Speed-accuracy trade-offs in humans: Fitts' law and Schmidt's law

TEXAS TECH UNIVERSITY Honors College

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Introduction

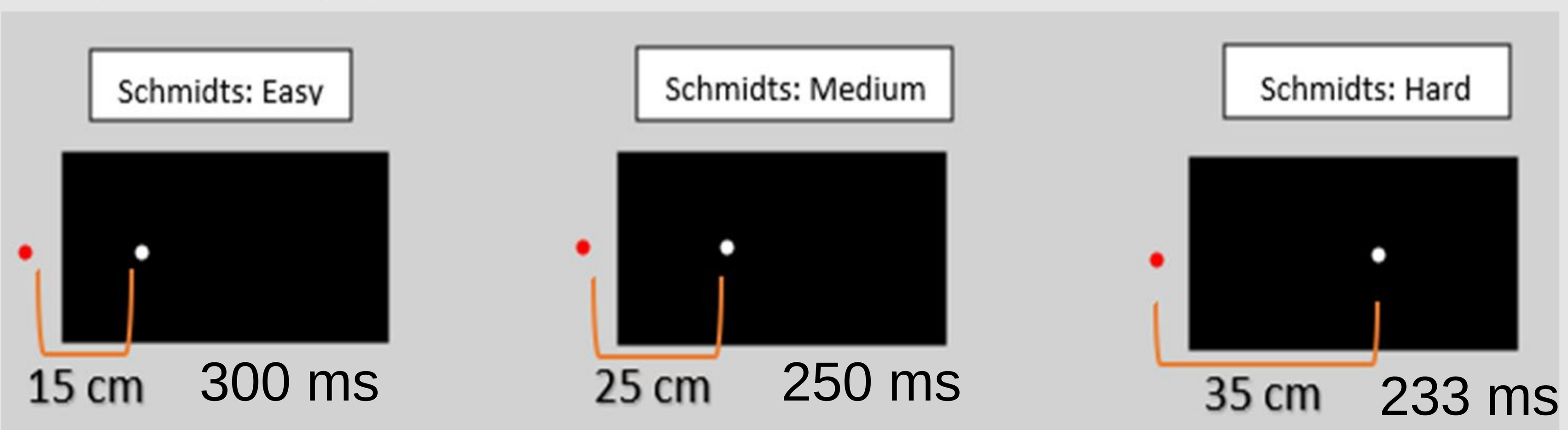
All our movements are constrained by speed-accuracy trade-offs. If we decide to move faster, then we will be less accurate. If we decide to move more accurately, then we will move slower. There are two laws that describe speed-accuracy trade-offs in slightly different tasks: Fitts' law and Schmidt's law. ***The goal of this project was to determine whether Fitts' and Schmidt's laws are two different laws or one and the same law.***

Hypothesis

We tested three pilot participants on Fitts' task and Schmidt's task that were designed to be as similar as possible. If Fitts' law and Schmidt's law are one and the same law, then movement time should be comparable in both tasks. If the movement times are different, then this suggests they are two different laws.

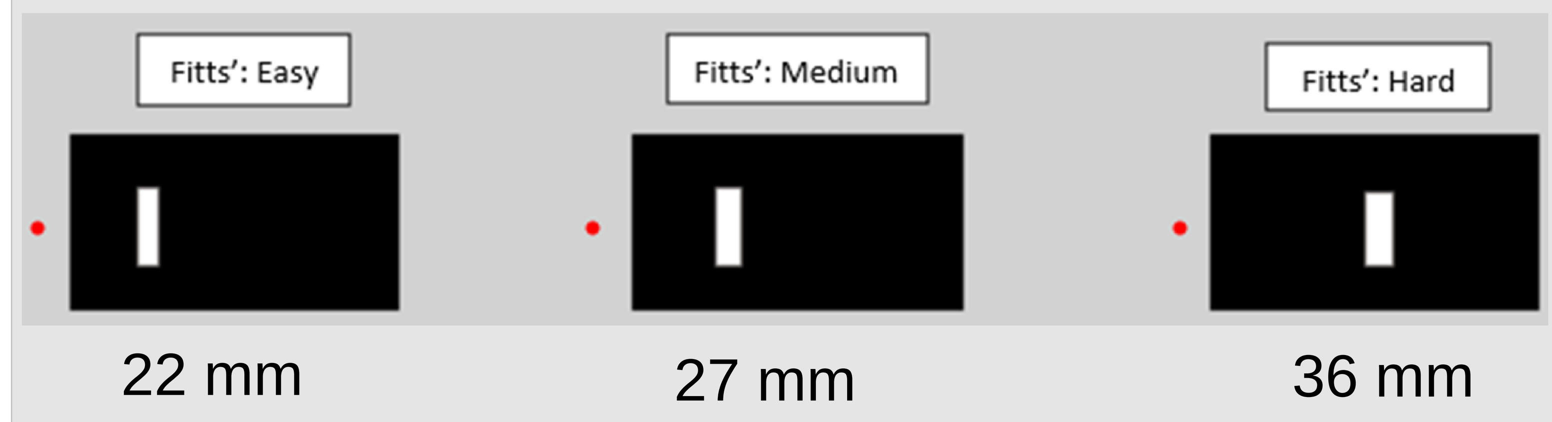
Materials & Methods

Both tasks were tested in three conditions where the movements were easy, medium, or hard. The participant began each trial by holding down a home button. In ***Schmidt's task***, the target was a tiny dot. Participants were instructed to move to the target with a goal movement time and to be as accurate as possible. The ***distance*** of the target and the ***goal movement time*** in the three conditions are shown below.

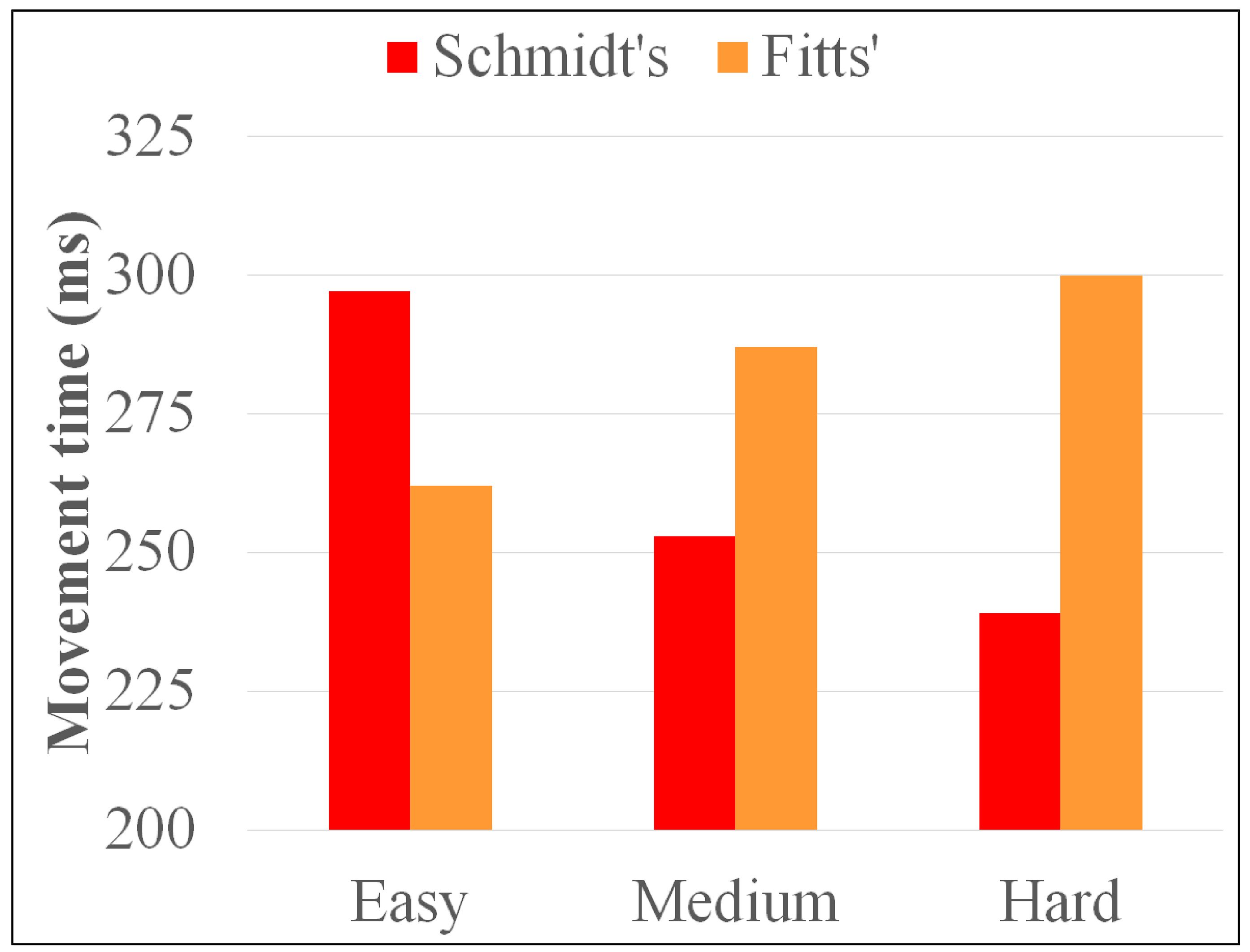


Methods (cont.)

In ***Fitts' task***, the participant was instructed to move to the target as quickly and as accurately as possible. The same ***distances*** as Schmidt's tasks were used, and the ***target width*** in the three conditions are shown below.



Results



Movement time in Schmidt's task was, as expected, close to the goal movement time of 300, 250, and 233 ms in the easy, medium, and hard conditions. Movement time in Fitts' task was not comparable. In fact, it increased from easy to hard.

Conclusion

Fitts' task and Schmidt's task were made as comparable as possible, and yet, they had very different movement times. ***These results suggest that that Fitts' and Schmidts' laws are two different laws of speed-accuracy trade-offs.***

Impact

The overall goal of our research is to increase our understanding of the fundamental mechanism of human movement. A better understanding of human movement could help with the wide range of movement disorders; for example, Parkinson's disease, recovery from stroke, developmental coordination disorder (DCD), and autism spectrum disorder.

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