



## Rarely a Good Idea to Do Two Things at Once

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### Commentary

It is not uncommon to find literature in rehabilitation journals advocating for clinicians to design dual-task or divided attention tasks in order to improve a patient's walking and balance performance and/or reduce their risk for falls. It is difficult to understand just where this framework originated. Perhaps it is due to the unscientific claim of some clients being distracted when they fall. However, there is little evidence to support this claim [1]. Instead, maybe the concept comes from the breadth of literature showing there is a degradation of balance with concurrent cognitive tasks [2,3]. But as we will discuss, this should come as no surprise, and in fact should be expected. Anyone who thinks about the first time they sat behind the wheel of a car, has tripped or run into another individual while using their phone when walking, or burned their dinner while attempting to cook, clean, and do laundry at the same time should attest: It is not wise to do multiple tasks at once.

My hope is to present a thought process that inspires clinicians to think intently of what we are really doing and what we should expect as an outcome when we ask individuals to complete multiple tasks at the same time. This article is not to imply there is no place for divided attention tasks, nor do I intend to describe a new treatment strategy to use in its place. In fact such tasks do have their place. I will continue to prescribe exercises to individuals, young and old with a variety of health conditions, that increase demands on cognitive processes (such as sustained attention, spatial processing, or planning sequenced movements) in combination with a walking or balance task. Instead, the aim here is to address what I believe to be an exaggeration or a misallocation of what these tasks are actually doing, to keep individuals on their feet and avoid a fall to the ground when they are outside of the clinic. Perhaps clinicians, myself included, have inflated how these tasks may contribute to learning and translate into everyday life to reduce risk of future falls. Let us take some steps back, and break down our collective cognitive errors to understand this topic with more clarity. I would like to make the distinction here, that when I refer to dual-task activities, I am referring specifically to cognitive-based tasks that are combined with motor tasks as a strategy to improve balance performance or reduce a patient's risk for falls. These are categorically different from other dual-task paradigms such as turning the head while standing/walking, or stepping over objects.

### Interventions to Improve Learning

First, let's apply the principle of performing multiple tasks at the same time to another area of life, and think about this concept in a different circumstance.

Suppose you are a six-grade teacher and you would like to improve students' reading performance in your class. You decide that your goal is to develop a program that will improve reading speed and comprehension. (Note: Hope the reader can draw the relationship of

the goal described here to improving motor performance and cognitive processing simultaneously as a clinician would in an attempt to influence fall risk for patients in the clinic with a dual-task intervention). I do not believe any educator would design an intervention where students would be forced into an environment that would divide their attention. If students were encouraged to read as fast as they could in a busy environment, either noisy or otherwise distracting environment, as an intervention, parents would not consider you to be a good teacher. It does not make sense with our current understanding of learning to advocate for students to expose themselves to this kind of environment. Doubt anyone would expect improvement in either a student's reading comprehension or speed using this proposed intervention. In fact, students are encouraged to do the opposite. We encourage students to find a quiet area void of distraction in order to improve each of these areas of performance alone. To gain expertise, an individual must concentrate their attention completely on an individual task and practice it over and over [4-6]. As the research psychiatrist Jeffrey Schwartz states in his book *The Mind, The Brain*, "attention must be paid," not divided [6].

Some may look at the previous example and point out that there is no motor component to the reading task. However, the same principle applies for practicing a musical instrument or learning to drive. The addition of another task always degrades the performance of each task if they were to be performed in isolation. No matter the task, no matter your gender, period [7].

There are numerous publications that have concluded quite clearly there is a degradation of balance performance when a simultaneous task is introduced [2,3,8]. These findings should not come as a surprise. Again, there is no combination of tasks any individual could expect to do at the same time as well as they would if they were to perform each task individually. However, this collection of research seem to be the publications clinicians have used in rehabilitation to justify the prescription of dual-task activities in the clinic. Instead, we should look at the results of these studies as a sign of walking and balance impairment, and that perhaps the degree of impaired balance performance with a dual-task may be predictive of an increased risk for falls [9], but it is not the cause of falls. This seems to be the second cognitive error that leads to the overinflated confidence a clinician may have, that performing dual-tasks will decrease an individual's risk for falls or improve their walking/balance performance.

### Correlation does not Imply Causation

The utility of divided attention as an intervention to reduce fall risk or to improve balance performance seems to be misallocated. Just because we find there is a relationship between adding a task to walking/balance tasks and poorer walking/balance performance, does not mean there is a causal relationship between the two.

To illustrate how this is poor reasoning, consider the breadth of research which has described characteristics or physical attributes that are related to a history of falls, or may be predictive of an individual who may fall in the future. Among other physical, social, or psychological characteristics, decreased grip strength is found to be associated with more falls [10]. I believe this specific association is a perfect example of many clinician's errors, as I doubt anyone would take the relationship between grip strength and risk for falls to be causal. In this light, it is quite obvious to see that designing interventions to increase grip strength because there is an association between the two is poor reasoning. I think we could all agree that no matter how many repetitions of squeezing a stress ball or handgrip I may prescribe a patient, it will never change their ability to remain on their feet when they lose their balance. It may seem controversial to say, but I believe blindly focusing interventions to improve balance and walking around dual-tasks or divided attention, truly reduces the risk for falls as effectively as working on improving grip strength would.

There is no need to discuss on this point. In fact the correlation error, illusion of cause, and misallocation of cause to explain observations is so pervasive in society that it is typically reserved for the introductory topic of most statistics and methods courses, and has been written about extensively to explain errors in cognition in everyday life [7,11]. Still, we must be conscious of these errors, because they are strong drivers of poor decision making and wrong turns in determining effective interventions.

## Rational Application

Again, the objective of this commentary is to generate a thought process, or dialogue among clinicians, to challenge the current practice pattern or intervention strategies chosen by clinicians regarding the use of dual-task or divided attention tasks. I must repeat there is a place for the use of dual-tasks and divided attention to influence balance and walking performance; however, we must think critically about when it is most appropriate to do so.

More than half of all falls do occur in the home [1]. It is typically frail elderly persons who tend to fall and injure themselves in the home during the course of routine activities [12]. In the vigorous older individuals who are more likely to participate in dynamic activities outside of the home and may fall as they may be challenged by environmental hazards [13]. However, there is no data available to substantiate the claim that individuals lose their balance because they are distracted. Although the Center for Disease Control and Prevention collects information about the social and individual costs associated with falls, they do not have data available about the activities people are performing when they do fall.

Even if the relationship between divided attention and falls were causal, there is little evidence that dual-task interventions positively affect walking or balance performance when individuals are engaged in another task simultaneously [14-17]. The literature is clear on the fact that an individual's performance on walking and balance tasks will be similarly compromised under a dual-task paradigm whether they have trained with divided attention tasks or not. Although there is evidence that these interventions can improve reaction and response time in motor tasks, the improvement can occur just as well with training under single-task paradigms as it does with dual-task treatments [14].

Another aspect of dual-task interventions to consider is the method in which the additional task is presented. It is commonplace for clinicians to ask individuals to complete sentences, perform

calculations, recite words of a category in alphabetical order, or recall their previous meals as they walk or perform a balance task. Most dual-task activities are presented to patients in this way most likely because these are the types of dual-tasks that have provided evidence of poorer performance in balance tasks in the laboratory and have been published or shared as part of training and education programs [3]. Clinicians should think critically about how functional this type of dual task is, and what type of alternative method may better translate into life outside of the clinic. It is difficult to imagine many instances where individuals run calculations or perform sentence completions in their head as they go through their daily activities. I suspect any effect that could come from this type of dual-task activity would likely not translate into a natural environment.

So what are clinicians to do? Perhaps it is best to prioritize divided attention tasks to those times that it is most appropriate. There is a point where error in balance performance due to an additive cognitive task becomes pathologic [18-20] and an individual is truly performing outside of an established norm. I would argue that these are the instances in which clinicians may introduce divided attention tasks. Of course, the patient's performance should show evidence they have moved into the autonomous stage of motor learning for each desired task in isolation prior to presenting the dual task activity. Still, one must also acknowledge the lack of empirical evidence to support the use of dual-task activities to reduce fall risk or improve an individual's balance performance if they were to become distracted in their natural environment.

I would like to close by emphasizing that dual-task activities should not be used by clinicians simply because they observe greater error in a patient's balance or walking performance when an additional cognitive activity has been introduced. This observation alone is not reason enough to train individuals in a dual-task paradigm. Again, the poorer performance should be expected. I would encourage every clinician to reflect on these issues the next time they are tempted to use a divided attention or dual-task activity in the clinic. Clinicians must decide whether we are observing a natural degradation in performance (just like that fish you burned because you were tending to the laundry in the basement), or whether the additional task is truly impairing a patient's balance, leading them to completely lose those faculties which help them maintain postural control simply because a simultaneous task has left them with little attention reserve to remain on their feet. I hope this provides a starting point a framework to help determine when and with whom to introduce such activities.

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