2021

Active Therapies in the Management of Concussion and Post-Concussion Syndrome

Breanna R. Krueger
University of North Dakota

Active Therapies in the Management of Concussion and Post-Concussion Syndrome

Breanna Krueger, PA-S, Contributing Author: Mindy Staveteig, MMS, PA-C
Department of Physician Assistant Studies, University of North Dakota School of Medicine & Health Sciences
Grand Forks, ND 58202-9037

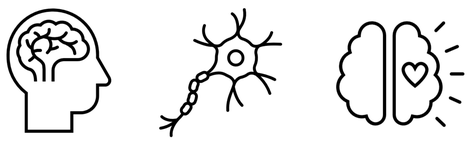
Abstract

The purpose of this research and literature review is to evaluate the recently completed literature to provide guidance to medical providers in the safest and most efficacious treatment options for adolescent patients with concussion and post-concussion syndrome. The literature was searched for studies directly related to adolescents and active therapies such as physical therapy, vestibular rehabilitation, exertional therapy, and cognitive behavioral therapy. The search time frame implemented was studies completed within the last ten years. Ten studies met the final criteria. The research shows a substantial benefit for immediate cognitive and physical rest following a mTBI. The research suggests that 24-48 hours of immediate cognitive and physical rest provides the most benefit for patients. In addition, the research reviewed has shown that earlier implementation of active therapies such as aerobic exercise, physical therapy, and cognitive behavioral therapy can benefit patients recovering from a mTBI and those with post-concussion syndrome.

Keywords: concussion, post-concussion syndrome, physical therapy, vestibular rehabilitation, exertional therapy, and cognitive behavioral therapy.

Introduction

- Sports related concussions (SRC) are recognized as a major health concern in young athletes.
- In 2018, the CDC published clinical practice guidelines relating to the diagnosis and management of mTBI.
- The purpose of this study is to evaluate the recently completed literature to provide guidance to medical providers in the safest and most efficacious treatment options for patients with concussion and post-concussion syndrome.



Statement of the Problem

- Signs and symptoms of sports related concussions can include somatic, vestibular, oculomotor, cognitive, emotional, and sleep complaints (Halstead, Mark, Walter, Kevin, Moffatt, Kody, 2018).
- Concussion symptoms often interfere with academics, relationships, social endeavors, and of course athletics so it is imperative that providers accurately diagnose and manage these patients to prevent lifelong burden.
- Historically, physical and cognitive rest have been mainstays in the treatment of both concussion and post-concussion syndrome. Recently, prolonged rest has been challenged in the treatment of both concussion and post-concussion syndrome.

Research Question

In adolescents with acute concussion or post-concussion syndrome, what is the effect of active therapies compared to traditionally prescribed cognitive and physical rest in improvement of symptoms?

Literature Review

Efficacy of Physical and Cognitive Rest in Concussion Management

•Taubman et al. (2016) found a statistically significant ($p<0.05$) difference in recovery times between those who initiated immediate rest and those who did not. Those who did not initiate immediate rest showed an increased likelihood for prolonged recovery (returning to school ≥ 30 days post injury).

•Thomas et al. (2015) reported longer recovery times for patients who rested for five days as well as greater total symptom scores when compared to those who rested for 24 to 48 hours ($p<0.03$).

Efficacy of Physical Activity in Concussion Management

•Lawrence et al. (2018) found that patients who initiated aerobic exercise later (14 days) reduced their probability of full return to school and sport by a greater percentage than those who initiated aerobic exercise at 3 days.

•Leddy et al. (2019) found a statistically significant ($p= 0.009$) difference in recovery times between patients who participated in aerobic exercise versus stretching while recovering from an acute concussion. The aerobic exercise group recovered in a median time of 13 days and the stretching group recovered in a median time of 17 days.

Efficacy of Physical Therapy in Concussions

•Lennon et al. (2018) did not find a statistically significant difference regarding change in PSCI scores whether physical therapy was implemented at 0-20 days post-injury, 21-41 days post-injury, or >42 days post-injury ($p=0.38$). Murray et al. (2016) reported improvement in patient dizziness, gaze stabilization, balance, gait, and time to return to school/sport for patients who participated in vestibular rehab. No adverse effects to vestibular rehabilitation were found.

•Schneider et al. (2014) found a greater proportion of patients who completed PT and vestibular rehab. being cleared for return to school/sport within eight weeks of treatment than those who completed PT alone ($p<.001$). SCAT2 and Dizziness Handicap Inventory Scores showed statistically significant improvement in the intervention group compared to the control group ($p=0.009$ and $p=0.019$, respectively).

Active Therapies in Post-Concussion Syndrome

•Patients who completed PT, graded aerobic exercise and usual care (psychiatric evaluation, occupational therapy, and consultation with a teacher who facilitated return to school) showed a greater reduction in PCSS scores than those who completed usual care alone ($p=0.47$) (Chan et al., 2017).

•Kurowski et al. (2017) found greater improvement in PSCI scores in the aerobic exercise group than the stretching group ($p=0.044$).

•McCarty et al. (2016) found that patients who participated in cognitive behavioral therapy demonstrated improved youth reported HBI scores at six months and improved parent and youth quality of life reports ($p<0.05$).

Discussion

- The results of the studies completed by Taubman et al. (2016) and Thomas et al. (2015) support the CDC's recommendation for immediate cognitive and physical rest following an acute concussion. Further studies are required to definitively determine appropriate strict rest duration and may be patient dependent. Limitations of these two studies include small sample sizes, patient reporting by way of diaries and interviews, and poor patient compliance.
- The results of the studies completed by Lawrence et al. (2018) and Leddy et al. (2019) overall suggest that aerobic exercise has beneficial effects on recovery from an acute concussion, primarily by speeding recovery times. Further studies are required to determine and establish specific recommendations regarding when to initiate aerobic exercise, what type of aerobic exercise to initiate, and intensity.
- The studies completed by Lennon et al. (2018), Murray et al. (2016), and Schneider et al (2014) suggest that vestibular rehabilitation, when used in conjunction with traditional management to include immediate cognitive and physical rest post-injury, sub-symptom stretching, and postural education improves recovery time. Further research is needed to determine optimal timing of treatment. It is of note as well that these studies included adults up to age 30.
- The studies completed by Chan et al. (2017) and Kurowski et al. (2019) suggest that sub-symptom aerobic exercise in conjunction with usual care can improve patient reported symptoms in those with prolonged recovery from a mTBI. Limitations to these studies include limited sample sizes and patient adherence to treatment recommendations in each. Future studies could implement monitoring during prescribed exercise to accommodate for this. At this time, definitive recommendations cannot be made for clinical care because of these limitations.
- The results of the study by McCarty et al. suggest that cognitive behavioral therapy can improve perceived quality of life for patients with persistent concussion symptoms. There was not a significant reduction in anxiety or depression symptoms by way of the PHQ-9 and PROMIS-PA8, however, a greater proportion of patients in the intervention group demonstrated >50% reduction in depressive symptoms versus those in the control group. As this study did not demonstrate any adverse effects in either treatment group, it is suggested that cognitive behavioral therapy is not harmful to patients. Larger, randomized clinical trials are required to make definitive recommendations for the use of a collaborative care model for patients with persistent post-concussion symptoms to include anxiety and depression.

Application to Clinical Practice

- ✓ It is imperative for the medical provider to make the most efficacious and safest recommendations regarding the management of adolescents who suffer from sports-related concussion and post-concussion syndrome.
- ✓ The evidence suggests that 24-48 hours of immediate cognitive and physical rest provides the most benefit for patients. This is in contradiction to the historically recommended prolonged cognitive and physical rest and an expansion on the CDC's guideline which recommends rest for 'several days.'
- ✓ Earlier implementation of active therapies such as aerobic exercise, physical therapy, and cognitive behavioral therapy can benefit patients recovering from a mTBI.
- ✓ The research regarding active therapies in the management of post-concussion syndrome is limited. It is suggested that active therapies can provide similar benefit to patients with persistent concussion symptoms > 1 month as with an acute mTBI. All the studies reviewed showed no adverse effects to treatment which suggests that active therapies are safe with little to no risk to patients with prolonged recovery.

References

- Bryan, M., Rowhani-Rahbar, A., Comstock, R., & Rivara, F. (2016). Sports and recreation related concussions in US youth. Pediatrics, 138, 1-10. http://dx.doi.org/10.1542/peds.2015-4635
- Chan, C., Iverson, G., Purtzki, J., Wong, K., Kwan, V., Gagnon, I., & Silverburg, N. (2017). Safety of active rehabilitation for persistent symptoms after pediatric sport-related concussion: A randomized controlled trial. Archives of Physical Medicine and Rehabilitation, 99, 242-249. http://dx.doi.org/10.1016/j.apmr.2017.09.108
- Giza, C., & Hovda, D. (2014). The new neurometabolic cascade of concussion. Neurosurgery, 75(04), S24-S33. http://dx.doi.org/10.1227/NEU.0000000000000505
- Halstead, M., Walter, K., & Moffatt, K. (2018). Sport-related concussion in children and adolescents. Pediatrics, 142(6), 1-26. http://dx.doi.org/10.1542/peds.2018-3074
- Kurowski, B., Hugentobler, J., Quatman-Yates, C., Taylor, J., Gubanich, P., Altaye, M., & Wade, S. (2017). Aerobic exercise for adolescents with prolonged symptoms after mild traumatic brain injury: An exploratory randomized control trial. The Journal of Head Trauma Rehabilitation, 32(2), 79-89. http://dx.doi.org/10.1097/HTR.0000000000000238
- Lawrence, D., Richards, D., Comper, P., & Hutchison, M. (2018). Earlier time to aerobic exercise is associated with faster recovery following acute sport concussion. Public Library of Science One, 13(4). http://dx.doi.org/10.1371/journal.pone.0196062
- Leddy, J., Haider, M., Ellis, M., Mannix, R., Darling, S., Freitas, M.,… Willer, B. (2019). Early subthreshold aerobic exercise for sport-related concussion: A randomized control trial. The Journal of Pediatrics, 172(4), 319-325. http://dx.doi.org/10.1001/jamapediatrics.2018.439
- Lennon, A., Hugentobler, J., Sroka, M., Nissen, K., Kurowski, B., Gagnon, I., & Quatman-Yates, C. (2018). An exploration of the impact of initial timing of physical therapy on safety and outcomes after a concussion in adolescents. Journal of Neurologic Physical Therapy, 42(3), 123-131. http://dx.doi.org/10.1097/NPT.0000000000000227
- Lumba-Brown, A., Yeates, K., Sarmiento, K., Breiding, M., Haegerich, T., Gioia, G.,… Timmons, S. (2018). Centers for Disease Control and Prevention guideline on the diagnosis and management of mild traumatic brain injury among children. Journal of American Medical Association Pediatrics, 172(11), e182853. https://dx.doi.org/10.1001/jamapediatrics.2018.2853
- McCarty, C., Zatzick, D., Stein, E., Wang, J., Hilt, R., & Rivara, F. (2016). Collaborative care for adolescents with persistent postconcussive symptoms: A randomized trial. Pediatrics, 138(4), 1-11. http://dx.doi.org/10.1542/peds.2016-0459
- Murray, D., Meldrum, D., & Lennon, O. (2016). Can vestibular rehabilitation exercises help patients with concussion? A systematic review of efficacy, prescription and progression patterns. British Journal of Sports Medicine, 51, 442-451. http://dx.doi.org/ 10.1136/bjsports-2016-096081
- Sady, M., Vaughan, C., & Gioia, G. (2014). Psychometric characteristics of the postconcussion symptom inventory in children and adolescents. Archives of Clinical Neuropsychology, 29(4), 348-363. http://dx.doi.org/10.1093/arclin/acu014
- Schneider, K., Meeuwisse, W., Nettel-Aguirre, A., Barlow, K., Boyd, L., Kang, J., & Emery, C. (2014). Cervicovestibular rehabilitation in sport-related concussion: a randomized controlled trial. British Journal of Sports Medicine, 48, 1294-1298. http://dx.doi.org/ 10.1136/bjsports-2013-093267
- Taubman, B., Rosen, F., McHugh, J., Grady, M., & Elci, O. (2016). The timing of cognitive and physical rest and recovery in concussion. Journal of Child Neurology, 31(4), 1555-1560. http://dx.doi.org/10.1177/0883073816664835
- Thomas, D., Apps, J., Hoffmann, R., McCrea, M., & Hammeke, T. (2015). Benefits of strict rest after acute concussion: A randomized control trial. Pediatrics, 135(2), 213-223. http://dx.doi.org/10.1542/peds.2014-0966

Acknowledgements

I would like to express my gratitude to John Seifert, MPH and Alicia Champagne, AT-C for their professional guidance and input on this scholarly project. I would also like to thank my advisor Mindy Staveteig and instructor Daryl Sieg for their guidance throughout the completion of this project. Finally, I would like to thank my husband and daughter for their support during my graduate school journey.