CAT Portfolio: Effectiveness of Dual Tasking in Adults with Brain Injury
Kaley Campbell, Anayston Casey, Madison Culpepper, Elizabeth Denton, and Katie Morgan
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University of Tennessee Health Science Center
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The Effects of Dual-Tasking on Fall Risks in Adults with Brain Injury

Kaley Campbell, MOT/S, Anayston Casey, MOT/S, Madison Culpepper, MOT/S, Elizabeth Denton, MOT/S, Katie Morgan, MOT/S
Faculty Advisor: Anita Witt Mitchell, PhD, OTR, FAOTA  Practitioner-Mentor: Jennifer Clone, OTR/L

**PICO QUESTION**

In adults with brain injury, is dual-tasking effective for decreasing fall risk?

**BACKGROUND AND RATIONALE**

Significance
It is common for various therapeutic disciplines to target either physical or cognitive components, but not both at the same time.

Intervention
Dual-tasking combines both physical and cognitive components into one therapeutic intervention.

Purpose
To create a more functional, realistic scenario to promote generalization of skills.

**SEARCH METHODOLOGY**

Databases and Websites Searched:
CINAHL, MEDLINE, PubMed, Web of Science, Cochrane Library, Science.gov, Scopus, JSTOR, Clinical Key

Population

Intervention
Dual-tasking: Dual-task training, dual-task.

Outcome
Fall risk: Falls, accidental falls, fall.

Inclusion Criteria
- Adults with brain injury, including CVA and TBI
- Dual-tasking in relation to fall risk, balance, or gait
- Full text articles
- English only

Exclusion Criteria
- Narrative reviews
- Articles including veteran populations

**SEARCH RESULTS**

<table>
<thead>
<tr>
<th>Identification</th>
<th>Screening</th>
<th>Eligibility</th>
<th>Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Records identified through database searching (n = 33)</td>
<td>Records after duplicates removed (n = 34)</td>
<td>Records screened (n = 24)</td>
<td>Full-text articles assessed for eligibility (n = 8)</td>
</tr>
<tr>
<td>Additional records identified through other sources (n = 4)</td>
<td>Records excluded by abstract (n = 10)</td>
<td>Records excluded (n = 16)</td>
<td>Records included in the CAT synthesis (n = 5)</td>
</tr>
</tbody>
</table>

**MAIN FINDINGS AND LIMITATIONS**

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Study Quality Rating</th>
<th>Findings</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pang et al. (2018); 88%</td>
<td>+ Walking + Reducing fall incidence</td>
<td></td>
<td>Inconsistent session time</td>
</tr>
<tr>
<td>Wang et al. (2015); 88%</td>
<td>+ Center of pressure sway area and Berg Balance Scale scores - Center of pressure distance or the Timed Get Up &amp; Go Test scores</td>
<td></td>
<td>CVA only</td>
</tr>
<tr>
<td>Perione, Gloria, &amp; Anselmino (2014); 80%</td>
<td>+ Balance Evaluation System scores - Activities-specific Balance Confidence Scale scores</td>
<td></td>
<td>Small sample</td>
</tr>
<tr>
<td>Evans, Greenfield, Wilson, &amp; Bateman (2009); 62%</td>
<td>+ Satisfaction with performance of daily activities</td>
<td></td>
<td>Small sample</td>
</tr>
<tr>
<td>Fritz &amp; Basso (2013); 100%</td>
<td>+ Walking speed + Time to descend stairs</td>
<td></td>
<td>Not blinded</td>
</tr>
</tbody>
</table>

**CLINICAL BOTTOM LINES**

- Strong evidence suggests that dual-tasking decreases fall risks in adults with brain injury.
- Effective interventions ranged from 3 times per week for 60 minutes over 8 weeks to 7 times per week for 15 minutes over 1 week.
- For adults with brain injuries, there is potential for carryover into everyday life after dual-tasking activities.

**RECOMMENDATIONS FOR IMPLEMENTATION**

More research is needed to fully determine the effectiveness of dual-tasking for reducing fall risks. Close monitoring of the effects of dual-tasking is recommended.

**EXAMPLE METHOD FOR MONITORING**

Times Assistance Was Required

<table>
<thead>
<tr>
<th>Date of Treatment</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
</table>

Physical Assist | Verbal Cues

**REFERENCES**
**Critically Appraised Topic**

**EBP Question**  
In adults with brain injury, is dual-tasking effective for decreasing fall risk?

**Clinical Scenario**  
There has been limited research on the benefits of dual tasking in relation to fall risks in adults with brain injury. Dual tasking combines both physical and cognitive components into one therapeutic intervention. Currently, it is common for various therapy interventions to spend the majority of time targeting physical or cognitive components, but not both at once. If supported by the evidence, combining both physical and cognitive tasks have the potential to create a more functional, realistic scenario, thereby increasing the likelihood of generalization of skills.

### Search Methodology and Terms

<table>
<thead>
<tr>
<th>Databases &amp; Sources Searched</th>
<th>Search Terms</th>
<th>Limits Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>CINAHL, Pub Med, MedLine @ OVID, Web of Science, Cochrane Library, Science.gov, Scopus, JSTOR, Clinical Key</td>
<td>(TBI OR &quot;traumatic brain injur*&quot; OR &quot;brain injur*&quot; OR &quot;acquired brain injur*&quot;) AND (adults OR &quot;older adults&quot; OR elderly OR geriatric OR senior) AND (dual task*) AND (&quot;functional improvement&quot; OR &quot;fall risk&quot; OR &quot;balance&quot;)</td>
<td>English, Full text, 2010-2020</td>
</tr>
</tbody>
</table>

**Inclusion Criteria**  
- Adults with brain injury  
- Dual tasking in relation to fall risk, balance, or gait

**Exclusion Criteria**  
- Narrative reviews  
- Excluded articles involving pediatric clients and veterans  
- Articles unrelated to balance, gait, and fall risk with dual tasking as an intervention method (executive functioning, cognition)

**Review Process**  
- We collaborated with our project mentor and Evidence-Based Practice (EBP) professor to narrow our final PICO question from functional improvements to dual tasking and fall risks. After looking at the available research, we included articles discussing dual tasking and balance & gait.  
- Databases were selected based on available resources through the University’s library. We did not use search engines without limiters.  
- Abstracts of each article were scanned for inclusion and exclusion criteria. After narrowing down the results, articles were appraised to determine if they were relevant or not.  
- Each member completed a critically appraised paper on one article each.  
- The Evaluation of Study Design was used for the RCTs, the JBI Critical Appraisal Checklist for Case Reports was used to evaluate the case study, and the Meta-analyses of Observational Studies in Epidemiology (MOOSE) Checklist was used to calculate the quality rating of the meta-analysis.  
- Our faculty advised reviewed and provided feedback on all our critically appraised papers to ensure quality control.

### Search Results by Level of Evidence

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Study Design</th>
<th># of Articles Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>High-quality RCTs, or systematic reviews of these studies, or meta-analyses</td>
<td>2</td>
</tr>
<tr>
<td>II</td>
<td>Small-scale RCTs, nonrandomized studies with a control group such as cohort studies, case control, pretest posttest designs, or systematic reviews of these studies</td>
<td>2</td>
</tr>
<tr>
<td>IV</td>
<td>Descriptive studies including single subject designs, case studies, normative studies, and survey studies</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total Articles Reviewed: 5</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Main Findings

**Level I**  
- Statistically significant improvement for walking function and reducing fall incidence in patients with chronic stroke with independent ambulatory function and intact cognition  
- Statistically significant improvements for center of pressure sway area and Berg Balance Scale scores  
- No statistically significant improvements for center of pressure distance or the Timed Get Up & Go Test scores (Quality scores: 88%)

**Level II**  
- Statistically significant improvements in Balance Evaluation System scores  
- In one study, statistically significant improvements with satisfaction in performance of daily activities  
- No statistically significant improvements in the Activities-specific Balance Confidence Scale scores (Quality score: 62% and 80%)

**Level IV**  
- Statistically significant improvements on the Walking While Talking Test, Trail Making Test, and in walking speed and time to descend stairs (Quality score: 100%)
### Limitations

**Level I**
- Small sample sizes for both studies
- Only stroke diagnoses in both studies
- Blinding was not implemented in the meta-analysis
- Inconsistent session times in the RCT
- Short follow-up periods for meta-analysis
- RCT used convenience sampling, leading to potential self-selection bias
- Multiple treatments in the RCT
- Attrition in the RCT

**Level II**
- One of the two studies were not blinded
- Small sample sizes for both studies

**Level IV**
- Multiple treatments

### Bottom Line & Recommendations:
- Strong evidence suggests that dual-tasking decreases fall risks in adults with brain injury.
- Effective interventions ranged from 3 times per week for 60 minutes over 8 weeks to 7 times per week for 15 minutes over 1 week.
- For adults with brain injuries, there is potential for carryover into everyday life after dual-tasking activities.
- More research is needed to fully determine the effectiveness of dual-tasking for reducing fall risks.
- Close monitoring of the effects of dual-tasking is recommended.

### References


### Name of Appraisers:
Elizabeth Denton, Madison Culpepper, Katie Morgan, Kaley Campbell, Anayston Casey

### Date Completed:
March 4th, 2020; Revised on May 12, 2020
RECOMMENDATIONS FOR IMPLEMENTATION

As previously discussed in the poster handout and our critically appraised paper, close monitoring of the effects of dual-tasking is recommended. Directly below this, is an example of a completed form one could use to monitor their client’s progress. Below that, is a blank chart one can use at their convenience, if they choose to implement dual-tasking and would like a method to monitor.

EXAMPLE METHOD FOR MONITORING FILLED OUT

![Graph showing client's progress with dates and physical assists and verbal cues]

Date of Treatment

EXAMPLE METHOD FOR MONITORING BLANK CHART

![Blank graph for monitoring progress with days and times of assistance required]
Records identified through database searching (n = 33)

Additional records identified through other sources (AJOT) (n = 4)

Records screened after duplicates removed (n = 34)

Records excluded by title (n = 10)

Remaining records screened (n = 24)

Records excluded by abstract (n = 16)

Full-text articles assessed for eligibility (n = 8)

Full-text articles excluded, with reasons listed on the search results form (n = 3)

Records included in the CAT synthesis (n = 5)
References


Appendix A

Critical Appraised Paper #1
In adults with brain injury, does dual tasking result in decreasing fall risks?

| Purpose of the Study | The objective of this study was to evaluate the effects of an 8-week dual-task balance/mobility exercise program on dual-task interference during walking, fall incidence, balance self-efficacy, participation in daily activities, and quality of life in individuals with chronic stroke. This study applies to the PICO question because it is implementing the dual task approach for intervention to see if it results in a decrease of falls in adults with brain injury. In addition, all the PICO elements are mentioned in the study. |
| Setting | The setting was in an exercise room located in the university, Hong Kong Polytechnic University. |
| Participants or Sample | The participants were recruited from the community stroke patient groups via convenience sampling. The study consisted of 84 females with the ages being 61.2±6.4. The inclusion criteria included a diagnosis of stroke, ≥6 months after stroke onset, ≥50 years of age, community-dwelling, medically stable, having balance deficits, ability to follow 3-step commands, and able to walk at least 10 minutes without manual assistance. The exclusion criteria included having neurological conditions other than stroke, not-community-dwelling before the stroke event, significant receptive or expressive aphasia, substantial cognitive impairment, and other serious illnesses that precluded participation in the study. All participants provided written informed consent before data collection. |
| Study Design and Methodology | The study design was a single-blind randomized control trial. Participants were randomized in blocks of 12 using a 1:1:1 allocation ratio to one of the three following groups: the dual-task training group, the single-task training group, or the upper limb exercise group (controls). Group allocation was concealed in sealed sequentially numbered envelopes, which were not opened until the baseline assessments were completed. All randomization procedures were performed by an off-site researcher who was not involved in other aspects of the study. The baseline assessments were performed by 2 researchers who were blinded to group allocation. The dual-task interference effect was measured for the time to completion of 3 mobility tests and for the correct response rate during serial-3-subtractions and verbal fluency task. Secondary outcomes included the Activities-specific Balance Confidence Scale, Frenchay Activities Index, and Stroke-specific Quality of Life Scale. The above outcomes were measured at baseline, immediately after, and 8 weeks after training. Fall incidence was recorded for a 6-month period post-training. |
| Level of Evidence | Level I |
| Outcomes and Main Findings | The key finding was that the 8-week dual-task program was effective in improving dual-task walking function and reducing fall incidence in |
chronic stroke patients with independent ambulatory function and intact cognition. Also, there was no significant effect on activity participation or quality of life \( (p > 0.05) \). Only the dual-task group exhibited reduced dual-task interference in walking time post-training (forward walking combined with verbal fluency \( [P=0.014] \), forward walking with serial-3-subtractions \( [P=0.035] \), and the timed-up-and-go with verbal fluency \( [P=0.001] \)). The dual-task cognitive performance showed no significant changes. The dual-task program reduced the risk of falls and injurious falls by 25.0% \( (P=0.037) \) and 22.2% \( (P=0.023) \), respectively, during the 6-month follow-up period compared with control. A factor that could have altered the outcomes were the drop-outs. There was good reliability of the dual-task assessments. There were no adverse events reported during the training period.

### Intervention Highlighted Through the Research

The use of a dual-task program to improve dual-task mobility, reducing falls and fall-related injuries. Each group trained for three 60-minute sessions per week for 8 weeks. The timing of the exercise sessions for each group was dependent on the availability of the participants, space, and equipment. The training sessions for the 3 groups were conducted at different times of the day or on different days so that participants would not be exposed to observing other treatments.

### Limitations

There needs to be more research on the particular research question. The sample size needs to be increased, as well as including both genders. The exercise sessions were not held at the same time of the day. The findings were only generalizable to community-dwelling ambulatory individuals with chronic stroke who have mild to moderate motor impairment and intact cognition. A convenience sample was used to recruit the participants in community self-help groups, leading to potential self-selection bias. Also, patients in the early stages of stroke typically receive other types of rehabilitative training concurrently, which may confound the results. Finally, the attrition could have affected the internal validity of the study.

### This Study was Identified as the “Best” Evidence and Selected for the Portfolio for the Following Reasons:

- May inform the design of fall-prevention programs in this population.
- All the elements in the PICO question were mentioned and discussed, which help answer and find valuable information about the question.
- This study helped expand the research on dual-task programs in adults with brain injury, which was a reason and rationale the practitioner-mentor picked this particular research question.
- Results and findings of this study showed that a dual-task program can be effective in improving dual-task mobility, reducing falls and fall-related injuries in ambulatory chronic stroke patients with intact cognition.

### Quality Score

88%
**Critically Appraised Paper #2**  
**In adults with brain injury, does dual tasking result in decreasing fall risks?**  

| Purpose of the Study | The purpose of this study was to determine the feasibility and potential value of incorporating cognitive-motor dual-task training into physical therapy interventions for an individual with a severe traumatic brain injury (TBI).  
  • If dual tasking can help improve balance and gait, then ideally, risk of falls will decrease. Occupational Therapists (OTs) see a lot of clients who are at a fall risk and OTs play a huge role in educating about fall risks. |
| Setting | Inpatient rehabilitation |
| Participants or Sample | The participant was a 26-year old female who sustained a severe TBI during a motor vehicle accident 46 days prior to physical therapy evaluation. She was classified as level IV on the 8-level Rancho Los Amigos Cognitive Function Scale. The participant’s main impairments were left-sided weakness and incoordination, poor balance, and reduced cognition and attention to task, which led to functional limitations in gait and mobility. |
| Study Design and Methodology | This study is a single case-study on a patient that was presented to the inpatient rehabilitation center for intense physical, occupational, and speech therapy 46 days after her injury. The physical therapists administered standard physical therapy for 16 days after her injury. The physical therapists incorporated dual-task training with physical therapy treatment for 7 days. |
| Level of Evidence | Level IV |
| Outcomes and Main Findings | The participant showed modest improvement in performance on divided attention tests in Phase B compared to Phase A. She showed clear improvements in functional tasks and had a 3-fold greater rate of change in walking speed during Phase B than in Phase A. The participant’s time to descend stairs markedly reduced after dual-task training but only modestly reduced during the baseline phase. The participant showed improvements on the Functional Improvement Scale and Berg Balance Scale with intensive multidisciplinary therapy. The participant cleared posttraumatic amnesia (PTA) on postinjury day 60. She started Phase A on postinjury day 28, therefore about 33% of Phase A (2 days) occurred with PTA, affecting the lower rate of recovery during this phase. The study found that dual-task training may contribute to improvements on outcome measures designed to test divided attention including the Walking While Talking Test and Trail Making Test and a greater rate of improvement in walking speed and time to descend stairs when compared to the baseline phase. |
| Intervention Highlighted Through the Research | The participant received physical therapy services 60 to 90 minutes per day, 5 to 6 days per week for a total of 26 days. Prebaseline treatment occurred over 12 days, then the participant participated in 2 phases that lasted 14 days total:  
  • Phase A: A 7-day baseline period that involved a continuation of the standard PT care provided |
- Phase B: A 7-day dual-task intervention period that included standard PT supplemented with a directed intervention of dual-task training. Dual-task training occurred for an average of 15 minutes out of each 30-minute session, totaling at least 180 minutes of dual-task training over 7 days. Cognitive tasks, such as addition, subtraction, and synthesis of lists were paired with treadmill walking. These tasks were added only after the participant was able to maintain a steady speed on the treadmill without assistance and comprised only 60 to 90 seconds of each stepping bout.

**Limitations**

Intensive multidisciplinary therapy alone may have accounted for improvements in walking speed and dual task measures (compared to improvements being a result of dual-task training). Next, Treadmill training may have contributed to the increased walking speeds rather than dual-task training itself. Finally, The participant started on amantadine the same day that phase B began. In TBI, amantadine can be used off-label to improve sustained and divided attention, increase arousal, and reduce impulsivity. Whether this drug contributed to the observed functional improvements is unclear because other mood-stabilizing drugs, including quetiapine and sertraline, were prescribed during phase A to reduce agitation and improve cognition and alertness. Quality Score is 44%.

<table>
<thead>
<tr>
<th>This Study was Identified as the “Best” Evidence and Selected for the Portfolio for the Following Reasons:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>This case study supports the use of dual-task training alongside physical therapy for individuals with a severe TBI. According to the article, this is the only case that reports the effect of cognitive-motor dual-task training in a person with severe TBI.</td>
<td></td>
</tr>
<tr>
<td>Prior work has explored dual-task training in TBI in subjects in the outpatient setting, but this study looks at an individual in the inpatient rehabilitation setting, which is the setting that our PICO question is based on.</td>
<td></td>
</tr>
<tr>
<td>Even though this is a single case study, it looks at the use of dual-task training in an individual with a brain injury, which directly related to the PICO question. By improving balance and mobility, ideally fall risks will decrease, which also directly relates to the PICO question.</td>
<td></td>
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</tbody>
</table>

**Quality Score**

100%
**Critically Appraised Paper #3**

In adults with brain injury, does dual tasking result in decreasing fall risks?


<table>
<thead>
<tr>
<th>Purpose of the Study</th>
<th>To estimate the effects of Cognitive Motor Interference (dual tasking) on gait and balance in people who have sustained a stroke.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting</td>
<td>All studies examined in this systematic review were conducted in a hospital, community group setting or was not specified in the specific article.</td>
</tr>
<tr>
<td>Participants or Sample</td>
<td>Fifteen RCT studies were included in the systematic review, which included 395 participants total. All of the participants had sustained a stroke and were over 18 years old.</td>
</tr>
<tr>
<td>Study Design and Methodology</td>
<td>This was a systematic review and meta-analysis that included only studies with RCT designs. Medline, the Cochrane Library, EMBASE, CINAHL, Web of Science, Physiotherapy Evidence Database scale (PEDro) and China Biology Medicine disc. The search was limited to randomized controlled trials (RCTs) but had no language restrictions. The full electronic search strategies for all databases are provided in Appendix S1. In addition, journals of rehabilitation medicine, neurology and sport science were searched by hand. Studies included in the systematic review had intervention groups which performed CMI and a control group which performed a single-task, or no treatment at all.</td>
</tr>
<tr>
<td>Level of Evidence</td>
<td>Level I</td>
</tr>
<tr>
<td>Outcomes and Main Findings</td>
<td>The results showed that CMI was better than the control group on center of pressure sway area in a random effects model [SMD = 1.05, 95% CI (-1.85, -0.26), P = 0.01]. No significant difference was observed between CMI and the control group on COP sway distance [SMD -0.49, 95% CI (-1.10, 0.12), P = 0.11]. The results showed that CMI was better than the control group on the Berg Balance Scale [MD 2.87, 95% CI (0.54, 5.21), P = 0.02]. However, sensitivity analysis were conducted on each of these and all were affected to some degree. No significant differences between the CMI and the control group for the Times Up and Go Test in a random effects [MD = -0.98 s, 95% CI (-3.83, 1.87), P = 0.50]. A sensitivity analysis for this outcome measure revealed that the pooled result was not influenced by individual trials.</td>
</tr>
<tr>
<td>Intervention Highlighted Through the Research</td>
<td>Cognitive Motor Interference, which is the simultaneous performance of a cognitive task and a motor task, and each task was separate. In the classic CMI, participants performed a motor task (e.g. walking) whilst answering a series of simple addition/subtraction questions (e.g. 100 - 7 = 93) [9].</td>
</tr>
</tbody>
</table>
| Limitations                | - Only looks at stroke and not all brain injuries  
- The quality of included trials the systematic review included – no studies included blinding the therapists, only 6 of the 15 studies conducted concealed allocation, only 1 of the 15 studies blinded the
participants and only 2 of the 15 studies conducted intention-to-treat analyses.
- The total number of participants was not considered large, which influence the ability of small difference in CMI and control groups to be detected.
- Subgroup analyses comparing CMI versus a single-task exercise or comparing CMI versus no intervention were not conducted due to insufficient number of studies.
- Longer-term outcomes on gait and balance function could not be assessed as most studies had short intervention durations and short follow-up periods (two to eight weeks).

| This Study was Identified as the “Best” Evidence and Selected for the Portfolio for the Following Reasons: | Because it:
| | • Is a high level of evidence study
| | • Helps provide evidence that directly answers our PICO question
| | • It was completed in the last five years, so it is current best evidence.

| Quality Score | 88.24% |
Critically Appraised Paper #4

In adults with brain injury, does dual tasking result in decreasing fall risks?


| Purpose of the Study | The purpose of this study was to evaluate the effectiveness of a 5-week cognitive-motor dual-tasking training program developed to improve performance of a group with dual-tasking difficulties arising from traumatic brain injury. The study is relevant to our PICO question of fall risk, as it measures how older adults improved their walking performance when dual tasking in their everyday lives. |
| Setting | The study setting was not specified directly in the article. |
| Participants or Sample | 19 people with acquired brain injury who displayed difficulty with dual-tasking activities. Participants randomly selected to treatment and control groups through concealed allocation. N = 9 (control group) N = 10 (treatment group) |
| Inclusion criteria: | - Participants between ages of 18 and 65 |
| | - Independently diagnosed with suffering a brain injury or neurological illness |
| | - Evidence of performance is at least one standard deviation below the mean on one of more tests assessing cognitive motor dual-tasking |
| | - Self-reported difficulties with everyday dual tasking |
| Exclusion criteria: | - Presence of severe language comprehension deficit that impacts ability to complete baseline assessment tests |
| | - Cognitive deficit that impacts ability to regularly complete training exercises |
| | - Physical disability that impacts ability to complete two-minute walking task |
| Study Design and Methodology | Baseline Assessment: Spot the Word Test, National Adult Reading Test, battery of tests (two motor and two cognitive tasks), lasting two minutes each. |
| | Single tasks include a walking task, a clicking task, a sentence verification task, a tone counting task. These four tasks are completed as single tasks, then combined with the other three. The following dual task combinations are completed by participants: walking and clicking, tone counting and sentence verification, tone counting and walking, sentence verification and walking, clicking and sentence verification, and tone counting and clicking. |
| Treatment Program: | Participants met with the researcher for thirty- minute weekly sessions to discuss the previous week’s training. Practice sessions were completed five days a week for five weeks, with two walking sessions lasting two minutes each (3-10 minutes of rest between the two). Participants then |
answered questions on a worksheet (5-point scale) related to their dual-task performance. Obstacles were used to increase the demand of the tasks if the task was reported to be too easy. Cognitive tasks that were included for dual tasking changed each week, which included listening to instrumental music, listening to vocal music, verbal fluency tasks, and answering autobiographical questions. These cognitive tasks were implemented as participants walked. The control group and treatment followed the baseline tests, but the control group repeated the tests at six weeks. The control group received a 5-10-minute call from a therapist on a weekly basis. The control group was asked to record journal entries five days a week for five weeks.

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Level II- Small scale Randomized Control Trial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcomes and Main Findings</td>
<td>A battery of tests was compiled by researchers, due to lack of assessment tools for cognitive-motor dual-tasking. Significance values were not adjusted due to it being a preliminary study. Outcome Measures: Sentence verification and walking dual-task condition, battery of testing, The Memory Span &amp; Tracking Test of Baddeley, Telephone Search with Counting Subtest (baseline), Dual-tasking Questionnaire (baseline) The Sentences and Walking dual-task condition improved performance, and it was shown to have a large effect size. After dual-task activities, the treatment group reduced self-reported difficulties. The effect size for the divided attention questionnaire was small to medium. With the training program, improvements were seen in walking and talking, and participants rated higher performance satisfaction in everyday situations. Participants awareness was increased during divided attention seen in dual tasking</td>
</tr>
<tr>
<td>Intervention Highlighted Through the Research</td>
<td>• 5-week cognitive-motor dual-tasking training program • Twice daily exercises with a combination of walking and cognitive activities (increasing demand throughout course of intervention) • The study progressed from low demand to higher demand tasks</td>
</tr>
<tr>
<td>Limitations</td>
<td>• Modest sample size, meaning the study was underpowered • Some participants’ data may suggest that there is no room for them to improve • Low test-retest reliability • The study was not blinded • May not generalize to untrained domains</td>
</tr>
<tr>
<td>This Study was Identified as the “Best” Evidence and Selected for the Portfolio for the Following Reasons:</td>
<td>• Low-budget- easy to generalize • With further research, dual tasking could be implemented into everyday situations, and obstacles could be implemented to assess fall prevention, versus being used to increase task demand. • If the domain of fall prevention was practiced, this article could be relevant in occupational therapy to decrease fall risk by practicing the domain of functional mobility.</td>
</tr>
<tr>
<td>Quality Score</td>
<td>62%</td>
</tr>
</tbody>
</table>
Critically Appraised Paper #5

**In adults with brain injury, does dual tasking result in decreasing fall risks?**


| Purpose of the Study | The purpose of this study was to assess the safety and feasibility of a dual-task home-based rehabilitation program in addition to individualized traditional outpatient physiotherapy sessions, and to determine whether this approach is more effective than traditional physiotherapy alone to improve balance control in patients with acquired brain injury. |
| Setting | Single Rehabilitation Center, Homes of participants |
| Participants or Sample | 16 Participants; 9 males and 7 females |
| Participants were included in this pilot study if they met the following criteria: (1) had a One Leg Stance Test score (with eyes open) less than 10 seconds; (2) could walk a distance of 10 m indoors on a level surface with supervision and with or without an assistive device; (3) were aged between 18 and 55 years old; (4) were diagnosed with acquired brain injury between 12 and 18 months before enrolment; (5) had adequate cognitive ability to understand the study plan and goals (Mini Mental State Examination score ≥24); and (6) had either oral or reading comprehension of the English language. Exclusion criteria were: (1) previous diagnosis of neurodegenerative diseases or psychiatric disorders and (2) changes in pharmacologic therapies (muscle relaxants and antispasmodic drugs) during the pilot study period. |
| Study Design and Methodology | Single-blind, randomized controlled pilot study |
| Level of Evidence | Level II – Small scale RCT |
| Outcomes and Main Findings | • The primary outcome measure was the Balance Evaluation System Test; secondary measures were the Activities-specific Balance Confidence Scale and Goal Attainment Scaling • Balance Evaluation System Test scores improved significantly in both groups, but the intervention group achieved greater improvement compared with the control group \( (P = 0.008, r = 0.63, \text{power} = 0.99) \). • There was no significant difference in improvement in Activities-specific Balance Confidence Scale scores between the two groups \( (P = 0.11, r = 0.63, \text{power} = 0.70) \), though there was a trend towards greater improvement in the intervention group. There was no significant greater improvement in Goal Attainment Scaling scores in the intervention group compared with the control group \( (P = 0.093, r = 0.63, \text{power} = 0.62) \). |
| **Intervention Highlighted Through the Research** | All of the participants received 50-minutes of individualized traditional physiotherapy sessions 3x per week for 7 weeks. In addition, the intervention group performed an individualized dual-task home-based program for 30 minutes each day for six days per week for 7 weeks with a caretaker or independently. Intervention group was provided booklet with pictures of tasks, caregiver instructions, and environmental requirements. |
| **Limitations** | • Dual-task performance was assessed using the only item on the Balance Evaluation System Test that assesses dual-task performance- other tests could measure outcomes  
• Participants in the intervention group spent more time in training than the participants in the control group – could have effect on results  
• Small sample size |
| **This Study was Identified as the “Best” Evidence and Selected for the Portfolio for the Following Reasons:** | • RCT  
• 80% quality score  
• Relevant to population and intervention being studied |
| **Quality Score** | 80% |