

## The Dual-Task Condition: Intervention

An Evidence-Based Guide For  
Attention-Related Fall Risk in Older Adults



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## Objectives

- Explain dual-task intervention and how it can be used to decrease attention-related fall risk in older adults
- Discuss the process of dual-task intervention, including current best practice to optimize outcome
- Facilitate an understanding of the current literature behind dual-task intervention



## Why is Dual Task Intervention Useful?

- Dual Task activities are a part of everyday life!
- Can improve motor performance under single- and dual- task conditions (Silsupadol, 2006; Silsupadol, 2009a; Silsupadol, 2009b; Hiyamizu, 2012)
- Can improve cognitive performance under single- and dual- task conditions (Silsupadol, 2009b; Hiyamizu, 2012)
- Task Integration Hypothesis (Silsupadol, 2009a; Silsupadol, 2009b)

## Examples of DT Intervention

- Primary motor task + secondary task
- Chart of Example Tasks
  - Primary motor and secondary cognitive tasks: RCT of older adults with impaired balance (Silsupadol, 2009a)
  - Secondary motor tasks: Study of adults with chronic stroke (Yang, 2007)



PRIMARY MOTOR TASK (Silsupadol, 2006; Silsupadol, 2009a)	SECONDARY COGNITIVE TASK (Silsupadol, 2006; Silsupadol, 2009a)	SECONDARY MOTOR TASK (Yang, 2007)
Stand with narrow BOS, eyes open or closed	Auditory discrimination (ex: identify noises)	Holding ball with 1 or 2 hands
Semi-tandem stance, eyes open or closed	Name things/words (ex: types of flowers)	Bouncing ball with 1 or 2 hands
Single-leg stance (ex: draw letter with one foot)	Random digit generation	Hold ball in 1 hand and bounce ball with other hand
Standing with external perturbations	Counting backwards	Kick ball
Walking with narrow BOS	Visual spatial tasks (ex: place letters in matrices and name letter in specific matrix; give directions from house to grocery store)	Hold ball in 1 hand and kick ball with foot
Side-stepping, backwards stepping	Remember something (ex: phone number, grocery list)	Bounce ball in 1 hand and kick ball with foot
Side-stepping, backwards stepping with narrow base of support while avoiding obstacles	Spell words backwards	Reciprocally bounce 1 ball with both hands

## Enhancing DT Intervention Effectiveness

- Selecting and Progressing the Motor Task
- Selecting and Progressing the Cognitive Task
- The Importance of Instructional Set
- Other Strategies



## Selecting and Progressing the Motor Task

- Consider patient status
- Progressive challenge
- Use Gentile's Taxonomy (Gentile, 2000; Silsupadol, 2006)
  1. Body stability tasks
  2. Body stability + object manipulation
  3. Body transport tasks
  4. Body transport + object manipulation

## Selecting and Progressing the Cognitive Task

- Consider patient baseline cognitive status!
- Vary type of cognitive task throughout training
  - Different type of cognitive tasks = different gait changes under DT conditions (Beauchet, 2005)
  - Task must be challenging enough to elicit DT cognitive costs (Verghese, 2007; Schwenk, 2010)

## The Importance of Instructional Set

- Allocation of attention during DT training may greatly affect outcomes
- 2 types of instructional set used with older adults (Silsupadol, 2009a; Silsupadol 2009b)
  - Fixed-priority instructions
  - Variable-priority instructions



## DT Intervention may not be appropriate for all patients...

- Patients with significant difficulty performing under single-task conditions
  - Compensation strategies (Hyndman, 2006)
- Cognitive rehabilitation or pharmaceutical management (Verghese, 2002)



## Other DT Interventions!



## Obstacle Course



- Yamada, 2012
- Traditional Training + Complex Obstacle Course
  - Patient moves sequentially between flags numbered 1-15 while avoiding obstacles
  - Flags and obstacles moved
  - Obstacles changed color
- 24-week program
  - Improved ability to divide attention
  - Lower incidence of falls and fractures in 12 months post-intervention

## Jacques-Dalcroze Eurhythmics

- Kressig, 2005; Trombetti, 2011
- Multi-task exercises performed to piano music
- 6-month program
  - Improves balance, rate of falls, and fall risk
  - Improvements persist 6 months post-intervention (Trombetti, 2011)
  - Long-term participation reduces gait variability



## Tai-Chi

- Tsang, 2012
- Elderly women who regularly practice Tai-Chi for at least 6 months:
  - Quicker response of tibialis anterior and medial gastrocnemius muscles
  - Stair descending strategy similar to that of young women
  - Improved ability to shift attention between mental and physical tasks



## Cognitive DT Training

- Li, 2010
- Computer-based DT training with 2 visual discrimination tasks
  - Task A: Color decision
  - Task B: Letter-identify decision
- Five 1-hour sessions
  - Cognitive DT training of executive skills may transfer to improve motor performance
  - Further research required



## Is DT Intervention Effective?

- Improved ability to multi-task
- Improved balance
- Improved gait performance
- Faster self-selected gait speed
- Improved postural control
- Improved cognitive performance under DT conditions
- Decreased risk of falling/lower fall rate



(Silsupadol, 2006; Yang, 2007 ; Silsupadol, 2009a; Silsupadol, 2009b; Schwenk, 2010; Trombetti, 2011; Hiyamizu, 2012; Uemura, 2012; Plummer-D'Amato, 2012)

### Is DT Intervention Effective?

- Used successfully among older adults with dementia (Schwenk, 2010)
- Improvements can be at least partially retained long-term (Trombetti, 2011; Silsupadol, 2009a)
- Some forms of DT training may be more effective than others (Silsupadol, 2009a; Silsupadol, 2009b; Schwenk, 2010; Uemura, 2012)

### Is DT Intervention Effective?

- DT training is at least as effective as ST training
- ST training may not improve performance under DT conditions
- DT training can improve performance under single- and dual- task conditions (Silsupadol, 2006; Silsupadol, 2009a; Silsupadol, 2009b; Trombetti, 2011; Hiyamizu, 2012)
- Training under DT conditions has been shown to improve cognitive performance (Silsupadol 2009b; Schwenk, 2010; Hiyamizu, 2012)