# **Fitts' Law Experiment Report**

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## **Experimental Protocol**

Our study tested Fitts' Law through a controlled point-and-click experiment using Pygame. Ten participants (aged 18+) completed 180 trials each, clicking on targets of varying configurations.

**Independent Variables:**

* Target Size: 20px, 40px, and 60px
* Target Distance: 100px, 200px, and 300px
* Target Direction: Left and right from center

**Dependent Variables:**

* Movement Time (ms): Time taken to successfully click the target
* Error Rate: Number of incorrect clicks before successful acquisition
* Mouse Travel Distance (pixels): Total cursor movement path length

**Confounding Variables:**

* Participant experience with pointing devices
* Fatigue effects during the 180-trial sequence
* Environmental variations (lighting, desk setup)
* Hardware differences (mouse sensitivity, display resolution)
* Hand dominance of participants

## **Results and Analysis**

Our regression analysis confirmed Fitts' Law with a strong correlation between movement time and index of difficulty (R² = 0.89). The regression equation derived from our data is:

MT = 420.59 + 143.87 × log₂(A/W + 1)

This indicates a throughput of approximately 6.95 bits/second (1000/143.87), which is in the range for mouse-based tasks.

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### **What difference does it make if tasks are performed in different directions?**

Movement times showed notable differences between left and right directions. Right-directed movements were on average 7.3% faster than left-directed movements, which helps to show that right handed users were the ones taking this test, and were faster than left handed users.

**What differences did you observe between participants with respect to error rates, time completions and distance travelled per task?**

* **Movement Time:** The fastest participant averaged 612ms per trial, while the slowest averaged 853ms (39% difference)
* **Error Rate:** Error rates varied from 0.14 to 0.72 errors per trial, with larger differences for smaller targets
* **Distance Traveled:** Some participants moved directly to targets (average path ratio 1.12), while others showed less efficient paths (average path ratio up to 1.48)

## **Limitations and Challenges**

Several challenges affected our experiment:

1. **Finding Participants:** it was very hard to find people who were willing to have time to sit down and do it. Especially since it was in code it would be hard to send to people
2. **Pygame:** none of the group members have used pygame before so there was a learning curve to get around at the beginning of the project.
3. **Excel:** Getting the formulas correct and analyzing our data properly.