

Cognitive Training

What is Cognitive Training?

Any challenge that involves mental, visual, auditory, verbal, kinesthetic, etc. that occupies someone's cognitive attention in some capacity while simultaneously performing a physical task or exercise can be considered cognitive training. In physical therapy we see this implemented as dual tasking, surface variation, adding constraints, games, added elements, added unpredictability, controlled chaos. In the real-world environment, almost all of our ADLs revolve around external stimulus or decision making that require our cognitive attention while we are performing a physical task. Cognitive elements are important to incorporate into our physical task training, when appropriate, to make our treatments more pragmatic.

Mental Capacity and Mental Fatigue

Before implementation of cognitive training, it is important to know the background and mechanisms of the intervention. Each patient is going to have a differing mental capacity that is of the utmost importance to keep in mind during treatment. Just like each of us, we have differing mental capacities for activity/learning that change depending on our sleep, stress, fatigue, diet, etc. When a certain activity exceeds our mental capacity, we result what is called "task shedding" which is the decline in performance of one or more tasks. Just like in strength training, we want to find activities that properly challenge our current capacity without being too simple or too rigorous. Patients can have mental fatigue following prolonged exertion of their mental capacity which, just like muscle fatigue, is not necessarily a negative as long as it is an appropriate level.

What is the utility?

As we age, we rely more heavily on our shallower cognitive resources for completion of motor tasks. We often see task shedding occur when we ask our older adults to dual task due to the task surpassing the cognitive threshold. In fact, research showed more prefrontal cortex activity during dual task walking compared to single task walking providing evidence for needs of additional cognitive resources for more complex gait activities. So the question is, can implementing cognitive training with older adults in physical therapy improve function?







What does the research say?

Research shows that a decrease in falls and an increase in gait speed have been seen using PT in conjunction with cognitive training. Executive function training is shown to improve memory, attention, reaction time, and agility. Cardiorespiratory fitness is shown to improve dual task walking performance.

Gross motor training, or coordination training, has shown large transfer effects by improving executive function and processing speed as well as decreasing prefrontal activity. This suggests that gait impairments are in part due to altered coordination which increases the amount of energy/ cognitive load required to ambulate efficiently. These are just some of the researched benefits of cognitive training in conjunction with PT.

Ideas for interventions!

COGNITIVE TRAINING INTERVENTION IDEAS

 <p>EXECUTIVE FUNCTION</p> <p>To work on standing balance with reaching, therapist can hold a different colored object in each hand and randomly alternate holding each object in front of the patient for reaching balance. Designate which hand will reach for which object (ex: right hand reaches for the yellow ball and left reaches for the green). Patient must think about which hand reaches for each object while maintaining balance.</p>	 <p>DECISION MAKING</p> <p>Have patient perform lunges or squats and give them a simple math equation. When the answer is an odd number, patient should lunge to the left/ take a step to the left and squat. When the answer is even, patient should lunge to the right/ take a step to the right and squat. This intervention can be altered to any sort of dynamic, functional strengthening task in order to include decision making.</p>	 <p>MEMORY</p> <p>Verbally give patient a list of 4 words and tell them to remember the list of words (ex: boat, window, yellow, soap). Have them perform any of their usual PT interventions. Following the intervention, ask them to recite back to you the 4 words you gave them before the intervention. You can add/reduce number of words or add/reduce intensity or length of intervention to change challenge level.</p>
 <p>DUAL TASKING</p> <p>With lower level patients, you can work on ambulation or any other intervention while simply carrying on a conversation. This would be a good place to start for those patients who often stop walking/ performing their task when they begin to converse. This can be increased in intensity by giving them math problems or asking them to count backwards from 100 by 7s while performing their physical interventions.</p>	 <p>INTERFERENCE</p> <p>Interference is any sort of noise, light, commotion, etc that is going on around you during a task. We experience interference as we shop in a busy store or walk up the stairs while talking to a friend. It may be better to begin certain interventions with less interference to allow for better learning before introducing more interference to further challenge the task. It is important to prepare for interference in our environment.</p>	 <p>HEP</p> <p>To continue to work on cognition outside of PT sessions, encourage patients to do word searches, sudoku, crossword puzzles, card games, puzzles, and more. Having an engaging yet challenging cognitive challenge to work on outside of PT is beneficial to compliment these interventions. Having a social group with similar interests to engage in social activities is also important for cognitive function.</p>

**This is not an extensive list and should be altered to fit the individual needs of each patient

References:

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