2-12-2016

Application of Dual Task Performance in Pediatrics and Adults with Traumatic Brain Injury: A Systematic Review

Lauren Bilski  
Department of Physical Therapy, Jefferson College of Health Professions, Thomas Jefferson University, Philadelphia, PA

Kathleen Clancy  
Department of Physical Therapy, Jefferson College of Health Professions, Thomas Jefferson University, Philadelphia, PA

Victoria Dean  
Department of Physical Therapy, Jefferson College of Health Professions, Thomas Jefferson University, Philadelphia, PA

Danielle Melfi  
Department of Physical Therapy, Jefferson College of Health Professions, Thomas Jefferson University, Philadelphia, PA

Kristin Reardon  
Department of Physical Therapy, Jefferson College of Health Professions, Thomas Jefferson University, Philadelphia, PA

Follow this and additional works at: https://jdc.jefferson.edu/dptcapstones

Recommended Citation
See next page for additional authors.

This Article is brought to you for free and open access by the Jefferson Digital Commons. The Jefferson Digital Commons is a service of Thomas Jefferson University's Center for Teaching and Learning (CTL). The Commons is a showcase for Jefferson books and journals, peer-reviewed scholarly publications, unique historical collections from the University archives, and teaching tools. The Jefferson Digital Commons allows researchers and interested readers anywhere in the world to learn about and keep up to date with Jefferson scholarship. This article has been accepted for inclusion in Department of Physical Therapy Capstone Posters by an authorized administrator of the Jefferson Digital Commons. For more information, please contact: JeffersonDigitalCommons@jefferson.edu.
Application of Dual Task Performance in Pediatrics and Adults with Traumatic Brain Injury: A Systematic Review

Lauren Bilski, Kathleen Clancy, Victoria Dean, Danielle Melfi, Kristin Reardon, Louis N. Hunter, PT, DPT
Department of Physical Therapy, Jefferson College of Health Sciences, Thomas Jefferson University, Philadelphia, PA

Background

In physical therapy practice, dual task training (DTT) has been utilized in patients with neurologic dysfunction, and there is consistent evidence in the literature to support the implication of such paradigms. Despite previous understanding that gait is largely an automatic skill, research has found that "gait is indeed an attention-demanding, high-level controlled task." Individuals with neurologic injury both cognitively and motor processing deficits that impact attention and motor function. Dual task performance is relevant in neuroplastic populations due to its interrelationship between dual task and automaticity of gait. Additionally, this association between activity and mobility is integral for appropriate compensation of complex environments encountered in daily life. Thus, the ability to divide attention and selectively attend to appropriate tasks is an important skill that probably every day function. 

Dual task training is defined broadly as simultaneous performance of two concurrent tasks; this can be the combination of two motor tasks or a motor task and a cognitive task. Common sequelae of traumatic brain injury (TBI) are increased sustained and divided attention, reduction in cognitive processing, impaired ability to motor control tasks automatically, and compromised executive function. Survivors of moderate to severe TBI may suffer from impaired attention and increased distractibility. This is evidenced by TBI effects of 2-10% in individuals annually, and the rate has been continually increasing over time. Based on these statistics, almost half a million hospital visits associated with TBI occur each year, with the majority of individuals suffering from birth through 15 years of age. This further magnifies the need to identify effective rehabilitation interventions to improve community reintegration.

Methods

Searches

- Database Searches: PubMed, Scopus, Medline Online, Google Scholar
- Search conducted: Individually by the five primary authors
- Inclusion: patients diagnosed with a moderate to severe traumatic brain injury; incorporation of DTT interventions (gait with a cognitive task with a lower cognitive functional motor task, one without functional outcome measures, written in English and published within 10 years (since 2005). (See exclusion criteria at each selection stage below)

Results

Table 1. Study Participant Demographics

<table>
<thead>
<tr>
<th>Participants</th>
<th>TBI participants</th>
<th>Control participants</th>
<th>Mechanisms of Injury</th>
<th>TBI Severity</th>
<th>Time Since Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>32.9 ± 15.4</td>
<td>30.9 ± 15.3</td>
<td>Both TBI groups had higher age compared to control group.</td>
<td>Moderate</td>
<td>3 months to 10 years</td>
</tr>
<tr>
<td>Gender</td>
<td>M: 64% F: 36%</td>
<td>M: 60% F: 40%</td>
<td>Both TBI groups had higher male gender compared to control group.</td>
<td>Moderate</td>
<td>3 months to 10 years</td>
</tr>
<tr>
<td>Activities</td>
<td>Both groups had higher level of activity compared to control group.</td>
<td>Moderate</td>
<td>3 months to 10 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion

The application of cognitive and motor dual task paradigms in the moderate to severe traumatic brain injury population may improve functional outcomes and rehabilitation programming in everyday tasks and environments. Results of these studies demonstrated that there is a relationship between DTT and the four outcomes of mobility (gait speed, walk style, balance, and foot alignment) across the lifespan but further research is required to illustrate the significance of such a relationship. There was also a correlation found between performance on the neuropsychological assessments and performance on the DTT. The majority of the studies reviewed demonstrated a decrease in gait speed with the introduction of DTT, with the exception of the case study that utilized dual task as an intervention. All other mobility outcomes identified had variable results, making it difficult to generalize to the TBI population. These variations were due to:

- The lack of standardization in outcome measures chosen
- Inconsistencies between DTT protocols
- Range in time elapsed from injury to the application of the DTT

Therefore, the implementation of dual task as an intervention over a period of time in the moderate to severe TBI population is recommended to further clarify the relationship between dual task and gait parameters.

Future Research

Future research regarding DTT is indicated to severe TBI population. Researchers are recommended to the following:

- Plan trials that aim to develop recommendations for pediatric-specific outcome measures, such as the TRIDENT for adults
- Outcome measures assessed in both controlled settings versus functional environments to determine when simple environments are appropriate in the introduction in patients receiving DTT interventions
- Recommendations for the introduction of DTT among the lifespan

Conclusion

Due to the possibility of attention and cognitive processing deficits in the TBI population, there is a necessity for physical therapists to address motor deficits within functional daily situations. Interventions requiring dual tasking could help with addressing these prominent attentional deficits that interfere with daily living after TBI. However, there is insufficient quality of evidence to support and justify using DTT during physical therapy for patients with mild to severe TBI. Further research among adults and pediatric TBI populations is warranted due to the complexity of dual task paradigms in everyday tasks.

References