

Researchers create virtual reality cognitive assessment

February 6 2021



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Virtual reality isn't just for gaming. Researchers can use virtual reality, or VR, to assess participants' attention, memory and problem-solving abilities in real world settings. By using VR technology to examine how

folks complete daily tasks, like making a grocery list, researchers can better help clinical populations that struggle with executive functioning to manage their everyday lives.

Lead author Zhengsi Chang is a Ph.D. student that works in the lab of Daniel Krawczyk, Ph.D., deputy director of the Center for BrainHealth. Along with Brandon Pires, a researcher at Texas Tech University Health Sciences Center, the team investigated whether VR can be used to effectively test a participant's [executive](#) functional load, or how much information a person can process to achieve a goal. Their findings were recently published in *Computers in Human Behavior Reports*.

The researchers adapted the Virtual Reality Functional Capacity Assessment Tool's (VRFCAT) "kitchen test", where participants plan a trip to the [grocery store](#) by comparing ingredients in kitchen cabinets to a list of recipes. Making a grocery list is an everyday task and should therefore accurately capture participants' daily working memory and performance. "Function-led tasks using VR technology allow us to maintain a balance between ecological validity and experimental control," said Chang.

In the virtual kitchen, 42 healthy adult college students memorized a slew of ingredients from a recipe list. The participants then navigated the kitchen to check for ingredients and tried to remember which ingredients they found. They returned to their recipe list, crossing off all the ingredients they didn't need at the store. Once they finished checking their grocery list, participants picked up their wallet and left the virtual kitchen.

To test their executive functional load, the researchers increased the number of ingredients and recipes to be memorized. Participants took longer to complete their grocery lists when they had to memorize more ingredients. This aligns with the researchers' prediction that participants'

task performance would decrease as functional load increases, which suggests that this VR assessment can effectively test executive functional load.

Computers in Human Behavior Reports Volume 2, August-December 2020, 100035 Researchers were surprised to find that participants' working memories were not related to how well they performed the task. "People might spend the same amount of time on the task, and make the same number of errors, but they could have totally different working memory capacities," said Chang.

Upon further analysis, the researchers realized that participants were actually switching up their strategies as executive functional load increased. Some participants tried to memorize as many ingredients as possible before looking at the recipe while others frequently switched between rummaging through the kitchen cabinets and examining the recipe list.

This strategy-switching explains why the researchers did not see a relationship between performance and participants' working memory. "This study indicates that our strategies have a dramatic effect on our capacity. If you enter into a task prepared with a plan, you will get the most out of your brain and see much better performance," said Krawczyk. Participants' performance reflects their executive function and supports the idea that the researchers' VR assessment can effectively test participants' executive function load.

The researchers hope to use their VR assessment to help people that suffer from executive function impairments. "We used VR technology to create an executive function assessment that can be used in neuropsychology to understand how veterans and other clinical populations manage their everyday lives," said Chang.

More information: Zhengsi Chang et al, Functional performance in a virtual reality task with differential executive functional loads, *Computers in Human Behavior Reports* (2020). [DOI: 10.1016/j.chbr.2020.100035](https://doi.org/10.1016/j.chbr.2020.100035)

Provided by Center for BrainHealth

Citation: Researchers create virtual reality cognitive assessment (2021, February 6) retrieved 28 April 2024 from <https://techxplore.com/news/2021-02-virtual-reality-cognitive.html>

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