# Analysis writeup

## Magnitude Comparison Task

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## Physical Size Comparison Task

## Multiplication Stroop Task

**Interaction between Size and Interference:**

* The significant contrast between large-sized low vs. high interference suggests that interference markedly increases RTs for larger problems. This is an expected finding given the sensitivity-to-interference hypothesis, which posits that higher interference exacerbates retrieval difficulties, especially with complex (large-sized) problems.
* The contrast between large-sized high interference and small-sized high interference shows a significant increase in RT for large problems under high interference, further underscoring the interaction effect: larger problems are particularly sensitive to interference, while small problems exhibit less sensitivity to interference changes.

**Conclusion**

Your data indicate that both size and interference independently contribute to increased RTs, with a marked interaction where larger problems under high interference experience the longest RTs. This suggests that when retrieval difficulty (large-sized) and cognitive load (high interference) combine, they slow down multiplication retrieval significantly, supporting a model where interference sensitivity affects response speed in multiplication, especially for more complex problems.

**Interaction between Size and Fluency:**

* The contrasts indicate a consistently significant difference between large and small sizes within each fluency level, showing that larger problems are significantly slower, even when fluency is high. The z.ratio values remain similar (around 7.3 to 7.6), highlighting a robust size effect not diminished by variations in fluency.

This interaction suggests that while fluency is associated with faster responses,

**Conclusion**

it does not eliminate the problem size effect; large-sized problems consistently lead to higher RTs than small-sized problems, regardless of fluency. Therefore, participants with high fluency still experience a delay with larger problems, though their overall RT is faster than lower-fluency participants. This supports the notion that problem size imposes a consistent processing load that fluency can attenuate but not eliminate.

**Interaction between Interaction and Fluency:**

The contrast between low and high interference is statistically significant at each fluency level, with estimates around -0.056 to -0.062 (all with p < .0001). This consistent difference underscores the substantial impact of interference, which fluency alone does not mitigate. The z.ratio values (around -5.2 to -4.7) confirm a stable interference effect that persists regardless of fluency level.

**Conclusion**

The interaction indicates that while higher fluency generally shortens RTs, it does not offset the effect of interference; high interference consistently leads to slower RTs compared to low interference across fluency levels. This suggests that interference introduces a persistent cognitive load that impacts response speed, even for participants with high fluency. Therefore, while fluency improves response times, the sensitivity to interference remains constant, supporting a model where interference exerts an independent slowing effect on RTs in multiplication tasks.

**Interactions between size, interference and fluency**

Large-sized vs. Small-sized in Low Interference: Significant across fluency levels, with contrasts between 0.0597 and 0.0632 (p < .01 for each). This indicates that larger problems are consistently slower than smaller ones, even when interference is low.

Low vs. High Interference in Large-sized Problems: Large-sized low interference consistently has shorter RTs than large-sized high interference, with negative contrast estimates around -0.084 to -0.092 (p < .0001), highlighting a significant interference effect for large problems.

Small-sized, Low Interference vs. Large-sized, High Interference: The most substantial contrast across fluency levels (between -0.1445 and -0.1553, p < .0001) confirms that small problems with low interference are significantly faster to solve than large problems with high interference, underscoring the combined impact of both size and interference.

1. **Size Difference in High Interference (Large-sized vs. Small-sized):**
   * This contrast (around 0.117 to 0.122 across fluency levels, p < .0001) consistently shows that large-sized problems under high interference take significantly longer than small-sized problems under high interference, indicating that interference amplifies the response time difference between problem sizes.

**Summary of Interaction:**

Overall, these results reveal that higher fluency generally improves RTs but does not mitigate the robust effects of problem size and interference. Large problem size and high interference jointly lead to the longest RTs, a trend that persists across all fluency levels, underscoring that interference sensitivity and problem size effects are stable influences on RTs in multiplication tasks. This interaction pattern suggests that even highly fluent participants are affected by the inherent cognitive demands imposed by large-sized, high-interference conditions.