Effect of Online Math Training.

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Introduction

- According to OCED (2016) we see a continuous decreases in student math scores
- There is debate in the literature about the effectiveness of math fact training:
  - Some view the approach as tedious as demonstrated in the terminology "drill and kill" as it is believed to provide students no additional benefit than recalling math facts quickly (Jiban & Deno, 2007)
  - Others argue that math fact training allows the individual to utilize less cognitive resources when solving a problem and therefore can focus on other aspects of the problem (Delazer et al., 2005)
- Tronsky (2005) found that three one-hour, in-lab sessions on complex math fact training improved recall on a dual task.
- This study seeks to improve the external validity of the test by using 2 to 12 timetables completed online at the discretion of the individual.
- We also tested for alternative benefits to the training

This study explores whether online math fact training:

1. Reduces math anxiety (Maloney, Ansar & Fugelsang, 2011)
2. Improves students' understanding of magnitude (Siegler, Thompson & Schneider, 2011)
3. Reduce the demand on their working memory load (Baddley, 1986; Davies, 2015; Pascual-Leone, 2000)
4. Improve general math skills (Wong & Evans, 2007; Rasmussen & Bisanz, 2005)

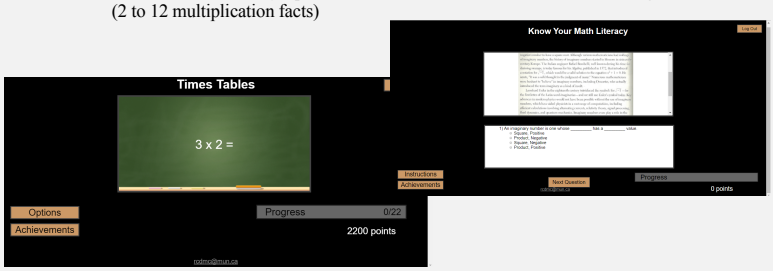
Methods

Participants

- 50 university students (16 males and 34 females, M_{Age} = 21.380 yrs, SD = 4.080)
  - → Ctrl (n = 27, 9 males and 18 females, M_{Age} = 21.964 yrs, SD = 5.073)
  - → Exp (n = 23, 7 males and 16 females, M_{Age} = 20.636 yrs, SD = 2.172)

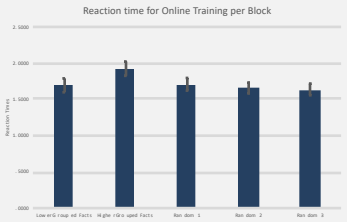
Procedure

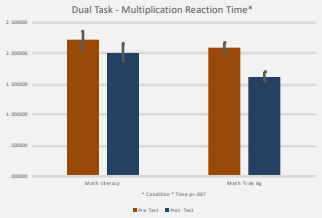
- **Pre-test and post-test**
  - State and Trait Anxiety
  - MARS-S
  - 20 Bounded Number lines
  - 20 Unbounded Number lines
  - Dual Working Memory Task
    - 3 blocks, 2 with 20 questions, 1 with 40 questions
    - Tasks involved recalling math facts and/or 6 consonant string
  - 20 minute General Math Measure (basic math facts)
- **Training Sessions**
  - 30 online math literacy (questions about math stories) or math fact training sessions (2 to 12 multiplication facts)



Results

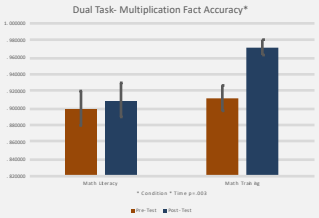
Training Effectiveness

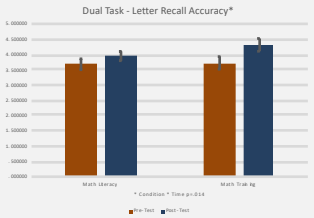




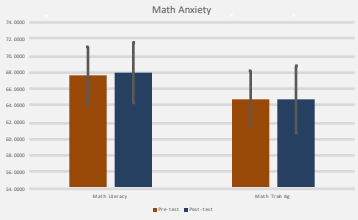
* The mean difference between reaction time for this block and the higher grouped facts is significant at a p<.05

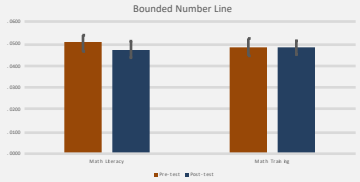
Dual Task Improvement

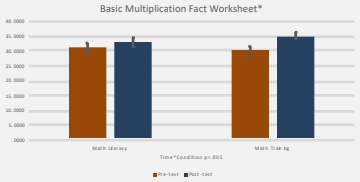


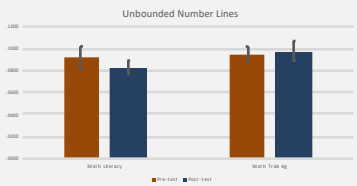


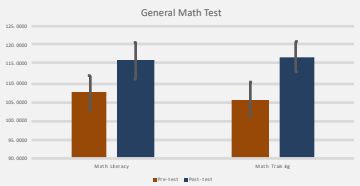
Transfer











Conclusions

- Online multiplication questions benefited students ability to recall math facts
- Math fact training resulted in a decrease in working memory load as illustrated in the dual task results (reaction time, letter recall, fact accuracy)
- During training, individuals were able to recall answers faster, reaching a state of automaticity
- All math learning does not correspond to understanding of magnitude as there was no significant finding with both bounded and unbounded number lines
- There was transfer to general multiplication tasks, but future study needs to test for transfer to more advanced tasks (e.g., word problems)
- Poor performance in basic math skills for university students was present, due to a lack of a ceiling effect, despite basic multiplication facts involved