Critical Review:
Academic Effects and Accommodations for School Aged Children and Adolescents with a Concussion

Colleen Thibert
M.Cl.Sc SLP Candidate
University of Western Ontario: School of Communication Sciences and Disorders

Abstract: This critical review examines the evidence regarding the academic effects of concussion in the school aged population. As well, it examines the use academic accommodations as a way to manage post-concussion symptoms in the classroom. Study designs include, a systematic review, survey research, retrospective chart review, randomized clinical trial, and discussion papers. Overall, the evidence gathered to evaluate academic outcomes is inconclusive. In addition, the most frequently cited academic accommodations are provided. Clinical recommendations are outlined for interpreting the academic effects of concussions, as well as for implementing academic accommodations.

Introduction

The definition of concussion has changed over time and varies within the literature. Overall, most of the current literature defines a concussion as a type of mild traumatic brain injury, resulting in complex pathophysiological processes affecting the brain, and induced by biomechanical forces (Dachtyl & Morales 2017). Concussions are one of the most common types of acquired brain injury in the pediatric population (Dachtyl & Morales 2017). Historically, concussions have been considered to be relatively mild injuries from which recovery typically occurs within 3 weeks for children and adolescents (McAvoy, 2012; McCrory et al., 2013). Common symptoms of concussion, however, including, physical, cognitive, and emotional difficulties can persist well after the injury (Arbogast 2013). Such findings have led to growing recognition of the need to consider best interventions to facilitate recovery.

In recent years, cognitive activity post-concussion has been the focus of much research. In particular, engaging in activities associated with high cognitive load within the early period post injury has been associated with negative outcomes in a variety of studies (Dachtyl & Morales 2017). Indeed, researchers warn of the hazards of returning to cognitive activity too soon and exacerbating concussion symptoms (Dachtyl & Morales 2017). As a result of these findings, a period of cognitive rest is often prescribed as part of the concussion management (Master 2012; Arbogast at al. 2013).

Concussion commonly occurs in individuals engaged in sport. As a result, concussion protocols typically address the athlete's gradual return to activity following a concussion. It must be acknowledged, however, that many of the common symptoms of concussion such as difficulty concentrating, remembering, and slow processing times have the potential to impact academic performance (Ransom et al. 2015). To date, however, little research has been focused on the implications of concussion on academic performance. One objective of the present study was to provide a critical review of available evidence examining academic outcomes for children and adolescents with concussion.

Students who are struggling in school often receive academic accommodations. Academic accommodations refer to instructional strategies or adjustments made such that the individual can demonstrate their knowledge and skills, and manage the school curriculum (Wright 2003). For individuals with concussion, academic accommodations might be useful in gradually introducing a student back into the classroom after the concussion while managing the effects of a concussion (Brown et al. 2014). Nevertheless, students who have sustained a concussion may appear physically well in the context of a classroom, therefore it may be difficult for educational faculty and peers to understand the

need for accommodations (Master et al. 2012). As a result, the extent to which academic accommodations are commonly employed for students with concussion is unclear. The second objective of the present study was to review research pertaining to academic accommodation for students with concussion.

Speech-language pathologists (SLP) have a critical role to play with children who have sustained a concussion. SLP's can assess symptoms relating to communication and help develop strategies in order for students to cope with their symptoms in the classroom. By being aware of the potential academic impacts and accommodations, SLPs may be in a position to be better advocates for children with concussion.

Objectives

The objectives of this paper are to critically evaluate the existing literature regarding (1) the impact of concussions on academic success and (2) the use of academic accommodations for school-aged children and adolescents who have a concussion.

Methods

Search Strategy

A search of the literature included the following terms: ['academic accommodations' OR 'academic effects'] AND ['pediatric concussion' OR 'concussion'].

Selection Criteria and Data Collection

Studies were selected if they related to academic effects of concussion or academic accommodations for school-aged children or adolescents (5-18 years). A total of 8 papers were identified that fit the selection criteria.

Results

Rozbacher et al. (2017) completed a systematic review of 9 studies examining the effects of concussion or mild traumatic brain injury (mTBI) on academic outcomes in school-aged children and adolescents. Relevant databases and appropriate search terms were used with broad inclusion criteria such that a wide range of academic outcomes were represented. Articles were rated by two raters using an appropriate rating system. Academic outcomes included grade point averages, school attendance records, and national examination records. Results revealed minimal impact on academic performance for students with concussion.

Strengths of this study include the well-described search and rating of relevant articles. No analysis of data was included, which the authors reported as due to the heterogeneity of the populations and academic outcomes within the articles. As well, only a small number of studies were included. Overall, this study provides suggestive evidence that concussion is not associated with poorer academic outcomes. Academic accommodations were not addressed in this study.

Ransom et al. (2015) conducted a between-groups study of symptomatic (n=109) and asymptomatic (n=240) school-aged children who had sustained a concussion (5-18 years) and their parents investigating the nature and extent of the adverse academic effects faced by students recovering from a concussion. Participants with concussion were recruited at the time of a clinic visit, were appropriately diagnosed with a gold standard assessment tool, and appropriately grouped into two categories based on the recovery status at the time of the clinic visit. All participants completed a study-designed questionnaire involving self-reported comparison of pre- and post-injury academic problems. Appropriate statistical analysis of groups with stratification for level of schooling was reported. Results revealed more adverse academic effects for symptomatic students than for asymptomatic students.

Strengths of this study included a good sample size, and a reasonably balanced sample of parent and child perspectives, appropriate statistical analysis, and the use of stratification. Weaknesses included only brief descriptions of the issue of severity, the lack of a control group, and the reliance on self-report of experiences retrospectively.

Overall, the results of this study are suggestive that individuals with concussion experience academic problems. Nevertheless, a specific link

to actual academic performance was not provided. Academic accommodations were not addressed in this study.

Arbogast et al. (2013) examined knowledge of cognitive rest and concussion management in a study involving both survey research and a retrospective chart review. Email invitations were sent with 2 reminders to a broad catchment of medical personnel for a study-designed survey with multiple-choice and open-ended questions addressing cognitive rest. A total of 89 responses were received (44% response rate), of which 90% had provided concussion care in the past 3 months. Responses were coded by 2 independent coders. Descriptive statistics only revealed that about two thirds of respondents were aware of cognitive rest and only 2 described it in detail. In the retrospective chart review, 174 charts met inclusion criterion (1 sign/symptom during study period) from a sample of 10% of potential charts. Data extraction including symptoms, and treatment or advice regarding cognitive rest was well described. Results indicated that about half of the respondents mentioned cognitive rest as part of concussion management, but only 11% provided written instructions about cognitive rest in patient charts. The reported symptoms included difficulty with concentration, fatigue, headache, and others. As well, 19-30% of patients reported a decline in school performance or effect on school attendance.

Strengths of this study included efforts to sample respondents broadly in the survey, a reasonable reminder schedule, however the proportion of charts reviewed in the retrospective study was somewhat limited. In keeping with survey nature of this work, statistics were descriptive only. No reliability for data coding was reported, and no information regarding the development of the survey was provided.

Overall, this study provided suggestive evidence that cognitive rest is typically included in concussion management by medical personnel, and that concussion can have a negative impact on academic performance.

Glang et al. (2014) investigated the effectiveness of a web-based resource, *Brain 101*, through a randomized clinical trial comparing improvement in post-concussion management in 13 high schools receiving intervention and 12 high schools with no intervention. A total of 4,804 student-athletes and 1,004 of their parents participated. Four instruments were used to measure the effectiveness of the *Brain 101* program, including an athlete survey, parent survey, concussion logs, and exit interviews with school administrators.

Results indicated that students and their parents in the intervention group outperformed students in the control group on measures of concussion knowledge. Results also showed that students who sustained a concussion in the intervention group received more and varied academic accommodations than students who sustained concussions in the control group.

Strengths of this study included a large sample size, appropriately broad outcome measures and statistical analysis. As well, the guide was created to tailor to the high school population, including teen relevant material. Weaknesses included the missing data rates, and lack of baseline fidelity measures.

Overall, the results of this study provide compelling evidence for the use of academic accommodations in the concussion management programs, in particular extended time to complete tasks, reduced workload, quiet room for tests, and postponed examination dates. Academic effects were not discussed in this article.

Kasamatsu et al. (2016) examined the athletic trainer's perspective of return to learn, cognitive rest, and academic accommodations after a student's concussion using a web-based survey. Prospective participants were among a large catchment of athletic trainers in the United States. The survey was developed as part of a larger research investigation but aligned with the present study's objectives and was built upon existing concussion literature. Appropriate descriptive statistics and statistical analyses were reported. A total of 1124 responses were collected (28.5% response rate), of which 883 recommended complete or situational cognitive rest for students following a concussion. Results also indicated the most common academic accommodations were

postponed schoolwork due dates (83%), allowed rest (80%), and partial school attendance (78%).

Strengths of this article included the rigorous survey development and numerous variables addressed. Weaknesses of this article include a low response rate. As well, the results are limited to perspectives of athletic trainers.

Overall this study provides suggestive evidence for the use of academic accommodations to aid in students return to academics following a concussion. Common accommodations recommended by athletic trainers included postponed due dates, rest breaks, partial attendance, and cognitive rest. Academic effects were not discussed.

McGrath (2010) provided a discussion paper on the importance of supporting the student-athlete's return to the classroom following a concussion. Included in the article is key information to advise school colleagues about concussion recovery, a 5-step model for concussion management within a school setting, a list of reasonable academic accommodations, and suggestions for implementation of accommodation plans. Academic accommodations included extensions of deadlines, excused absences from school, rest periods during the school day, staggering of tests, etc.

One weakness of a discussion paper is that it does not include a description of the scope of the evidence cited, or how the evidence was identified or evaluated. Nevertheless, this paper was written by an expert in the field, and provides academic accommodations that are plausible and relevant to the specific symptoms for a student with a concussion. A rationale for each accommodation based on a specific symptom is provided, and accommodations that are consistent across the literature are provided.

Overall this article provides somewhat suggestive evidence that academic accommodations may be appropriate for students with concussion. Although academic impacts of concussion were acknowledged in the paper, the discussion did not focus on these effects.

Master et al. (2012) also provided a discussion paper describing the importance of a return-to-learn plan for children and adolescents who have sustained a concussion. This article describes a practical plan for school re-entry and provides examples of specific academic accommodations. Some specific research findings are highlighted. A list of accommodations is provided that are not symptom specific but are practical and easy to implement.

Once again, this paper is written by an expert in the field, but little information is provided regarding the scope and evaluation of evidence.

Overall this paper provides somewhat suggestive evidence that academic accommodations may be appropriate for students with concussion. Academic effects were not specifically reviewed in this paper.

Dachtyl & Morales (2017) proved an evidence-informed return to academic's model for school-aged children and adolescents who have a concussion (Pre-K to 12th grade). The Cognitive Return to Exertion (Cortex) was developed by a Speech-Language Pathologist with input from multiple other administrative and health care professionals within the school system. The 6-step comprehensive model utilizes existing research in concussion symptoms, effects of cognitive overexertion, and management of concussion symptoms. CoRTEx appropriately emphasizes inter-professional collaboration, uses standardized measures for assessment, and utilizes academic accommodations. A list of symptoms that may have a negative impact on academic success is listed. In addition to the model, authors also included a descriptive case study to demonstrate how the model would be applied in practice. The case study outlines the concussion symptoms and individualized academic accommodations that were implemented with no statistical analysis reported.

Strengths of this article included, extensive use of the literature to support recommendations, utilization of existing return to academic models, and the collaboration of an SLP and athletic therapist in the model development. A major

weakness of this descriptive paper is the lack of evidence to evaluate the model's effectiveness.

Overall this paper provided highly suggestive evidence of the appropriateness of academic accommodations for students who have sustained a concussion. It provides specific academic accommodations for the common symptoms of concussions, including physical symptoms, maintenance symptoms, emotional symptoms, and cognitive symptoms.

Discussion

In reviewing the literature, recurring themes were apparent for academic outcomes and recommended academic accommodations.

Because of the lack of evidence for academic effects of concussions, the results of this review should be interpreted with caution. The studies that did address academic outcomes were mixed in their findings. Rozbacher et al. (2017) found that concussions had little impact on students grades and national examinations scores on a group level. However, findings from Ransom et al. (2015) suggested that school-aged children recovering from a concussion had greater difficulty in classes and perceived drop in grades post-concussion. In addition, Arbogast et al. (2013) also found that 30% of their participants reported a decline in school performance or attendance following a concussion.

Interpretation of the two previously mentioned articles is limited due to the fact researchers were measuring perception of academic outcomes and not actual academic outcomes (ei. grades). Overall, these mixed findings may suggest that poorer academic outcomes are perceived by students, but actual decline in academic performance is unfounded.

This mismatch in perception and data may represent an area where clinicians can educate the student and their parents, to help relieve any anxiety they may have about returning to school following a concussion.

Many academic accommodations were proposed in the literature, with some supported by research and others supported by clinical experience. Six of the six studies outlining academic accommodations highlighted the importance of cognitive rest immediately following concussion onset. The overall goal of cognitive rest is to prevent cognitive activity from surpassing a level that triggers symptoms of concussion (Arbogast et al. 2013). However, there is debate in the literature on how much cognitive rest is needed. Master et al. (2012) cautions readers about the prolonged duration of cognitive rest, noting that 'low-key social interactions…are permitted to prevent social isolation or depression and anxiety as the result of removal from daily routines'. Dachtyl & Morales (2017) also note the potential negative academic outcomes from prolonged school absence, such as drop in grade-point average. Regardless of duration, cognitive rest is a key component in concussion management.

The following accommodations were most frequently mentioned in the evaluated studies:

- Gradual return to school
- Frequent rest breaks throughout the school day
- More time to complete tasks
- Extended deadlines
- Note-taking accommodations (scribe, teacher-provided printed notes)
- Quiet room to complete tests or assignments.

Clinical Implications

Overall, the results of this critical review should be interpreted with caution when applying them to clinical practice, given the few quantitative studies that looked at academic effects and accommodations for school aged children and adolescents. In addition, the heterogeneity of the population who sustain a concussion poses difficulty for researches to obtain generalizable data.

The mismatch in findings for academic effects outlines the need for clinicians to educate their clients about concussions. More specifically, clinicians can reassure parents and students by outlining symptoms that may impact academic

performance and accommodations that can help them access the curriculum during recovery.

The clinical bottom line for implementing academic accommodations, is that accommodations should be individualized, symptom specific, and gradually implemented and eliminated. The necessity of including cognitive rest into a return to school plan was highly cited in the literature. As well, an effective concussion management plan involves an inter-professional team, such as teachers, nurses, athletic trainers, and parents.

References

Arbogast, K. B., McGinley, A. D., Master, C. L., Grady, M. F., Robinson, R. L., & Zonfrillo, M. R. (2013). Cognitive rest and school-based recommendations following pediatric concussion: The need for primary care support tools. Clinical Pediatrics, 52(5), 397-402.

Brown, N., Mannix, R., O'Brien, M., Gostine, D., Collins, M., & Meehan, W. (2014). Effect of cognitive activity level on duration of post-concussion symptoms. Pediatrics, 133, 299–204.

Dachtyl, S. A., & Morales, P. (2017). A collaborative model for return to academics after concussion: Athletic training and speech-language pathology. American Journal of Speech - Language Pathology (Online), 26(3), 716.

Glang, A. E., Ph.D, Koester, M. C., M.D, Chesnutt, J. C., M.D, Gioia, G. A., Ph.D, McAvoy, K., Psy.D, Marshall, S., Ph.D, & Gau, J. M., M.S. (2015). The effectiveness of a web-based resource in improving postconcussion management in high schools. Journal of Adolescent Health, 56(1), 91-97.

Kasamatsu, T., Cleary, M., Bennett, J., Howard, K., & McLeod, T. V. (2016). Examining academic support after concussion for the adolescent student-athlete: Perspectives of the athletic trainer. Journal of Athletic Training, 51(2), 153-161.

Master, C. L., Gioia, G. A., Leddy, J. J., & Grady, M. F. (2012). Importance of 'Return-to-learn' in pediatric and adolescent concussion. Pediatric Annals, 41(9), e160-e166

McAvoy, K. (2012). Return to learning: Going back to school following a concussion. NASP Communiqué, 40. http://www.nasponline.org/publications/periodicals/communique/issues/volume-40-issue-6/return-to-learning-going-back-to-schoolfollowing-a-concussion

McCrory, P., Meeuwisse, W., Aubry, M., Cantu, B., Dvorak, J.,Echemendia, R., . . . 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.

McGrath, N. (2010). Supporting the student-athlete's return to the classroom after a sport-related concussion. Journal of Athletic Training, 45(5), 492-498.

Rozbacher, A., Selci, E., Leiter, J., Ellis, M., & Russell, K. (2017). The effect of concussion or mild traumatic brain injury on school grades, national examination scores, and school attendance: A systematic review. Journal of Neurotrauma, 34(14), 2195-2203.

Ransom, D. M., Vaughan, C. G., Pratson, L., Sady, M. D., McGill, C. A., & Gioia, G. A. (2015). Academic effects of concussion in children and adolescents. Pediatrics, 135(6), 1043-1050.

Wright, D.B. (2003). Common Definitions: Adaptations, Accommodations, Modifications. Diagnostic Centers California. Retrieved March 7, 2018, from http://www.pent.ca.gov/acc/commondefinitions_accom-mod.pdf