

Physical Disabilities

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The Role of Occupational Therapy in Managing Post-Concussion Syndrome

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Over the past several years, there has been increased focus on diagnosing, managing, and preventing concussion and post-concussive symptoms in an effort to prevent further injury and identify the best course of symptom management. Emerging evidence is identifying both short- and long-term symptoms of concussion and the impact on occupational performance, return to life roles, and quality of life. Patients with post-concussive symptoms often experience difficulty transitioning back to activities such as work, school, and play. The types of patients who experience post-concussive symptoms vary, and include but are not limited to those who sustained concussions as a result of a sports injury, motor vehicle accident, blast injury, or a fall.

Occupational therapists are trained to analyze activities and identify limiting patient factors or environmental barriers that may prevent full participation in everyday occupations, making occupational therapy a relevant and important service in the rehabilitation of post-concussion syndrome. Therefore, it is both practical and necessary for occupational therapists to be a part of the rehabilitation team for patients who receive medical treatment following a concussion. Occupational therapists who work with this patient population should possess basic knowledge and skills to assist patients with symptom management, environmental or activity adaptations, or both, and basic competence in administering visual, perceptual, and vestibular assessments.

Literature Review

Defining concussion is challenging, given its many working definitions and the lack of specific tests to confirm the diagnosis. According to the position statement on concussion published after the 4th International Conference on Concussion in Sport, concussion is defined as a brain injury and “a complex pathophysiological process affecting the brain, induced by biomechanical forces” (McCrory et al., 2013, p. 1). Further criteria for diagnosing concussion include (1) a direct blow to the head, face or neck, or other body part with the force transferred to the head; (2) rapid onset of short-term impairment of neurological function; (3) neuropathological changes without abnormality seen on imaging; and (4) clinical symptoms with possible loss of consciousness that may resolve spontaneously or persist for longer periods (McCrory et al., 2013).

Given the complexity of this diagnosis, it is difficult to determine the trajectory for recovery, but it is suggested that most individuals should recover spontaneously from concussion within

7 to 10 days (McCrory et al., 2013). However, other studies have suggested that individuals may have symptoms that last up to 1 year postinjury (Sigurdardottir, Andelic, Roe, Jerstad, & Schanke, 2009). Those individuals who present with symptoms up to a year or more are often diagnosed with *post-concussive syndrome*. Persistent symptoms are found to be correlated with decreased quality of life and impaired independence with basic activities of daily living. Factors associated with prolonged recovery include a history of attention deficit disorder, attention deficit hyperactivity disorder, or other neurological condition; prior concussions; psychiatric co-morbidity; and prolonged loss of consciousness (Bonfield, Lam, Lin, & Greene, 2013).

Evaluation

Specific areas for occupational therapists to assess with a client post-concussion include vision and visual-perceptual deficits, cognitive and sensory processing skills, and the ability to complete activities related to self-care, work, school, leisure, and play. Following the completion of a comprehensive evaluation, the occupational therapist can establish a treatment plan to address the areas of impairment and set measurable goals to facilitate return to meaningful life roles and routines.

Vision: Evaluating visual tracking and visual skills has gained increased attention as both a diagnostic tool for concussion as well as a tool for assessing post-concussion syndrome, which often includes difficulty reading (Marinides et al., 2014). Research has identified objective findings that show differences in saccadic eye movements, smooth pursuits, and tracking in a control group versus a group of individuals with post-concussive syndrome (Heitger et al., 2009). Additional research has also identified changes in accommodation and convergence that occur in individuals with post-concussion syndrome (Poltavski & Biberdorf, 2014). Functionally, individuals often report difficulty focusing on words when reading, or letters appearing to move on the page, as well as increased headache and eyestrain when attempting to read.

Occupational therapy evaluations thus should include screening eye movements including smooth pursuits, saccades, and visual fixation through observation as well as standardized assessments, such as the Developmental Eye Movement Test (DEM; Garzia, Richman, Nicholson, & Gaines, 1990) and the King-Devick Assessment (KD; Oride, Marutani, Rouse, & DeLand, 1986). The DEM provides an objective method of assessing fixational and saccade activity during reading and non-reading tasks. It incorporates a subtest of number calling in a vertical array and provides the means to evaluate oculomotor function with numbers in a horizontal array. Norms for this assessment were established with children aged 6 to 13 years; however, the assessment is appropriate for use with adults to measure progress over time despite lack of normative data for adults.

The KD also assesses saccadic eye movement, through a brief measure of rapid number naming. Additional screening should

include evaluating convergence and accommodation, and the impact on functional activities. Interventions might include the use of scanning activities, computer games, Vision Coach or Dynavision, Saccadic Fixator, and other activities to improve hand-eye coordination. Occupational therapists can work collaboratively with optometrists to improve near focus, convergence, and accommodative function; treatment interventions may include teaching compensatory strategies to address difficulties with light sensitivity, convergence, and visual tracking.

Sensory Processing: The Sports Concussion Assessment Tool, version 3 (SCAT3; McCrory et al., 2013) and the Rivermead Post-Concussion Symptom Questionnaire (King, Crawford, Wenden, Moss, & Wade, 1995) are two commonly used assessments for concussion. They include items related to sensory processing, specifically light and sound sensitivity that ultimately affect quality of life and the return to daily activities. Despite the fact that many sensory processing concerns are included on questionnaires and assessments, limited rationale and research exist to explain why they occur. Theories related to changes in neuronal communication and inflammation offer possible explanations but are ultimately inconclusive (Cubon, Putukian, Boyer, & Dettwiler, 2011). However, it can be hypothesized that a concussion results in changes that limit an individual's ability to screen out extraneous stimulation.

In addition to the SCAT3 and the Rivermead Post-Concussion Questionnaire, occupational therapists can evaluate sensory processing through interviews and questionnaires such as the Adult Sensory Profile (Brown, Tollefson, Dunn, Cromwell, & Fillion, 2001).

By administering the Sensory Profile, one can identify sensory processing patterns and potential triggers that exacerbate and increase reactions to sensory information. Therapists can recommend environmental adaptations or help patients modify their reactions to sensory stimulation (e.g., wearing sunglasses and hat, using natural versus fluorescent lights).

Specific Protocols

Return to school: Some protocols are designed to help children and young adults transition back to school. Because of symptoms such as light sensitivity, sound sensitivity, difficulty with visual tracking, and dizziness, returning to school can be challenging. However, many professionals have suggested the importance of returning the individual to structured activities, including school, as soon as possible to establish a general sense of improved well-being and to restore a consistent routine (Halstead et al., 2013).

Occupational therapists can work collaboratively with physicians and psychologists to determine what modifications might reduce symptoms to allow the child to participate in school. Modifications for visual difficulties might include using a line guide or tinted blue transparency when reading to help with visual tracking difficulties and to reduce glare. Depending on the child's visual tracking and focusing abilities, the therapist may also recommend larger print or access to lesson notes ahead of time. Modifications for general sensory sensitivity, including decreased tolerance for crowds and visual motion, might include recommendations to allow the child to change classes ahead of time and to provide an alternative to eating lunch in a busy cafeteria.

Many young adults who sustain concussion, particularly athletes, are enrolled in college full time, and they often struggle with return to campus life. Classes can become increasingly challenging and social activities, one of the most important aspects of college life, can become difficult to tolerate. Occupational therapists can suggest that students request accommodations, such as preprinted notes, increased test time, and the use of recording devices for taking notes. Therapists can also recommend compensatory strategies for visual tracking difficulties when reading. For social activities, therapists can help students identify activities that are less stimulating and therefore less likely to provoke symptoms. For example, one recommendation might be to avoid studying or eating lunch with a large group of peers, and to meet with a smaller group of friends in a less stimulating environment.

Return to work: Visual changes and difficulty with concentration and sensory processing can all limit participation in work-related tasks. As with return to school, there is a benefit to an initial period of rest, followed by a graduated return to work if one's job permits. However multiple factors may complicate a client's return to work, such as his or her need to earn money right away, and requirements/responsibilities of the job may limit the potential for a flexible schedule. Therapists can work with patients and their employers on strategies to manage symptoms, such as creating modified workstations, using anti-glare computer screens, or implementing frequent rest breaks.

Case Example

KG is a 41-year-old female with no prior medical history, who was driving when her car was hit on the driver's side and totaled. She did not lose consciousness during the accident, but she sustained a second-degree burn on her right wrist and was brought to a local hospital; she didn't have any obvious head injuries, and she was released home the same day. However, she reported that a few days after the accident, she began to have difficulty finding words, losing her train of thought, drowsiness, and difficulty processing information. She attempted to return to work and began to experience headaches, light sensitivity, nausea, and dizziness. A neurologist diagnosed a concussion, and she was subsequently referred for rehabilitation services to manage symptoms and return to daily activities. KG was referred to occupational therapy to improve her eye-hand coordination and for visual re-training. Prior to the accident, KG worked full time as a psychiatrist, had a busy social life, and was independent in all areas of self-care, home management, work, and leisure activities.

Evaluation

Vision evaluation: Following the accident, KG had difficulty following moving objects with her eyes, difficulty shifting her focus from one distance to another, burning eyes, difficulty seeing clearly without squinting, difficulty concentrating, daily eyestrain and headaches, and dizziness that worsened when in crowded, visually stimulating environments. KG also displayed difficulty with saccadic eye movement, and initially she was only able to focus (converge) at 10 inches from her nose (normal is 2 to 4 inches). The DEM findings indicated a horizontal score of 45.28 seconds (below norm), with complaints of nausea, dizziness, and eyestrain after performing.

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Sensory evaluation: KG's primary sensory issues included increased sensitivity to noise, light, and movement, specifically when riding the subway, walking on a crowded sidewalk, or being in crowded or loud spaces (i.e., Grand Central Terminal train station). She also noted difficulty concentrating when talking on the phone, sorting mail, and listening to voicemail.

Subjective symptoms: KG reported nausea, dizziness, headache, fatigue, tearfulness, and occasional outbursts of anger.

Functional evaluation: KG performed all self-care activities with minimal difficulty and increased time.

Household activities: KG performed light home management activities including cooking, cleaning, and laundry only when necessary, with moderate difficulty and increased time.

Community activities: KG was unable to participate in community or leisure activities.

Reading/computer use: Prior to her accident, KG was an avid reader and frequently read journal articles and books. At the time of the occupational therapy evaluation, KG avoided reading and computer use as they made her nauseous and dizzy, and increased the frequency of her headaches.

Goals

Short-term goals (to be achieved within 4 to 6 weeks): (1) KG will improve horizontal DEM score from 45.28 seconds to 39 seconds or less to improve ease with reading; (2) KG will perform a light cooking activity with minimal difficulty and one rest break.

Long-term goals (to be achieved at time of discharge from OT program): (1) KG will tolerate reading for 30 minutes without rest breaks by the time of discharge from the occupational therapy program; (2) KG will perform a complex, multistep cooking task while following a recipe, with one to two rest periods by the time of discharge from the occupational therapy program; (3) KG will participate in a work-related activity involving reading and writing, requiring 30 minutes of focused attention and concentration, with minimal difficulty by the time of discharge.

Interventions

Vision: Occupational therapy intervention focused on improving KG's pursuits, saccades, accommodation, and functional convergence. Treatments began with basic visual scanning activities with simple information and were eventually graded up to be more complex, where KG was required to scan in multiple directions and integrate more complex visual information. Scanning activities included word searches, copying phone numbers, and doing word cancellation worksheets. Brockstring, a string with three beads, was used to develop convergence and focus with both eyes (Scheiman & Wick, 1994). Activities such as placing a pencil in a straw were used to improve depth perception. These activities were performed in alternate positions, such as prone or while wearing a weighted vest, to provide additional proprioceptive input to decrease her dizziness and nausea during visual activities.

Education: KG was educated extensively on managing her symptoms, listening to her body, and taking breaks as needed. Compensatory strategies included planning daily activities ahead of time, especially when returning to work; performing more challenging tasks earlier in the day when she wasn't as tired; setting a timer when doing an activity to schedule rest breaks; and wearing sunglasses and a hat in bright environments. KG was also educated in sensory calming strategies, including palming (placing her hands over her eyes to reduce exposure to light and allow rest) and hugging a pillow to provide stress relief and increase proprioceptive input.

KG received occupational therapy services for approximately 8 months (6 months 2x/week, then 2 months 1x/week to assist with transition back to work). At the time of discharge from the

occupational therapy program, KG had very few visual symptoms; she occasionally had eyestrain, but this was noted more at the end of the day. KG's horizontal score on the DEM improved from 45.28 seconds to 35.13 seconds (normative data for a 13 year old is 37.56 seconds; no normative data for English speaking adults exists) with no symptoms after performing. At discharge, KG was able to consistently converge at 2 inches. Functionally, KG was independent with self-care, community activities, and household tasks, and she returned to work full time.

Conclusion

Concussion management and rehabilitation are gaining increased attention and focus in the medical community. Referrals to occupational therapy will increase as more people with concussion and mild traumatic brain injury are identified. There is also a growing need for further education on preventing concussion, as well as managing symptoms following concussion. Occupational therapists are instrumental in providing holistic rehabilitation and facilitating return to routine self-care, work, and leisure activities for clients who have sustained a concussion. They play an important role on the interdisciplinary team in the comprehensive management of clients following concussion, and they can facilitate improved functional and cognitive outcomes in this population. ●

References

- Bonfield, C. M., Lam, S., Lin, Y., & Greene, S. (2013). The impact of attention deficit hyperactivity disorder on recovery from mild traumatic brain injury: Clinical article. *Journal of Neurosurgery: Pediatrics*, *12*, 97–102.
- Brown, C., Tollefson, N., Dunn, W., Cromwell, R., & Filion, D. (2001). The Adult Sensory Profile: Measuring patterns of sensory processing. *American Journal of Occupational Therapy*, *55*, 75–82. doi:10.5014/ajot.55.1.75
- Cubon, V. A., Putukian, M., Boyer, C., & Dettwiler, A. (2011). A diffusion tensor imaging study on the white matter skeleton in individuals with sports-related concussion. *Journal of Neurotrauma*, *28*, 189–201.
- Garzia, R. P., Richman, J. E., Nicholson, S. B., & Gaines, C. S. (1990). A new visual-verbal saccade test: The Developmental Eye Movement test (DEM). *Journal of the American Optometric Association*, *61*, 124–135.
- Halstead, M. E., McAvoy, K., Devore, C. D., Carl, R., Lee, M., Logan, K., ... Guinn-Jones, M. (2013). Returning to learning following a concussion. *Pediatrics*, *132*, 948–957.
- Heitger, M. H., Jones, R. D., Macleod, A. D., Snell, D. L., Frampton, C. M., & Anderson, T. J. (2009). Impaired eye movements in post-concussion syndrome indicate suboptimal brain function beyond the influence of depression, malingering or intellectual ability. *Brain*, *132*, 2850–2870. doi:10.1093/brain/awp181.
- King, N. S., Crawford, S., Wenden, F. J., Moss, N. E. G., & Wade, D. T. (1995). The Rivermead Post-Concussion Symptoms Questionnaire: A measure of symptoms commonly experienced after head injury and its reliability. *Journal of Neurology*, *242*, 587–592.
- Marinides, Z., Galetta, K. M., Andrews, C. N., Wilson, J. A., Herman, D. C., Robinson, C. D., ... Clugston, J. R. (2014, July 9). Vision testing is additive to the sideline assessment of sports-related concussion. *Neurology: Clinical Practice*, *10*.1212. doi:10.1212/CPJ.0000000000000060 [Published ahead of print]
- McCrory, P., Meeuwisse, W. H., Aubry, M., Cantu, B., Dvořák, J., Echemendia, R. J., ... Turner, M. (2013). Consensus statement on concussion in sport: The 4th International Conference on Concussion in Sport held in Zurich, November 2012. *British Journal of Sports Medicine*, *47*, 250–258.
- Oride, M. K., Marutani, J. K., Rouse, M. W., & DeLand, P. N. (1986). Reliability study of the Pierce and King-Devick saccade tests. *American Journal of Optometry and Physiological Optics*, *63*, 419–424.
- Poltavski, D. V., & Biberdorf, D. (2014). Screening for lifetime concussion in athletes: Importance of oculomotor measures. *Brain Injury*, *28*, 475–485.
- Scheiman, M., & Wick, B. (1994). *Clinical management of binocular vision*. New York: Lippincott.
- Sigurdardottir, S., Andelic, N., Roe, C., Jerstad, T., & Schanke, A. K. (2009). Post-concussion symptoms after traumatic brain injury at 3 and 12 months post-injury: A prospective study. *Brain Injury*, *23*, 489–497.

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