

The Problem State: A Cognitive Bottleneck in Multitasking



By: Ganesh Pitchiah

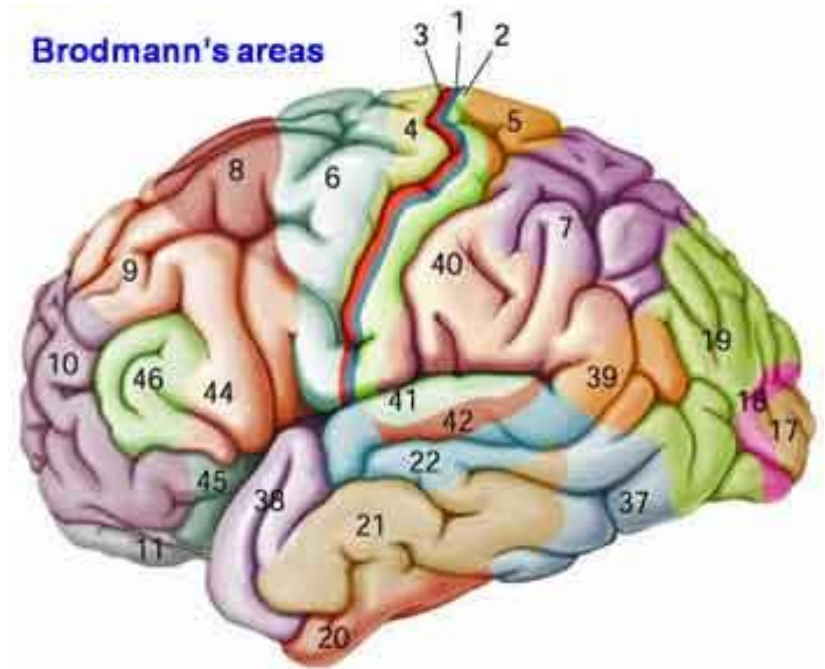
2010: Borst, J. P., Taatgen, N. A., & van Rijn, H.

Multitasking - Review

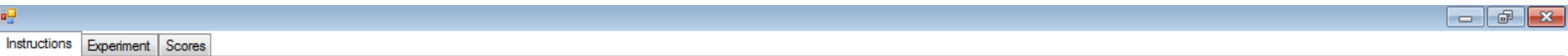
- Context Switching
- Broadman's Area 10
- Cognitive Load : the use of 7-digit phone numbers. Ex:2341957

The Problem State

- Blood oxygen level dependent activity in the **posterior parietal cortex** that correlates with transformation on mental representations.



Instructions



Username :

INSRUCTIONS

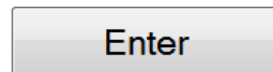
1. Enter your email-id as username.
2. Every trial has two tasks:
 - (a) subtraction task and
 - (b) text entry task.
3. At the beginning of each trial, you can choose the task you want to go with first.
4. After the trial begins, only one of the two tasks is active at any given moment.
5. Visual feedback has been removed forcefully, so you have to remember:
 - (a) the "carry" in subtraction and
 - (b) "next letter of a word" if the entire word is shown at the start.
6. The first 6 trials are "single tasking" while the latter 28 are "multitasking".

User Inputs

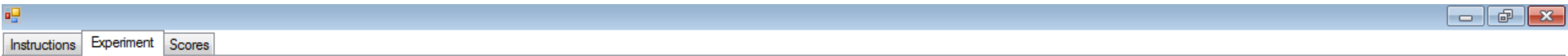
Subtraction Task :



Text Entry Task :



Experiment



Trial : 1/34

Points : 190

$$\begin{array}{r} 6489998837 \\ - 3331017316 \\ \hline \end{array}$$

DEXTRORSAL

A	B	C	D	E	F	G
H	I	J	K	L	M	N
O	P	Q	R	S	T	U
V	W	X	Y	Z		

Text Entry

The screenshot shows a software window titled "Text Entry" with a blue header bar. Inside the window, there are three tabs: "Instructions", "Experiment", and "Scores". The "Experiment" tab is active. The main area of the window displays "Trial : 1/34" and "Points : 4". On the right side, there is a virtual keyboard with a text input field above it. The input field is empty. The keyboard has a "Delete" button at the top right, and letters A through Z arranged in a grid. The letter 'I' is highlighted with a blue border. At the bottom center of the window, there is a "SUBMIT" button.

Instructions Experiment Scores

Trial : 1/34

Points : 4

Delete

A B C D E F G
H I J K L M N
O P Q R S T U
V W X Y Z

SUBMIT

Subtraction Task

Trial : 1/34

Points : 174

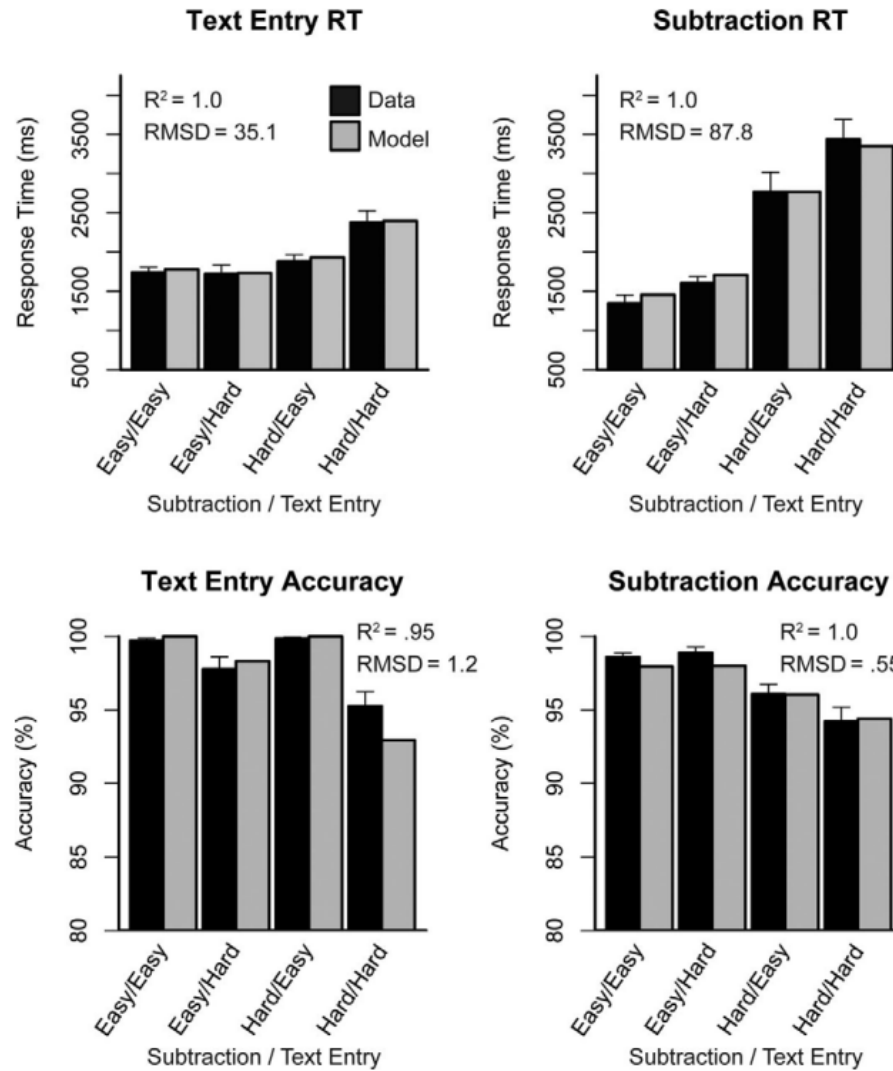
$$\begin{array}{r} 596884 \\ - 270754 \\ \hline 4129 \end{array}$$

SUBMIT

Threaded Cognition & ACT-R

- Threaded cognition is an integrated theory of concurrent multitasking - that is, doing two or more things at once.
- ACT-R is a cognitive architecture in which a human task can be modeled by breaking into discrete operations.

Results



References

- Borst, Jelmer P., Niels A. Taatgen, and Hedderik van Rijn. "The problem state: A cognitive bottleneck in multitasking." *Journal of experimental psychology. Learning, memory, and cognition* 36.2 (2010): 363.
- Borst, J. P., and N. A. Taatgen. "The costs of multitasking in threaded cognition." Proceedings of the Eighth International Conference on Cognitive Modeling. 2007.
- Anderson, John R. "ACT: A Simple Theory of Complex Cognition John R. Anderson." *Cognitive modeling* 49 (2002).

Thank You