PRESIDENT'S MESSAGE

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Leonardo da Vinci was best known for his dramatic and expressive artwork, yet he was also an innovator and changemaker with a passion for conducting experiments that led to important scientific discoveries and futuristic inventions. A quote from Leonardo da Vinci is relevant to what each of us must do to advance physical therapy practice: "*It had long since come to my attention that people of accomplishment rarely sat back and let things happen to them. They went out and happened to things*." This statement should prompt us to reflect on how each of us can act to influence our physical therapy practice and the participation needs of the clients we serve.

HOB P08-22-12-14 is an APTA position statement sparked by the Academy of Orthopaedic Physical Therapy delegation that was adopted by the 2022 APTA House of Delegates. This position is a rallying call for unrestricted access to physical therapists as entry-point practitioners for activity participation, wellness, health, and disability determination. The Federation of State Boards of Physical Therapy (FSBPT) responded by clarifying the language in the Seventh Edition of the Model Practice Act that physical therapy practice includes reducing the risk of injury, impairment, functional limitation, and disability, including performance of **participation-focused physical examinations** and the promotion and maintenance of fitness, health, and wellness in populations of all ages.

Some physical therapists may report having a lack competence or confidence with aspects of a physical examination that check for abnormal findings of the heart, lungs, abdomen, cognition, or other systems. Entry level doctoral programs and post-graduate continuing education providers should ensure that their curriculum is adequate to meet physical examination standards for participation-focused applications such as in sports or certification to drive a commercial motor vehicle. Any physical therapist who lacks confidence in performing participation-focused exams should undergo further post-professional education or by shadowing with other competent practitioners.

The article that follows by Jennifer Klose, PT, DPT and her colleagues from Concentra is a great example of entry-point care that describes the role of the physical therapist in early intervention for concussion management after a work-related injury. This author team has developed evidence-based protocols for concussion management that incorporates principles of our OHSIG clinical practice guidelines to optimize work participation and best practices that are described in our independent study courses for the Occupational Health Practitioner (OHP) Certificate Program. All too often, progressive physical activity is absent from concussion management of injured workers. Administration of graded submaximal endurance submaximal step, treadmill, or cycle ergometer tests during early intervention allows the physical therapist to objectively determine safe submaximal workload (in METs) for progression of physical activity during recovery. Enjoy!

EARLY INTERVENTION MANAGEMENT OF MILD TRAUMATIC BRAIN INJURY

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Management and rehabilitation following a concussion or mild traumatic brain injury (mTBI) can be challenging due to the variable nature of an injured worker's symptoms and clinical presentation. The Centers for Disease Control estimates that between 1.6 and 3.8 million Americans suffer a concussion or mTBI annually, and 1 in 4 of those occur in the workplace.[1] Injured workers diagnosed with mTBIs are not only impacted by their subjective and objective symptoms, but they may also encounter lost productivity that can lead to deconditioning and additional physical and cognitive barriers.

When managed appropriately, most mTBIs resolve quickly, as demonstrated in a study which found that the majority of workers presenting to the emergency department with mTBI missed at least one day of work and most (81%) returned to work within 30 days.[2] There is a need to promote best practices for management of these injured workers to receive appropriate clinical care, ensure collaboration between clinicians and stakeholders, and to recommend appropriate rehabilitation strategies. The aim of this article is to provide insight into the role of early intervention physical therapy, identify any barriers that may cause a delay in recovery, and review return-to-work (RTW) considerations.

EARLY INTERVENTION PHYSICAL THERAPY

There is growing evidence that earlier participation in aerobic exercise and graded activity leads to improved mTBI outcomes.[3,4,5] Clinical Practice Guidelines by the Academy of Orthopaedic Physical Therapy (AOPT) for *Physical Therapist Evaluation and Management After a Concussion/Mild Traumatic Brain Injury*[3] reports strong evidence for a key recommendation that "Physical therapists should implement a symptom-guided, progressive aerobic exercise training program for workers who have experienced a concussive event and exhibit exertional intolerance and/or are planning to return to vigorous physical activity levels." The Concussion in Sports Consensus Statement provides a recommendation for only a brief rest period of 24 to 48 hours following concussion accompanied with engagement in a gradual and progressive activity level that is performed below cognitive and physical symptoms exacerbation thresholds.[4]

Clinical recommendations for early referral to physical therapy should be made based on the presence of vestibular, oculomotor, and/or musculoskeletal impairments following mTBI. There should be an indication that physical therapy intervention is appropriate, and the worker is not exhibiting any red flag signs and symptoms that should be addressed prior to the referral recommendation. A mTBI can be considered an invisible injury making communication with stakeholders and clinicians important to

prevent potential discrepancies in information regarding care that could cause delays in appropriate referrals to physical therapy.[2] The collaboration between the clinician, therapist, and stakeholders is critical to implement an appropriate plan of care and to discuss the benefit of physical therapy and work activity modification.

The physical therapist should perform a comprehensive evaluation of each worker following a mTBI and carefully assess for any signs and symptoms of significant brain injury or neurological deficit.[3] These workers should be excluded from physical therapy until further medical and diagnostic testing is completed to substantiate medical stability to participate. Evaluation of clinical findings can aide in determining the physical therapy plan of care, movement related impairments, and level of symptom irritability.[3] Treatment should focus on providing worker education on recovery, addressing objective impairments, promotion of subthreshold aerobic exercise, and gradual RTW activity simulation. Recent studies indicate that an individual participating in controlled sub-symptom aerobic exercise can enhance recovery outcomes.[5,6] Exercise can potentially improve brain function and prevent physical deconditioning associated with prolonged rest, not only for the mTBI population but also other musculoskeletal and health conditions.[5] Inactivity and deconditioning can potentially delay recovery by manifesting in secondary symptoms including fatigue, depression, and anxiety.[5-7]

Instruction on the role of exercise could allow individuals to adopt a more proactive approach toward recovery and be less likely to focus on symptoms and instead more on functional progression.[8] Mild to moderate levels of physical activity should be initiated early in the individual's treatment program to diminish the effects of deconditioning and engage the individual to adopt a positive outlook on their recovery.[9] Grool et al demonstrated that the resumption of physical activity within 7 days of concussion led to a lower risk of post-concussion syndrome (PCS) at 28 days.[6] This emphasizes the importance of implementing an individualized subthreshold exercise program to improve their overall recovery.[6,10] Using concepts of the FITT principle (frequency, intensity, time, type), exercise prescription should focus on appropriate activity based on the individual's presentation, level of activity tolerance, and target heart rate. Target heart rate intensity for an exercise prescription can be determined using exertional tests, such as the Buffalo Concussion Treadmill Test (BCTT) or based on percentage of age predicted maximum heart rate.[9] This individualized approach allows the physical therapist to focus on the worker's specific impairments and aerobic capacity which can expedite recovery and allow for a safer transition to a graduated program focused on work simulation and return to function.

Prescribing aerobic exercise can be based on the results of the BCTT, if the individual is able to tolerate the testing parameters.[11] If the person cannot safely perform or tolerate the BCTT, the Buffalo Concussion Bike Test (BCBT) has been developed as an alternative.[12] Modified submaximal aerobic capacity testing should be substituted if the individual is experiencing significant cervical dysfunction, vestibular or balance limitations, or if the person is too symptomatic to perform the test.[11] The results of the aerobic capacity testing can be used to guide exercise progression by symptom baseline objective data and to show functional progression throughout their rehabilitation program.

Aerobic exercise should initially be prescribed after the worker is asymptomatic at rest. The physical therapist should assess the person's base line vitals, including heart rate, rate of perceived exertion, and reported symptoms on the 0-10 visual analogue scale, to determine acceptable exertional levels. After establishing the sub-maximal symptom exacerbation threshold, the person should initially begin with exercise on a stationary cycle for the first week, and then transition to a treadmill once clinically appropriate. The exercise prescription should begin with 20 minutes per day at an intensity or "dose" of 80% to 90% of the heart rate (HR) achieved for peak submaximal workload on the exercise test. Workers should be guided to continue exercise on their own if their symptoms remain stable for a minimum of 5 days per week. Exercise is stopped at the first sign of symptom exacerbation or after achieving the prescribed exercise duration at the target HR range. The BCTT/BCBT can be repeated every 1 to 2 weeks to establish a new symptom-limited threshold HR.[9] Aerobic exercise should be gradually increased in time and intensity while continually monitoring the exertional level and recovery time for symptoms to return to baseline.

A review of current evidence supports earlier (within 1 week) introduction of exercise and found that a shorter interval between acute injury and initiation of aerobic exercise was associated with a sooner return to activity.[7,9] There is a noted positive correlation between early exercise participation, the earlier an individual is engaged in exercise, not only with earlier symptom resolution, but also a positive effect on the person's overall outlook. Similarly, another study found that recovery time from acute injury was significantly faster for the sub-threshold aerobic exercise group compared to the relative rest group (8 days vs 23 days). It was noted that participants in the exercise group did not experience any delays in recovery compared to 13% in the rest group.[8]

PREDICTORS OF DELAYED RECOVERY

Risk factors of delayed recovery from a mTBI must be identified following a head injury with or without loss of consciousness to effectively communicate the prognosis to the worker, family members, and stake holders. Subjective reports of a history of a previous head injury or a history of mental health conditions that include depression, anxiety, or attention deficit hyperactive disorder can be the first predictors identified contributing to a more negative prognosis for recovery.[13,14]

Early symptom presentation serves as a strong predictor of recovery from a mTBI.[13] Low-level symptom presentation within the first 24 to 48 hours is more favorable in terms of early recovery.[13] More severe physical symptoms of nausea/vomiting, extracranial injuries, or severe head pain or pain in other areas of the body within the first 24 to 48 hours can be predictors for a longer recovery and delayed RTW.[14] Individuals with a presentation of physical symptoms of a worsening headache or declining general cognitive and neurological status after the first 48 hours will likely lead to a delayed recovery and RTW.[13,14] Perhaps more important than the physical symptoms, psychosocial symptoms should be identified in individuals. Psychosocial symptoms of depression, anxiety, and post-traumatic stress following the first 48 hours after mTBI will lead to a longer recovery period.[14]

Personal factors of education level, job satisfaction, and access to a support system play a role in recovery and RTW.[14] Authors suggest that individuals with low-level education, low job satisfaction that includes disagreement or lack of communication between the employer or payer, and limited or no access to support from family, friends, or employers are more at risk for delayed RTW.[14] There is a small percentage of individuals between 5 and 21% who may experience symptoms from a mTBI up to 2 years

following injury.[14] Individuals applying for or receiving financial compensations as a result of their injury claim may be influenced by secondary gain motives that could potentially lead to delayed recovery.[14]

IMPACT OF FEAR AVOIDANCE BEHAVIOR ON OUTCOMES

It is well-established that fear avoidance contributes to the development of chronic pain following musculoskeletal injury.[15,16] Fear avoidance behavior also appears to correlate with symptom chronicity and intensity after mTBI.[17-19] It is imperative for clinicians and physical therapists to understand the psychological variables that drive fear avoidance, such as poor coping styles which may perpetuate symptoms and prolong disability. Fear avoidance is a coping style characterized by the avoidance of activities or situations that are perceived to provoke or worsen symptoms due to fear of the symptoms and their associated consequences.[16] Following mTBI, sensory stimuli such as loud noises, bright lights, and physical or mental exertion often initiate and intensify post-concussion symptoms. When symptoms are activity-related, it can lead to fear of those activities which reinforces avoidance behaviors.

Over time, excessive avoidance of activities or situations that provoke symptoms may sensitize individuals to these triggers such that when symptom triggers are encountered, symptoms are more easily provoked.[17] Fear avoidance after mTBI is associated with higher post-concussion symptoms, emotional distress, and catastrophic beliefs about post-concussion symptoms.[18] Individuals with mTBI who demonstrate high fear avoidance in the weeks following injury are more likely to experience adverse health outcomes such as anxiety disorder and disability. Prescribed vestibular, cardiopulmonary, balance and strengthening exercise may be associated with reduced fear avoidance.[20] As mentioned above, fear avoidance behaviors may be mitigated, and outcomes optimized the earlier that physical therapists can participate in the multidisciplinary mTBI management team.

Two patient-reported measures of fear avoidance have recently been developed for use with TBI: the Fear of Mental Activity Scale (FMA) and the Fear Avoidance Behavior after Traumatic Brain Injury Questionnaire (FAB-TBI). Clinical predictors that were significant in unadjusted models include reported loss of consciousness, higher post-concussion symptom burden, and the injury occurring because of a motor vehicle collision as compared to sport/recreation or a fall. In the adjusted model that included all covariates, loss of consciousness and higher post-concussion symptom burden continued to account for significant variance in FAB-TBI total scores.[21]

RTW Communication and Outcomes

Throughout the management of mTBI in the worker's compensation population, the healthcare management team must consistently consider a RTW plan. Barriers and facilitators to optimal recovery and RTW include early intervention, workplace and personal support, workplace modifications, and patient, family, and stakeholder education by the healthcare team.[22] As a member of the healthcare management team, physical therapists have a unique opportunity to achieve superior outcomes with patients by addressing these barriers and facilitators.

Work modifications play an important role in the RTW process. Gordeau et.al,[23] assessed workplace accommodations following mTBI and found that common modifications included adjustments to work activities, modified hours, micro breaks, environmental modifications (eg, moving workspaces due to lighting or noise), and techniques to assist with cognitive changes—memory, attention, or concentration. The authors also found that most patients engaged in a gradual RTW process.[23] Work modifications or restrictions for activity should be set at a sub-symptom threshold and should address the employee's physical demands, cognitive demands, and the work environment that align with essential job functions.[24] This is supported by a key recommendation in the mild brain injury guidelines[24] that states: "After a brief period of rest during the acute phase (24-48 hours) after injury, patients with concussion should be encouraged to gradually resume normal activity (activities of daily living, work, school, duty, leisure) based upon their tolerance, as long as the activity does not pose a risk for concussion." The healthcare practitioners must understand the parameters (weight, height, duration, etc) around each activity to establish appropriate activity restrictions.

Physical demands can be determined by reviewing a job description and clarify the demands of the job (lifting, stairs, push pull, etc) and modified duty options with the worker and/or employer. The physical therapy plan for exercise progression and return to work should consider the workload requirements for materials handling and other occupational tasks. The individual's sub-maximal symptom exacerbation threshold from graded exercise testing is a key performance-based metric of workload endurance tolerance (in METs) that may be related to published MET levels determined for a broad range of occupational tasks.[25]

Cognitive demands and the work environment are understood best through pointed questions with the patient and employer. Cognitive demands are activities that require a higher cognitive load and or level of concentration or focus (reading, computer use, etc). Understanding the possible triggers in the work environment should also play a role in RTW modifications. Work environment stressors may include visual distractions (conveyor belt, driving, etc), sound distractions (loud noises, manufacturing, etc) and social settings (high socialization with other versus low socialization with others). These stressors may be further assessed during a work-site intervention for a functional job analysis that facilitates interaction between the worker and supervisor. As the patient's objective impairments improve and there is increased tolerance for activity participation, restrictions should be reviewed and progressed as appropriate.

Communication and education are important throughout the RTW process. The treatment of PCS, and the non-linear progression of PCS is not well understood by most stakeholders—employer, safety manager, nurse case manager, and the claims adjustor. Graff et al reviewed facilitators and barriers to RTW after mTBI and reported that the worker-employer relationship can act as either a facilitator or barrier to workers with mTBI that are trying to RTW.[26] Stakeholders should understand that workers with this invisible injury may experience short term setbacks that require adjustments to restrictions and their treatment plan. As an occupational health practitioner, it will be important to incorporate regular discussions with stakeholders to educate on PCS, the status of the injured worker, and how each party can support the worker as they transition back to function. Work restrictions and discussion of accommodations should be reviewed at these regularly scheduled touch points.

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