Critical Review: Does Cognitive Training improve Return-to-Work Outcomes following Adult Traumatic Brain Injury

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This critical review examines the effectiveness of cognitive training on improving return-to-work (RTW) outcomes in adults with TBI. Study designs include a case study, randomized controlled trial (RCT), a retrospective cohort study and a systematic review. Overall, the evidence collected from this critical review is inconclusive. However, there is some evidence that indicates cognitive training (as part of a comprehensive program) to be effective in improving return-to-work outcomes in adults with traumatic brain injury. Recommendations for future research are provided.

Introduction

Traumatic Brain Injury (TBI) is a disruption in normal brain functioning due to an external force. In the U.S., it is estimated that 42% of the population will have at least one TBI in their lifespan (Maas et al., 2017). In Canada, TBI is one of the leading causes of major permanent disability due to trauma (Tator, 2010).

One serious consequence of TBI is an impairment in one's ability to think, or cognition. Symptoms may include difficulty focusing, paying attention and slow processing (Twamley, Jak, Delis, Bondi, & Lohr, 2014). Recent evidence suggests that cognitive skills in people who had even a single incident of TBI is projected to have a significant decline within months to years post injury as opposed to remaining stable or showing improvements (Maas et al., 2017). The decline in cognitive skills (usually with physical, emotional and behavioural comorbidities) is more likely to persist over a long period of time than to be resolved (Donker-Cools, Daams, Wind, & Frings-Dresen, 2016).

Poor cognition (e.g. difficulty learning new tasks and decrease in overall productivity) may lead to a disruption in daily functioning (Twamley et al., 2014). Moreover, one of the most commonly reported post-injury effects is a disruption in the ability to return to work (Donker-Cools et al., 2016). This is a concern because majority of TBI patients are young adults (Maas et al., 2017) who are still part of the work force.

Although there is plenty of research about cognitive training after TBI, as well as vocational intervention for TBI patients, empirical studies examining the link between cognitive training and RTW outcomes are limited. Cognitive training aims to improve mental functions by doing exercises that target areas such as attention and memory amongst other skills which are crucial for employment post-injury. It is important to know the clinical efficacy of cognitive training programs for TBI patients looking to go back to work. Such clinical implications will be useful for evidence-based intervention.

Objectives

The objective of this paper is to critically evaluate existing literature regarding the effects of cognitive training on the ability to return to work in adults following TBI.

Methods

Search Strategy

Relevant articles were obtained using Scopus database. The following keywords were used for the database search: [(traumatic brain injury) AND (cognitive training) AND (return to work)]

The search was limited to articles in English.

Selection Criteria

Studies included in this critical review investigated cognitive training and measured RTW outcomes in adults following TBI. Studies that had participants with non-traumatic brain injury, psychological or cognitive comorbidities were excluded.

Data Collection

The literature search yielded 6 articles that met the selection criteria. One of those articles was in French. One study was a review article that cited two other experimental studies that presented RTW outcomes, one of which was in Polish and the other one was not related to the research question of the current study. After further exclusions, 4 articles were considered to meet the selection criteria: a case study,

an RCT, a retrospective cohort study, and a systematic review.

Results

Klonoff, O'Brien, Prigatano, Chiapello, and Cunningham (1989) explored the role of cognitive training in increasing awareness (the ability to recognize residual skills) in 2 TBI case studies (32-year old woman with sports-related injury, severity unspecified; 48-year old man, severe). They participated daily in 1 hour of individual cognitive retraining conducted by trained therapists which involved scoring, graphing and making weekly summary sheets of their performance in addition to completing the actual tasks such as letter scanning. The authors were not involved in the sessions and took qualitative data based on their observations. Results showed that both patients pursued work opportunities that considered their strengths and were unable to regain their previous jobs.

Although Klonoff et al. (1989) provided useful qualitative observations of factors to consider in cognitive training, the study had poor validity given the lack of objective measures. The study also did not specify the duration of treatment nor the nature of the tasks. Overall, this study provides equivocal evidence regarding the link between cognitive training and return to work.

Twamley, Jak, Delis, Bondi, and Lohr (2014) conducted an RCT that investigated the effects of Cognitive Symptom Management and Rehabilitation Therapy (CogSMART) combined with supported employment in 34 veterans (age range: 22-49) with mild to moderate TBI. Participants were randomized to control and treatment groups with the latter receiving 2 hours of intervention per week for 3 months from trained supported employment specialists. The outcome measure was return to work as well as standardized tests/checklists of injury symptoms (IQ, memory, attention, verbal learning and executive functions). Results showed no significant difference between groups for work outcomes, but significant improvements in post-injury symptoms and prospective memory were observed in the treatment group.

The study showed methodological rigour as exemplified by its appropriate statistical treatment, randomized sampling, control groups, subjective and objective outcome measures. Limitations included the small sample size, lack of age matching, and absence of blinded assessors.

Overall, this study provides suggestive evidence that cognitive training does not impact return to work.

A retrospective cohort study by Murphy et al. (2006) explored the clinical efficacy of the Rehab UK Vocational Rehabilitation Program for adults with mild to severe acquired brain injury. Of the 232 participants (age range: 17-62), 60% had TBI. Data was collected over three consecutive years. Treatment duration ranged from 1 week to 4.5 years and involved group sessions for cognitive rehabilitation, vocational trial phase followed by job coaching. Results indicated that 41% of the participants with TBI obtained paid employment upon discharge.

The study by Murphy et al. (2006) had well defined recruitment, assessment, data collection procedures and statistical analysis that were sufficient for replication. Other variables that may have affected the results were discussed.

A limitation of the study was that more than a third of the participants started treatment between 5-35 years since injury. Further investigation is needed to evaluate the effects of latency time between injury and treatment onset. Therefore, the study presents evidence of moderate strength. The results and their clinical applicability should be based on its methodological strengths and weaknesses.

Donker-Cools et al. (2016) wrote a systematic review exploring various effective RTW interventions following acquired brain injury. Using keywords and medical subject headings, a database search was done in Cochrane Library, CINAHL, EMBASE, PsychINFO and PubMed. 12 studies met the selection criteria. However, only four out of the 12 studies investigated cognitive training and RTW outcomes in TBI patients.

The results from the four studies are as follows: only one study showed positive RTW outcomes following cognitive training (combined with skills training, coaching and work-directed intervention). This study was reported as a high quality non-randomized controlled trial. The remaining three studies indicated no difference in RTW outcomes between the treatment and control group. All three studies were randomized controlled trials, one of which was large scale and was reported as high quality.

The methodology used by Donker-Cools et al. (2016) explicitly reported the literature search procedures as seen in their elaborate appendage of search terms. The thorough description of inclusion and exclusion criteria also made the study reproducible.

Data from randomized controlled trials were thoroughly discussed and analyzed using appropriate statistical tests. The procedures for the assessment of methodological quality were also clearly explained. Heterogeneity within the population was also indicated as the rationale for precluding meta-analysis. Overall, Donker-Cools et al. (2016) presented compelling evidence in their systematic review. Application of the results to clinical practice is highly advised.

Discussion

Overall, the findings from the four studies yielded mixed results. There were two studies that indicated no positive outcomes. These studies have inherent limitations in validity and reliability which rendered their evidence weak. However, there is also strong evidence that cognitive training does not lead to better RTW outcomes based on the three RCTs from the systematic review by Donker-Cools et al. On the contrary, there were two studies that reported positive outcomes with suggestive to compelling evidence.

Recommendations

Further research is recommended to clarify the relationship between cognitive training and RTW outcomes in adults with TBI. The following recommendations are made to improve the level of evidence from the existing literature:

a) Future research should investigate the effects of latency time between injury and treatment onset.
b) Other factors such as age, severity of TBI, level of education and length of treatment should be examined to determine what effects they have on cognition and ability to return to work.
c) Further research is needed to generate more recent evidence regarding the topic.
d) A more exhaustive search strategy using more databases is needed.
e) Inclusion of samples with psychological and/or cognitive comorbidities are recommended for generalizability to a bigger population.

References

Donker-Cools, B. H. P. M., Daams, J. G., Wind, H., & Frings-Dresen, M. H. W. (2016). Effective return-to-work interventions after acquired brain injury: A systematic review. *Brain Injury*, *30*(2), 113–131. https://doi.org/10.3109/02699052.2015.1090014

Klonoff, P. S., O'Brien, K. P., Prigatano, G. P., Chiapello, D. A., & Cunningham, M. (1989). Cognitive retraining after traumatic brain injury and its role in facilitating awareness. *Journal of Head Trauma Rehabilitaion*, *4*(3), 37–45.

Maas, A. I. R., Menon, D. K., Adelson, P. D., Andelic, N., Bell, M. J., Belli, A., … Zumbo, F. (2017). Traumatic brain injury: Integrated approaches to improve prevention, clinical care, and research. *The Lancet Neurology*, *16*(12), 987–1048. https://doi.org/10.1016/S1474-4422(17)30371-X

Murphy, L., Chamberlain, E., Weir, J., Berry, A., Nathaniel-James, D., & Agnew, R. (2006). Effectiveness of vocational rehabilitation following acquired brain injury: Preliminary evaluation of a UK specialist rehabilitation programme. *Brain Injury*, *20*(11), 1119–1129. https://doi.org/10.1080/02699050600664335

Tator, C. (2010). Brain injury is a major problem in Canada and annual incidence is not declining. *Canadian Journal of Neurological Sciences*, *37*(6), 714–715. https://doi.org/10.1017/S0317167100051337

Twamley, E. W., Jak, A. J., Delis, D. C., Bondi, M. W., & Lohr, J. B. (2014). Cognitive symptom management and rehabilitation therapy (CogSMART) for veterans with traumatic brain injury: Pilot randomized controlled trial. *Journal of Rehabilitation Research and Development*, *51*(1), 59–70.