Dual Tasking and Mobility in Old Age: Potential Lessons for Incontinence Research?”

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Agenda

- Dual tasks: concepts, approaches, challenges
- How might dual tasks be relevant to urinary incontinence?

What are Dual Tasks?

- “stress tests” to assess “brain reserve”
- Usually based on attentional capacity and challenge due to divided attention
- Evaluates decline in performance between single task and additional task as “dual task cost”
- Can be any mix of tasks
- In geriatrics, often defined as a motor and a cognitive task.

Face Validity

- Geriatrics “stops walking while talking”
- General population: texting while driving, walking

Classic Dual Task Elements: Motor component

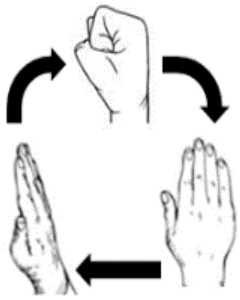
- Standing balance/sway under multiple sensory conditions
- Walking (speed, gait characteristics)
- Challenging motor tasks such as obstacle avoidance, narrow walk, directional stepping
- Upper extremity eg peg test, finger tapping

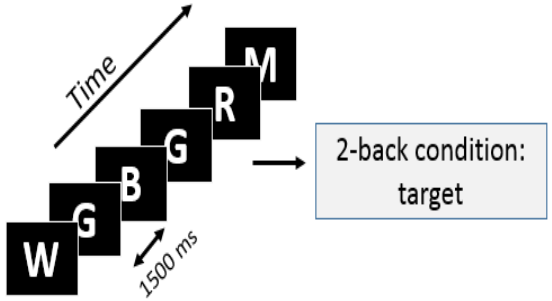
Classic Dual Task Elements: Cognition or second Component

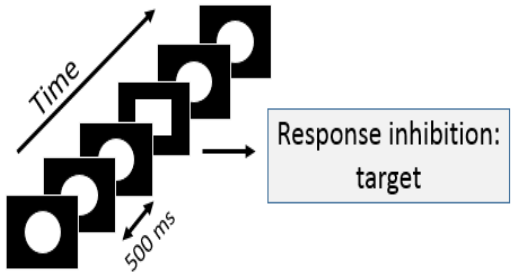
- Internal cognitive tracking: recite alternate letters, count backwards, n-back, visual spatial memory task (STAR test)
- External focus: motor response (push button) in response to visual or auditory cue- can combine with n back, inhibition or other tasks
- Second motor task: carry something, hand movements
- Complex task: texting or calling a phone number on a cell phone

Packages of dual tasks
The COMBINE (Nadkarni et al)

- Cognitive tasks performed while standing and while walking:
  - Motor sequencing: Luria Motor Sequences task
  - Working Memory: 2-back verbal paradigm
  - Response inhibition: Go- No go task
  - Phone dialing task: an ecologically valid task
- Instructions included task accuracy and RT.
- COMBINE: did not dictate any task prioritization.
- Order of tasks was randomized.







Preliminary not for citation

Dual Tasks: Validity

- Age: (cross sectional) older adults perform more poorly, healthy older people may only differ during stress/challenge- unclear if this develops earlier in midlife than single task deficits (Boisgontier) may improve across childhood (Ruffieux 2015)

- Falls: many pooled analyses, often includes retrospective falls history but also some are prospective… Verghese WWT predicts future falls but not estimated as "cost" (JAGS 2002) Recent pooled analyses say dual task predicts falls but not clearly superior to single task even in high functioning (Menant 2014, Lord et al 2015)

- Dementia/MCI: (cross sectional) Dual task elicits greater declines in gait with MCI and AD, especially with more complex cognitive tasks (Muir 2012) no greater discrimination versus single task (Nascimbeni 2015, Ijmker 2012)

Dual Tasks: Validity

- Concussion: discriminates recovery in athletes (Howell 2015, Dorman 2015)

- Multiple Sclerosis: (cross sectional) gait speed declines with dual tasking, little info on cognitive decline with dual tasking (Wajda 2015). Dual task motor effect seen during UE (peg test) (Learmonth 2015)

- Parkinsons disease: (cross sectional) cog performance decline not gait decline during dual task in worse PD (Fuller 2013) early PD shows dual task gait characteristic changes not seen on single task gait (Panyakaew 2013) Balance is worse in PD than control but no added discrimination by dual task (Fernandes 2015)

- Longitudinal decline in mobility, decline in cognition, incident disability: nothing yet

Dual tasks and subclinical pathology

Dual tasks and subclinical amyloid burden by PET in older adults with normal cognition and gait

Walking speed under various conditions

Task Type	PiB (+) N=12	PiB (-) N=16	p-value
Regular Walk (without concurrent task)	1.14 ± 0.16	1.16 ± 0.21	0.75
Response inhibition (Go No-go task)	0.94 ± 0.25	1.11 ± 0.26	0.08
Working memory (2-back task)	0.88 ± 0.22	1.04 ± 0.25	0.11
Simple Motor sequencing (Open & close hands)	1.03 ± 0.22	1.3 ± 0.9	0.012
Complex Motor Sequencing (Luria Motor Task)	0.75 ± 0.24	0.98 ± 0.15	0.027
Dialing a phone	0.74 ± 0.19	0.89 ± 0.20	0.06

Dual task cost on walking speed (%)

Task type	PiB (+) N=12	PiB (-) N=16	p-value
Response inhibition (Go No-go task)	18.8 ± 18.5	6.3 ± 7.8	0.028
Working memory (2-back task)	22.2 ± 16.3	10.3 ± 12.6	0.048
Simple Motor sequencing (Open & close hands)	10.2 ± 11.9	1.4 ± 7.1	0.04
Complex Motor Sequencing (Luria Motor Task)	34.3 ± 17.7	16.5 ± 17.5	0.039
Dialing a phone	35.6 ± 11.8	23.4 ± 14.7	0.034

Nadkarni et al preliminary data not for citation

Interventions

- Treat poor dual tasking with practice (aging, AD, PD, head injury) (Fritz 2015)
  - Task-specific behaviors can improve
  - Unclear “task transfer”
  - Unproven effect on clinically relevant outcomes

- Dual task as outcome
  - Some changes with antidementia drugs in AD trials (Beauchet 2014, 2015)

Operational Methodological Challenges

- Instructions regarding task prioritization
- Practice effects
- Pacing with oral responses “metronome effect”
- Need to measure both motor and cognitive performance
- Calculating dual task cost- need each task done alone first then together (3 conditions, 4 measures)- also report absolute and relative costs

Conceptual Methodological Challenges

- Dual task performance may only be relevant when the single task performance appears “normal”. To evaluate dual task value, we must compare dual task cost to predictive validity of the single task.

- Which motor and cognitive tasks best capture the range of performance or reserve capacity? We need a range of types and difficulties of cognitive and motor tasks.

- Perhaps we could take each participant to their limits of “good” performance, then add a challenge? Start with either the motor or the cognitive task?

Dual tasks and urge incontinence

- Urge incontinence and age-related attentional deficits are both associated with small vessel vascular brain disease and with prefrontal lobe abnormalities.
- Is urgency an attention-demanding experience?
- Does movement in the context of urgency distract attention from suppressing the urge to void?
- Might this be one reason why waiting to move until the “urge” passes helps reduce incontinence episodes?
- Could dual task testing identify persons with constraints on attentional capacity?
- Could dual task training increase attentional reserve and thus reduce incontinence episodes in UI?