the *Occupational Therapy Practice Framework: Domain and Process* (4th ed.; OTPF-4) occupational categories and subcategories (American Occupational Therapy Association [AOTA], 2020). There were 70 occupational performance difficulties identified by participants before classification into OTPF-4 occupational categories. Four areas of occupational performance difficulties were identified that fit into two OTPF-4 occupation categories (e.g., reading for both school and leisure would be classified into education and leisure, respectively) and, thus, were placed within each of the two appropriate categories. This led to 74 occupational performance difficulties. Next, COPM data were also classified according to OTPF-4 occupational subcategories (e.g., community participation, job performance and maintenance). Similar to dual coding for broad occupational categories, data were dual coded for occupational subcategories as appropriate.

## Results

Fourteen participants completed the baseline assessment. The majority of participants were female (64.28%), with a mean age of 29.71 yr ( $SD = 13.60$ ). Additionally, the sample was primarily White (71.41%) and non-Hispanic–Latino (92.85%). A history of multiple concussions was common within the sample ( $M = 3.00$  prior concussions,  $SD = 1.66$ ), with an average time since the most recent concussion of about 30 mo ( $M = 29.71$ ,  $SD = 28.38$ ).

The top three occupational challenges reported were in these occupational categories: education (21.62% of COPM goals), social participation (20.27% of COPM goals), and IADL performance (18.91% of COPM goals), respectively (Figures 1 and 2). Formal educational participation (e.g., participating in academic extracurricular activities) was an occupational subcategory that was cited frequently as a challenge, with 21 related COPM goals (23.6%). Community participation and relationships (e.g., going to social gatherings, maintaining relationships) were the most reported challenges in social participation, with 11 goals related to this area (12.35%).

Meal preparation and cleanup (e.g., planning weekly meals, obtaining groceries, eating on a regular schedule) was the most frequently reported in the IADL category, as indicated in eight goals (9%). Other noteworthy affected IADLs included medication management and financial management. Job performance

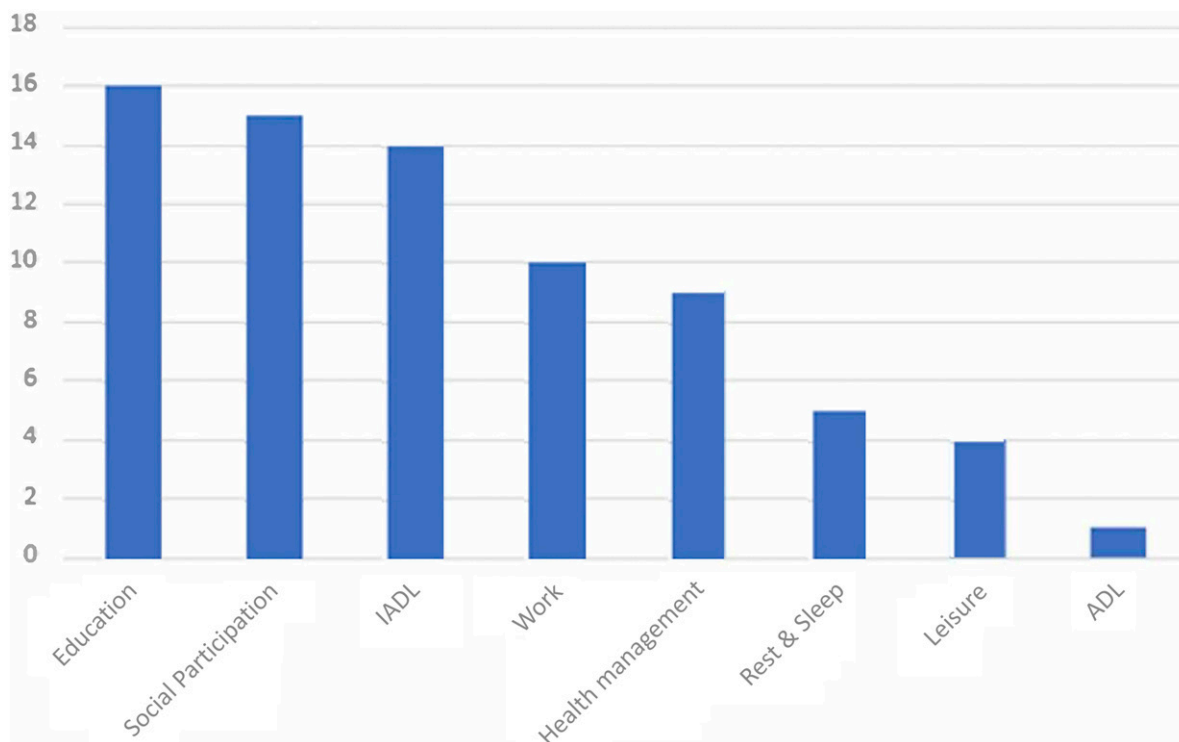
and maintenance (e.g., maintaining preinjury productivity, multitasking at work, maintaining work schedule) was related to 12 goals (13.48%), making job performance the most frequently reported challenge in the work category. Eight goals (8.98%) were related to the rest and sleep (e.g., falling and staying asleep, maintaining healthy sleep–wake routines) occupational category. Reading (e.g., maintaining attention, synthesizing what has been read) was most frequently reported in the leisure category (4.49% of COPM goals). Participants also identified difficulties with returning to previously enjoyed exercise routines.

Overall, perceived performance of identified occupational challenges was low ( $M = 4.21$ ,  $SD = 1.63$ ), as was satisfaction with performance ( $M = 3.80$ ,  $SD = 2.82$ ).

## Discussion

There is growing recognition of a subset of people who experience ongoing symptoms after a concussion that can interfere with everyday life (Fourtassi et al., 2011; Moen et al., 2022). Evaluation typically consists of neuropsychological cognitive assessment or self-reported symptoms (Cogan, 2014; Iverson et al., 2017). Consistent with the occupational therapy scope of practice and the primary charge of enabling life participation (AOTA, 2020), the population with PCS could greatly benefit from occupational therapy services. The role of occupational therapy for people with PCS is

**Figure 1. Occupational performance limitations according to occupational categories from the *Occupational Therapy Practice Framework: Domain and Process* (4th ed.).**



Note. ADL = activities of daily living; IADL = instrumental activities of daily living.

**Figure 2. Occupational performance limitations according to occupational subcategories from the *Occupational Therapy Practice Framework: Domain and Process* (4th ed.).**



further enhanced by a recommended transition in postconcussive care to a graded return to activity post-concussion (McCrory et al., 2017), as opposed to prolonged rest, which may be associated with increased symptoms (DiFazio et al., 2016).

A wealth of literature has identified decreased cognitive abilities, emotional dysregulation, and the presence of other negative symptoms (e.g., headaches, sensitivity to light or sound) using self-report and objective assessment methods (Bigler, 2008; Lundin et al., 2006; van der Horn et al., 2013). Existing literature makes an incremental step toward describing how PCS affect the performance of everyday life activities, using data from fixed-item questionnaires. However, the use of fixed-item questionnaires limits evaluation to only the items asked about on the questionnaire, which is not reflective of the unique occupational profiles of individual clients. The purpose of this work was to evaluate the occupational performance limitations of adults with PCS using of a semistructured interview.

Mild versions of executive dysfunction, such as that in PCS, become apparent in complex, novel, dynamic situations (Lezak et al., 2004; Suchy, 2009). As such, mild executive deficits are often apparent in occupational performance of the same types of occupations reported as affected in the present study including return to work/academics and socialization (Morrison et al., 2015). Difficulty with return to work and academics at the previous capacity in the present study may be further complicated by a lowered tolerance of screens, the presence of headaches, and lower attentional capacity experienced in PCS (Polinder et al., 2018). Slow return to social activities and roles,

particularly in large group gatherings, is likely due to the culmination of auditory, visual, and cognitive stimuli that can become overstimulating in social environments. Additionally, changes in emotional regulation can also hamper familial, platonic, or romantic social relationships.

An unexpected finding was the reported limitations in leisure pursuits and maintaining basic self-care routines such as medication management, maintaining a sleep schedule, eating at standard mealtimes, or even adherence to a morning self-care routine (e.g., showering). Limitations were expected in occupations that elicited an increase in symptoms (e.g., loud social environment) or in occupations requiring higher order cognitive functions (e.g., cooking a complicated recipe), not within basic, routine activities. Finally, this sample had trouble with both falling asleep and staying asleep, as noted in prior research on PCS; although not frequently addressed, sleep is in the occupational therapy scope of practice and presents an opportunity for growth (Macera et al., 2013).

Because of the subtle nature of PCS, it may be difficult for people with PCS to self-report how symptoms affect everyday life. Additionally, education on PCS from health care providers may not describe the potential for persistent symptoms; therefore, people with PCS may have a tendency to be dismissive of symptoms. As demonstrated in the current study, occupational therapy practitioners have a key role to play in evaluating the impact of symptoms of PCS on life activities. The addition of occupational therapy services within a multidisciplinary concussion clinic led to improved identification of affected performance skills and performance patterns (Harris et al., 2019).

Occupational therapy practitioners may use data that are supportive of the role of occupational therapy in addressing PCS to advocate for client referrals post-concussion and for the inclusion of occupational therapy services within multidisciplinary concussion clinics. Clinical evaluation of PCS primarily consists of self-reported symptoms (Iverson et al., 2017). Symptom evaluation falls within the scope of occupational therapy practice, but it also overlaps with the scope of practice of several other health professions; occupational therapists can provide an invaluable contribution through a thorough evaluation of the influence of PCS on occupational performance through semistructured interview methods (AOTA, 2020). Furthermore, occupational therapy practitioners may then better address the functional impact of PCS in adults through the use of occupation-based interventions and can directly measure change in performance over time.

The wide variety of occupational performance limitations reported in this sample of people with PCS suggests that a fixed-item questionnaire may be insufficient. Fixed-item questionnaires only acquire the data on the content directly mentioned within the items, whereas a semistructured interview format allows for gathering data on a multitude of occupations and the exact manner in which the occupations are affected. For example, a semistructured interview tool, such as the COPM, allows for the flexibility needed to evaluate the full breadth of occupations; to ascertain the client-specific impact of symptoms on occupation; and to develop client-centered, occupation-based goals. Use of the COPM in clinical practice also has been noted to improve collaboration between the therapist and client and to serve as a starting point for facilitating client insight and ownership of the therapy process (Parker & Sykes, 2006).

Our findings can assist in informing specific areas of inquiry and targeted questions that may be asked in a semistructured interview or as a basis for occupation-based intervention. A systematic review of interventions in adults with PCS identified only 10 studies with performance-based outcomes, and only one evaluated an occupational therapy-focused intervention (i.e., self-management; Jaber et al., 2019). There is a need for development and testing of interventions to improve participation outcomes in adults with PCS. Specifically, adults with PCS may benefit from a strategy training-based intervention (e.g., CO-OP, multicontext approach) for addressing functional outcomes in populations that are capable of new learning and skill transfer (Cicerone et al., 2019).

## Implications for Occupational Therapy Practice

The findings of this study have the following clinical implications for occupational therapy practice:

- Occupational therapy practitioners play a critical role in client-centered evaluation of occupational performance limitations in adults with PCS.
- Advocacy from occupational therapy practitioners and managers for inclusion of occupational therapy services in concussion health care services is warranted to recognize and address the functional impact of concussive symptoms.

## Conclusion and Limitations

This study contributes to the knowledge of how PCS in adults affect everyday life activities. In turn, this work can be useful for informing future studies on suitable interventions for adults with PCS. Alternatively, literature on the functional impact of PCS in adults could inform the development of a tailored occupational performance assessment for this population for more accurate or efficient screening and evaluation. Clinically, occupational therapists can gain a richer understanding of how symptoms of PCS uniquely manifest in a client's occupations through the use of a semistructured interview as part of assessment. A small sample size, a relatively young adult population, and use of a single site for recruitment may limit the generalizability of study findings. Further research is needed to confirm findings and to ascertain the effects of PCS for older adult populations. The majority of data gathered were self-report; future work may consider the use of additional, complementary objective measures. 📌

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