

Upper Extremity Rehabilitation: Complex Interventions for Neurological Conditions

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Mr. Robertson

- <https://youtu.be/B70qDfl3LyA>
- Berg Balance Score = 38 (medium fall risk)
- Montreal Cognitive Assessment = 25/30
- Observed having difficulty attending during meals
- Goals: 1) Independent ADL's 2) Participating in weekly poker game



When you're walking and then you start thinking about how you're walking, and you feel like you're walking weird....



POKER FACE



This is what we know

- Repetition alone, without usefulness and meaning, is not enough to produce increased motor cortical representation.



Cognitive Motor Interference

- occurs when simultaneous (dual-task) performance of a cognitive and a motor task results in deterioration of performance in one or both tasks, relative to performance of each task separately (single-task performance)

(Abenethy et al 1988)

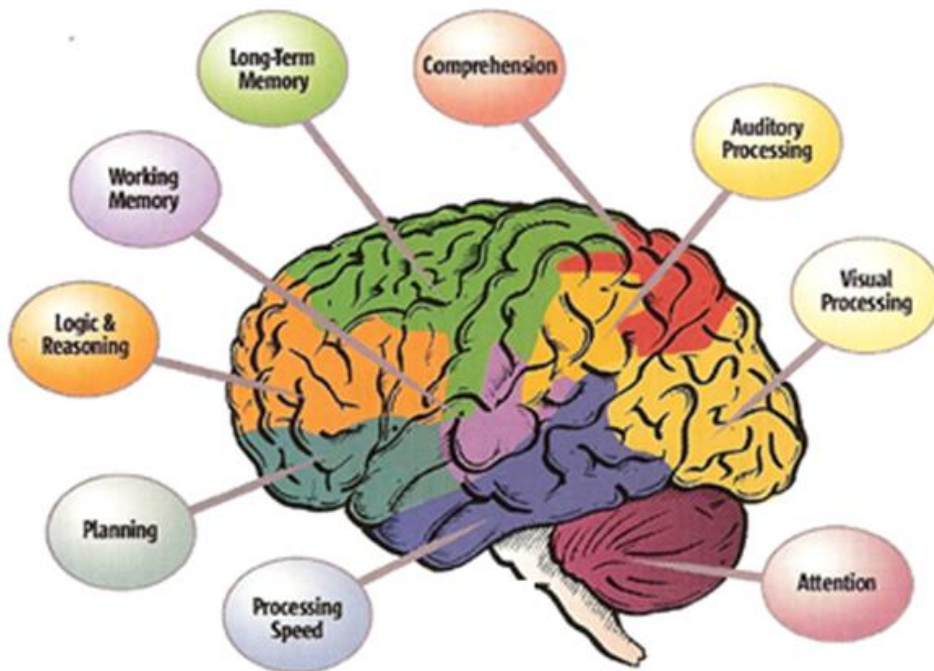
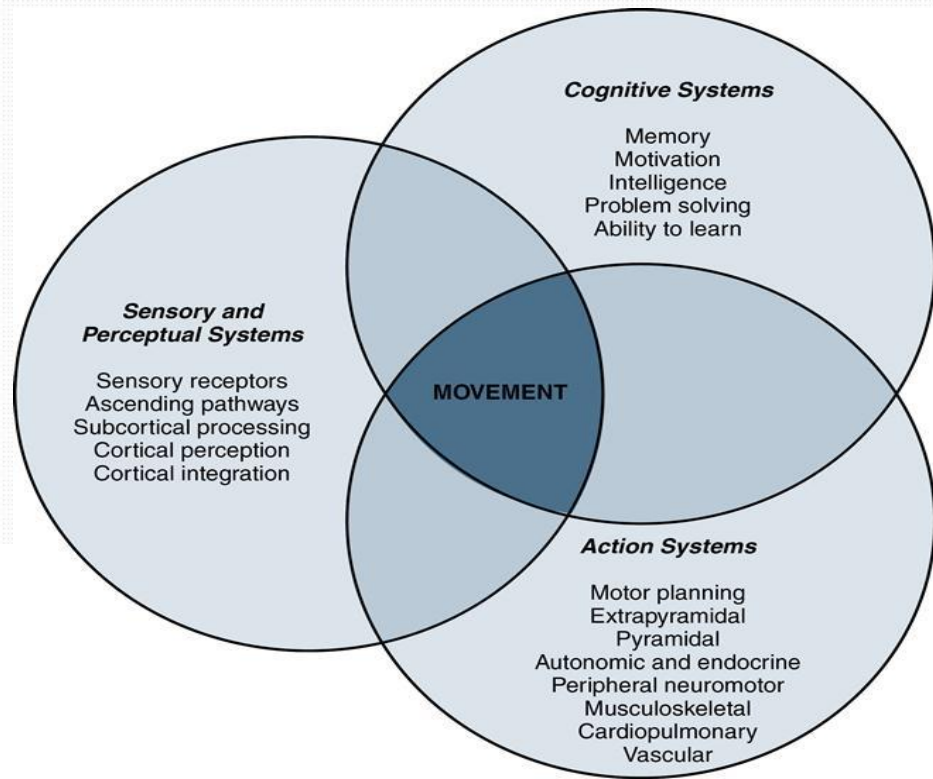


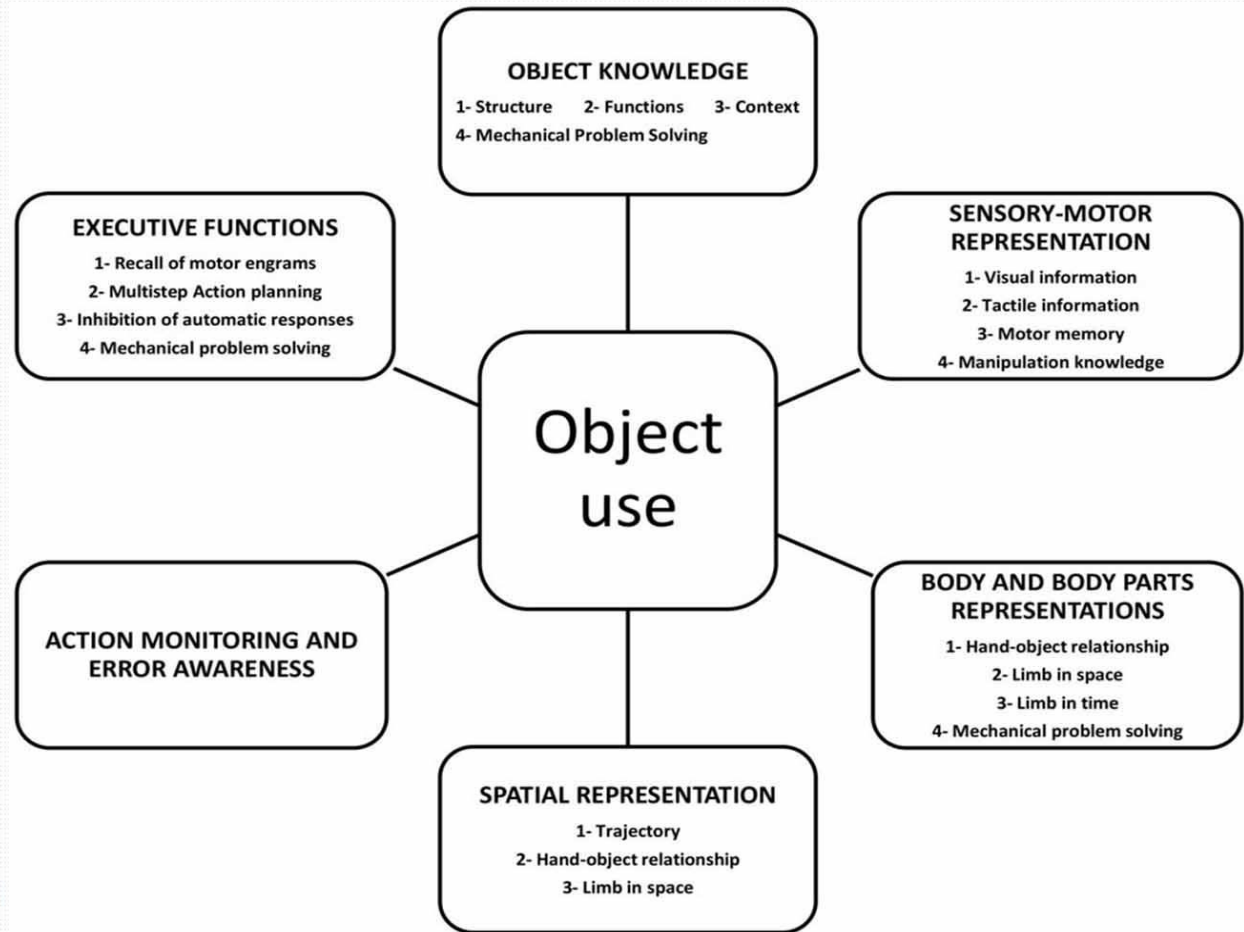
Why does CMI happen?

- Shared processing/mental resources for task
- Same mechanism/resources needed at the same time
- Similarities in the content of information being processed

(Pashler, 1994)







Cognitive-Motor Interference

- Attention/executive factors were determined to be most predictive of the ability to perform dual tasks
- Often will prioritize the cognitive task over motor unless otherwise directed.

(Holtzer et al 2011, 2012; Plummer et al 2013)



Most Studied Dual Task



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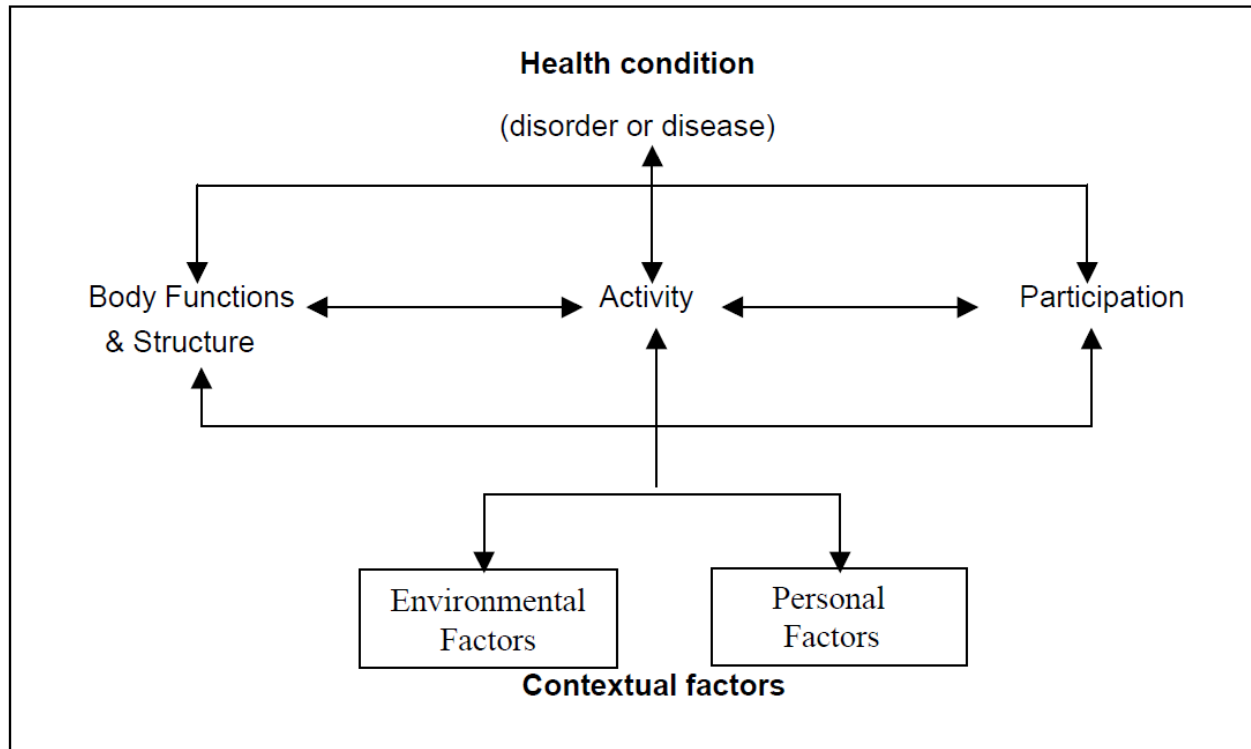
Patterns of Dual Task Performance

		Cognitive performance		
		No change	Improved	Worsened
Motor performance	No change	No dual-task interference	Cognitive facilitation	Cognitive interference (motor-related)
	Improved	Motor facilitation	Mutual facilitation	Motor-priority trade-off
	Worsened	Motor interference (cognitive-related)	Cognitive-priority trade-off	Mutual interference

Plummer et al 2013

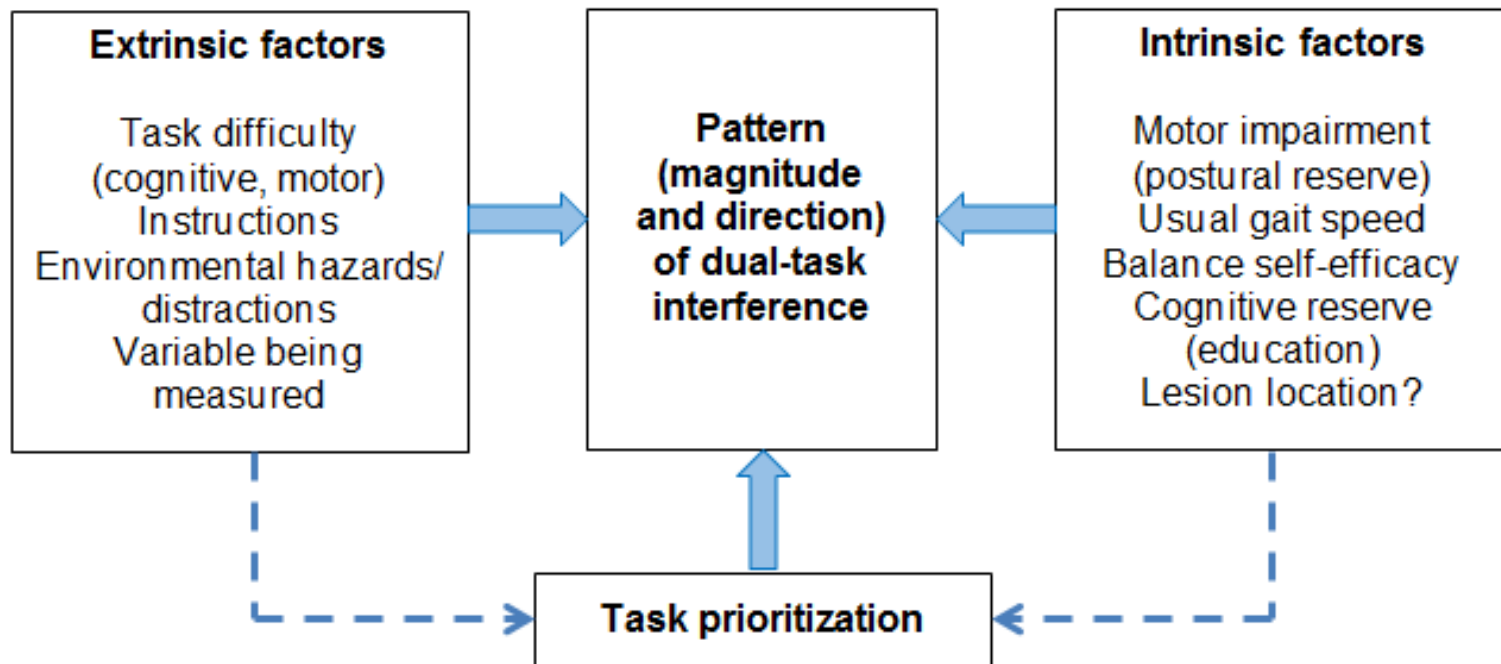


What is a complex intervention?



ICF; WHO, 2001

Factors Influences Attention Allocation



Plummer et al 2013





Recovery of arm function following a stroke is evaluated across a variety of simulated environments in Madonna's Independence Square.



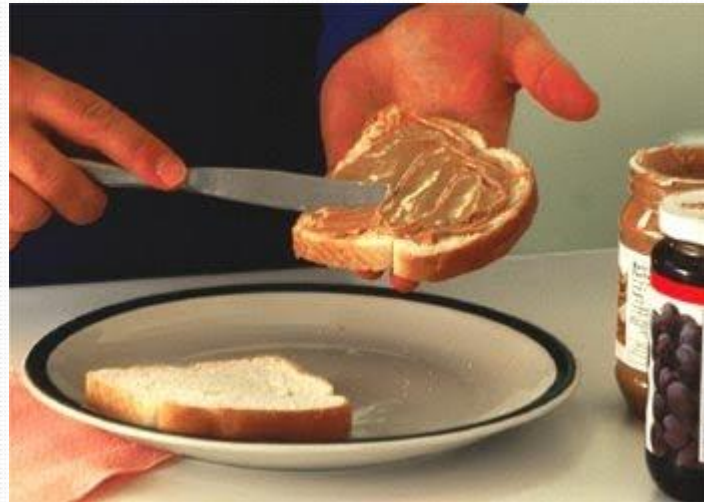
Simple? vs Complex Intervention



Beyond Motor Training

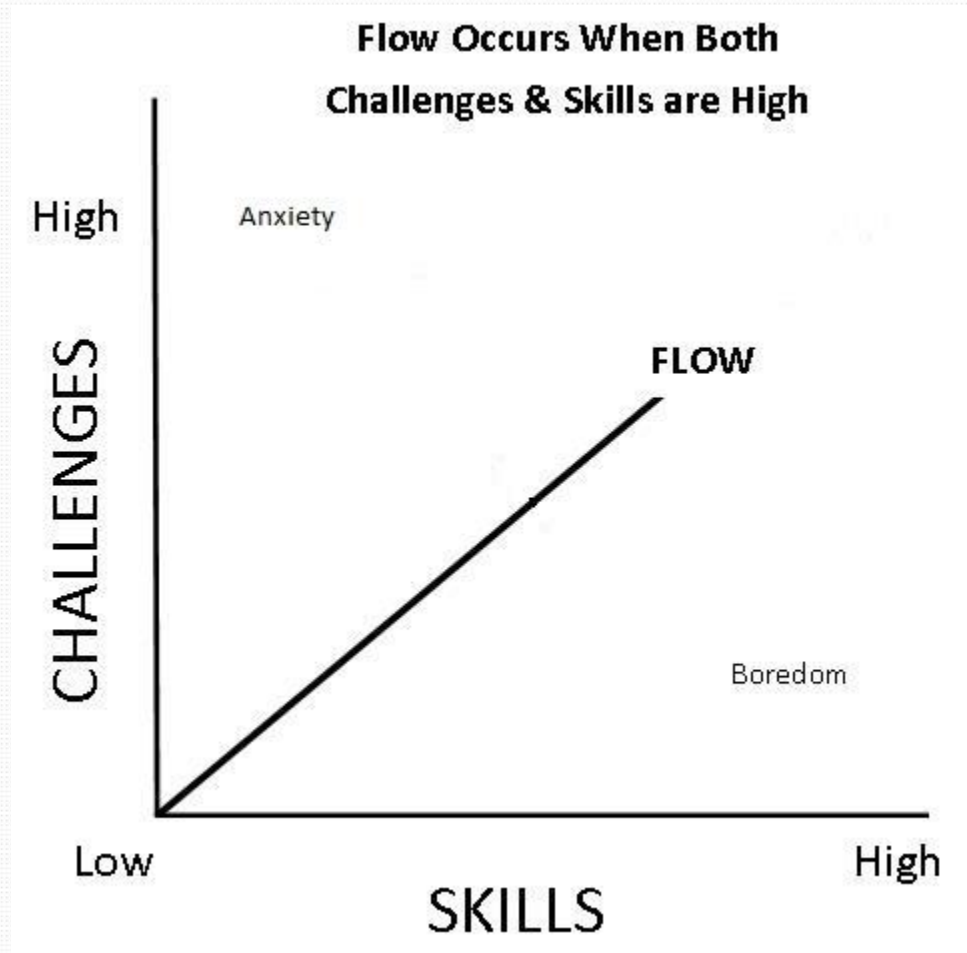
- Performance of ADL's is an interaction between motor and cognitive
- Do not always consider the cognitive demands
- Dual-Task

Make a sandwich



ASSESSMENT

Single Task
Dual Task Components



Cognitive Assessments: Examples

- Tests of Everyday Attention (TEA): selective, sustained, attentional switching
- Stroop Test: attention, executive functioning
- Multiple Errands Task



Tasks		Completed Accurately	Completed Partially	Omitted	Partial Task Failures If task is not completed accurately or it is omitted, indicate which partial task failures are observed and determine cause from debriefing interview.	Observed
4	Buy a birthday card				<ul style="list-style-type: none"> • Bought wrong kind of card • Spent excessive time looking for card (>2min) • Exchanged card while waiting in line 	
Rules		Adhered To Broken			Rule Break Frequency and Reason If a rule is broken, check each time it is broken in the frequency column and determine cause from debriefing interview.	Frequency
1	All tasks carried out in any order				<ul style="list-style-type: none"> • Omitted some tasks • Completed/followed instructions in order 	

red blue orange purple
 orange blue green red
 blue purple green red
 orange blue red green
 purple orange red blue
 green red blue purple
 orange blue red green
 green purple orange red



Effective Interventions

Key Ingredient(s)?

- Executive function (attention too) is involved in appropriately modifying behaviour and adapting movement to changing environmental conditions (Elliott, 2003)
- Thus, derive benefit from therapies that use problem solving approaches



Effective Interventions

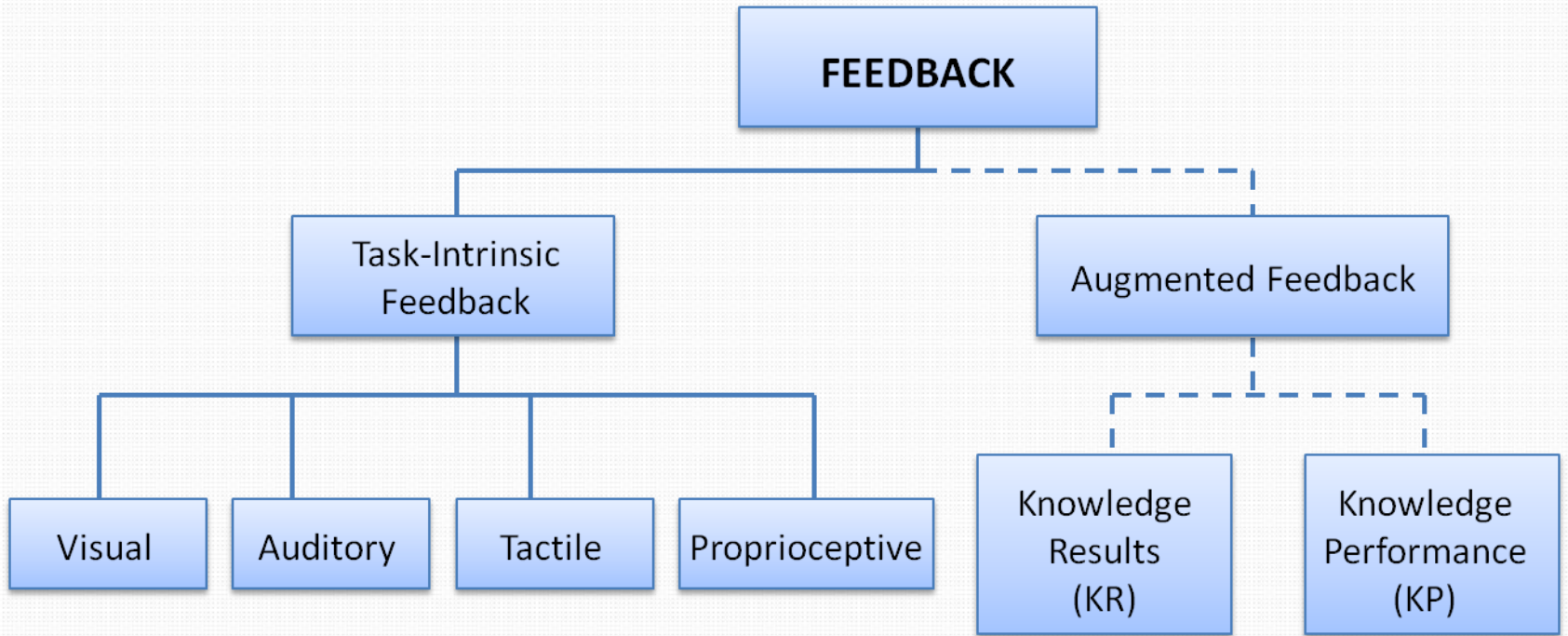
- Motor Imagery
- Task-specific
- Constraint-Induced
- Cognitive Orientation to Occupational Performance (CO-OP)



A Moment for Motor Learning

- Motor learning involves perception, cognition and action processes described as the search for a task solution that emerges from an interaction of the individual with the desired action and the environment (Newell, 1991)





Treatment Ideas

- Compensatory: taught to avoid dressing and talking at the same time;
- Attentional Allocation: instructed to focus on dressing only
- Remediation: given practice sessions in which they attempt to improve their dual-task performance.



General Principles: Intervention

- Select a task that requires problem solving and blending of motor control with motor planning.
- Simple: fill a glass with water, putting toothpaste on a toothbrush, plugging in an electric shaver.
- Complex: multiple steps, such as preparing a meal or getting dressed, social events



Intervention Ideas



Figure 7. Enriched environments can increase functional gains (such as standing tolerance) during daily tasks.

- Expectations precede movement
- Beginning and End
- Environmental Cues
(Jan Davis)

Setting the Stage



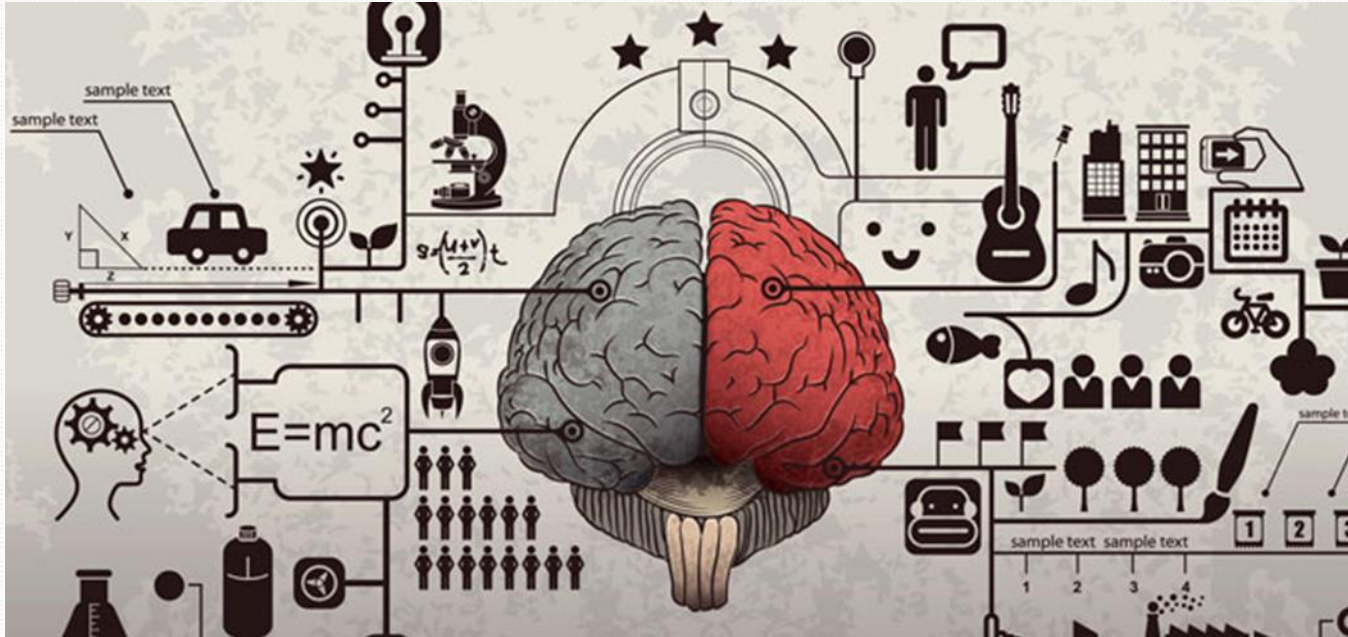
Environment



Source: Susan K. O'Sullivan, Thomas J. Schmitz; Improving Functional Outcomes in Physical Rehabilitation, Second Edition, www.AccessGolection.com Copyright © McGraw-Hill Education. All rights reserved.



THANK YOU



Okay that's it.

You need a time-out.

