CSE 593

Human Ability & Cognitive Architectures

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Logistics

- Students enrolled from the waitlist received deadline extensions. Check your extensions today!

- Assignment 0 (Individual) was due yesterday; Assignment 0 (Group) due next week
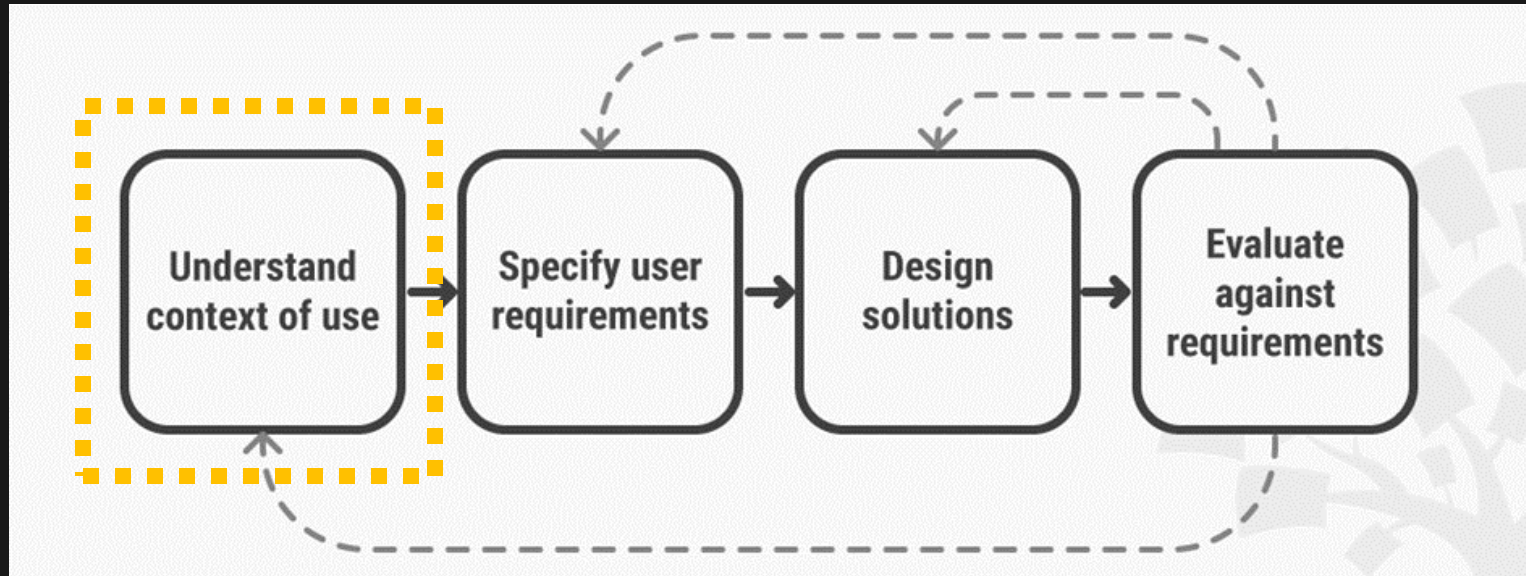
- Quiz 2 assigned today; due tomorrow!

Goals

Identify methods to assess human ability
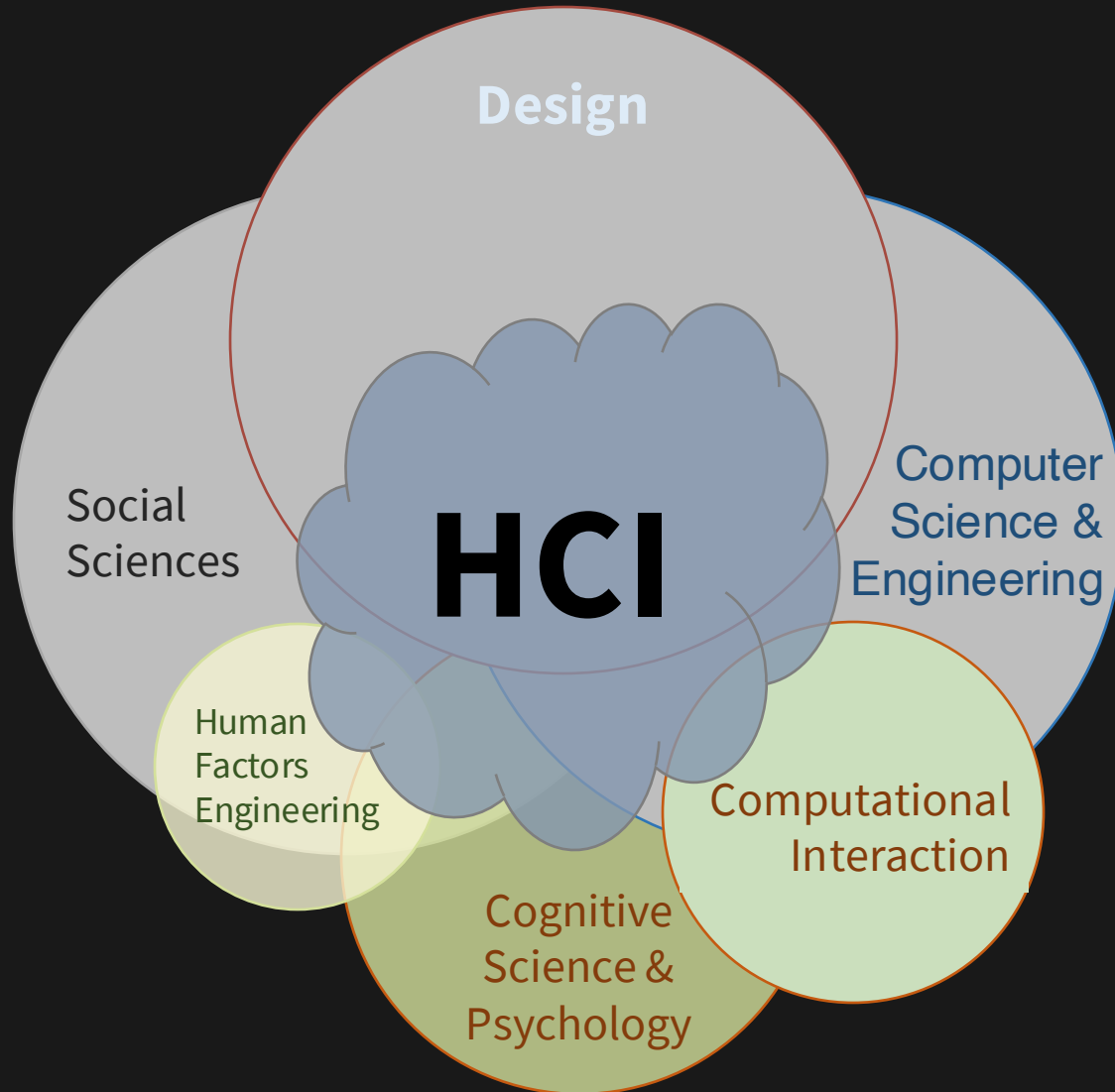
Learn about an early engineering model of cognition

Identify components of a cognitive model

Identify relationships to interactive technology

User-Centered Design Process

Brief (somewhat accurate) history of HCI

Understanding Context of Use

- Traditionally, HCI research has performed quantitative user studies to understand human ability and cognition.

- HCI research has proposed methods to formalize such knowledge using behavior models

- We will talk about quantitative user studies again later in the course, but in the context of evaluation.
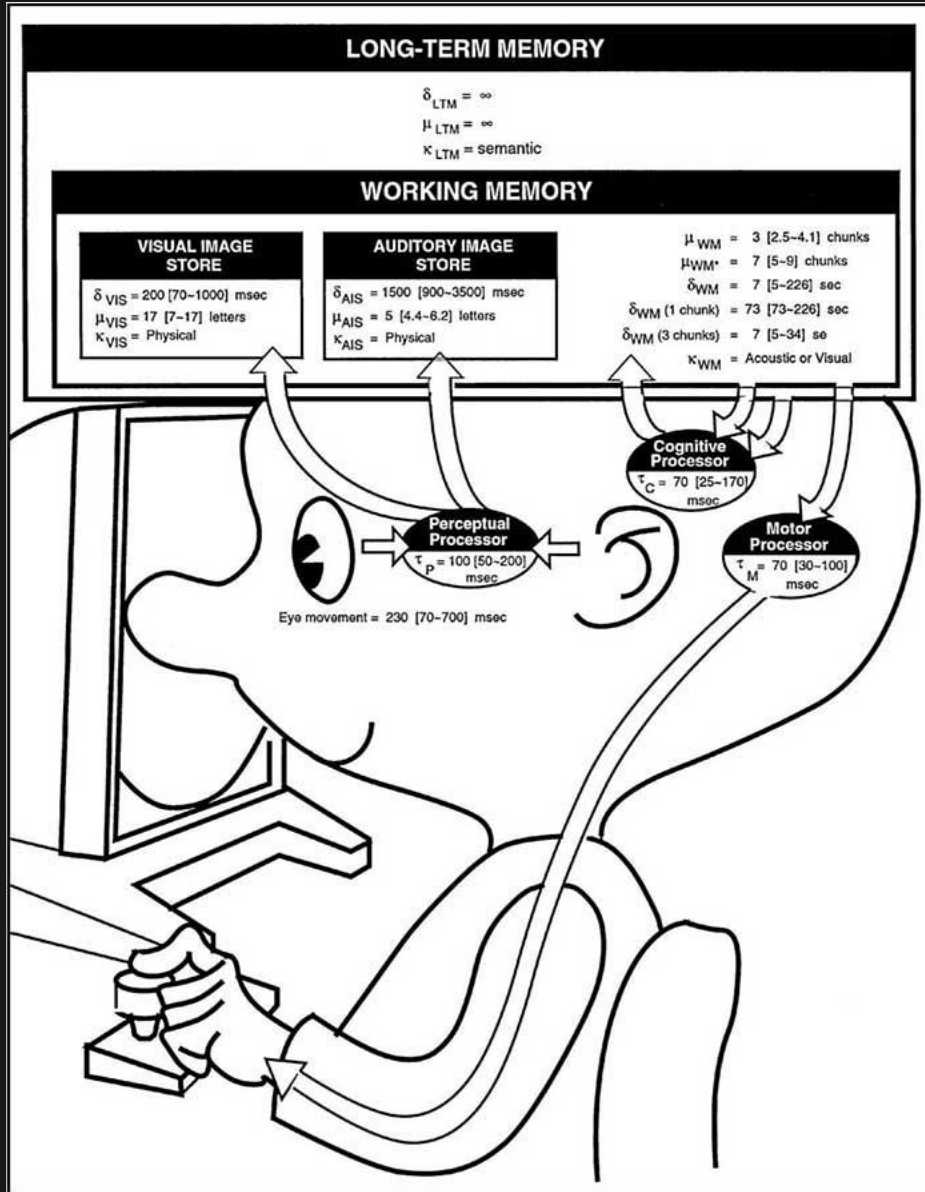
Human vs. technology
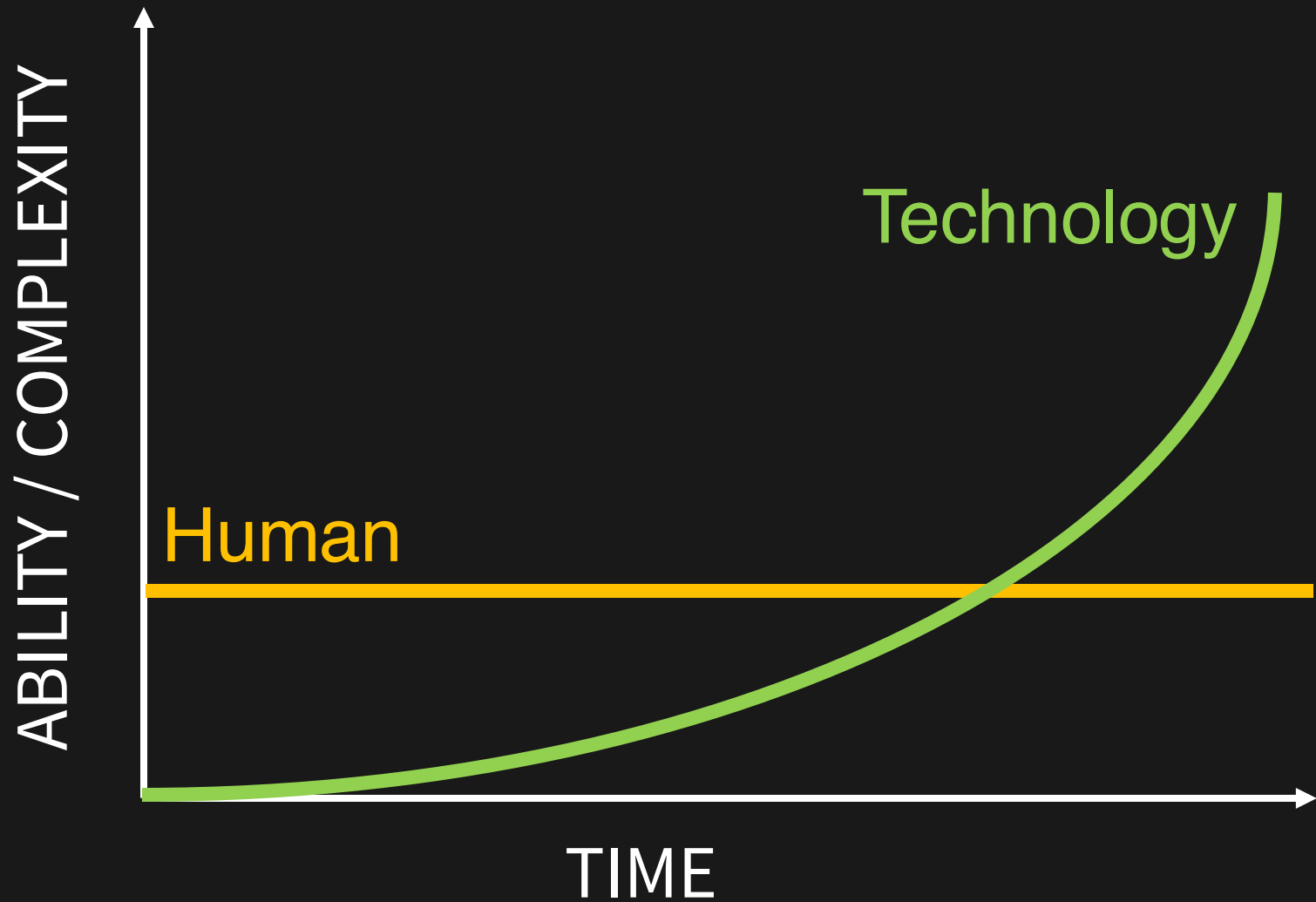
Why model cognition?

Why model cognition?

"help us to understand, predict, and even to calculate human performance relevant to human-computer interaction"

The Model Human Processor

μ : storage capacity

δ : the decay time

κ : the main code type

τ : cycle time

Principle of Operation

- P0: Recognize-Act Cycle of the Cognitive Processor
- P1: Variable Perceptual Processor Rate Principle
- P2: Encoding Specificity Principle
- P3: Discrimination Principle
- P4: Variable Cognitive Processor Rate Principle
- P5: Fitts' Law
- P6: Power Law of Practice
- P7: Uncertainty Principle
- P8: Rationality Principle
- P9: Problem Space Principle

The Perceptual System

The Perceptual System

"The perceptual system carries sensations of the physical world detected by the body's sensory system into internal representations of the mind by means of integrated sensory system."

The Motor System

"People translate thought into action by activating patterns of voluntary muscles."

Memory

Memory

"Storage."

The Cognitive System

"Connect inputs to outputs."

What are some of the characteristics of the Model Human Processor (MHP)? Select all that apply.

❑ MHP is the best cognitive architecture out there!

❑ MHP treats humans as computers.

❑ MHP accurately explains human cognition.

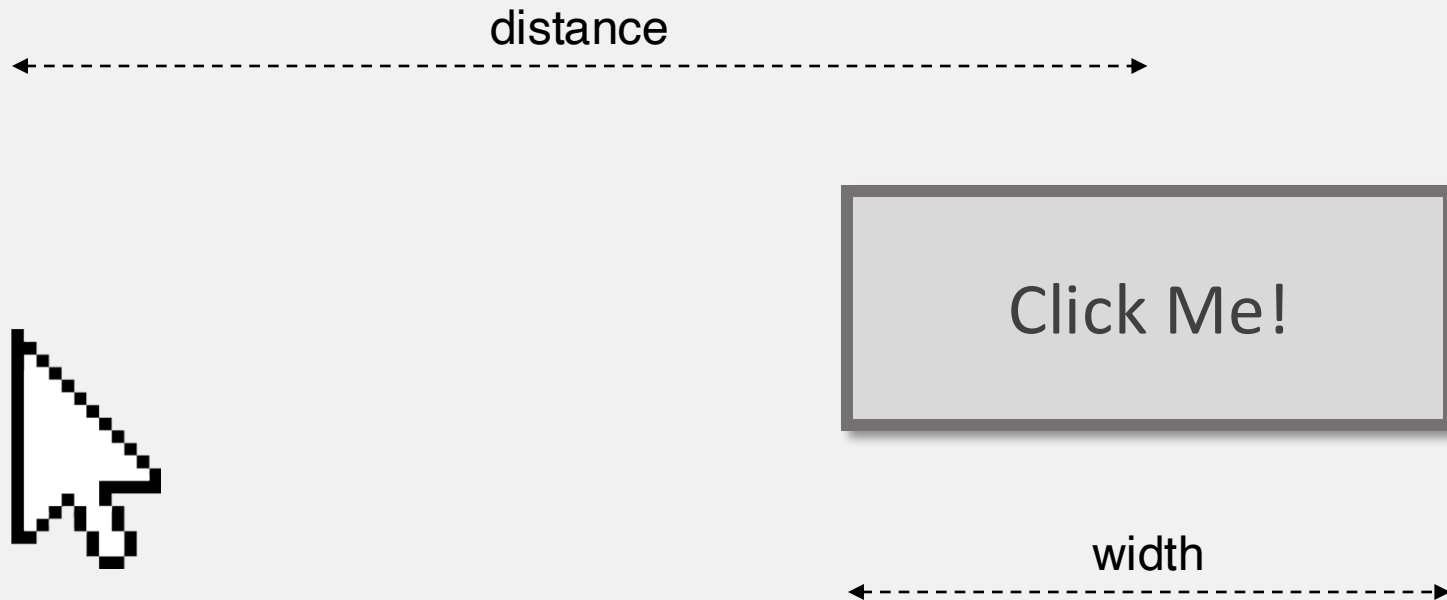❑ MHP offers a good enough approximation of human performance.

You have 120 seconds…

DONE!

The Model Human Processor

A simple model of cognition that does not explain cognition, but allows for a good enough approximation of human ability.
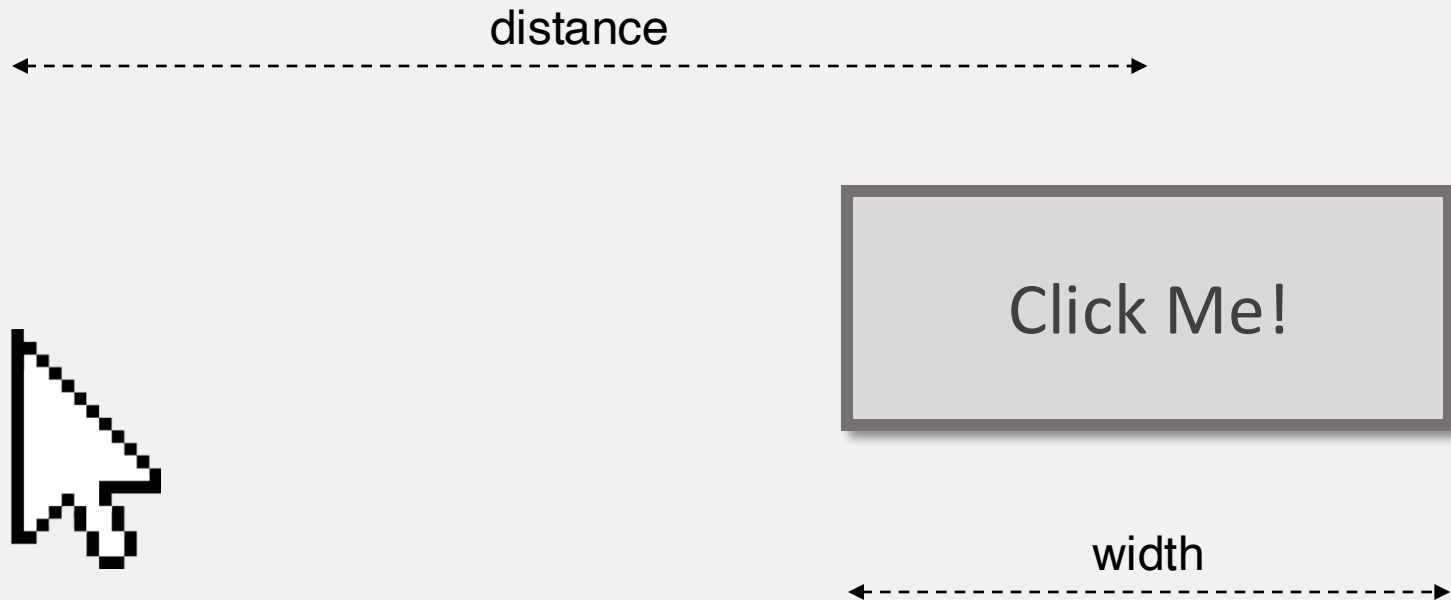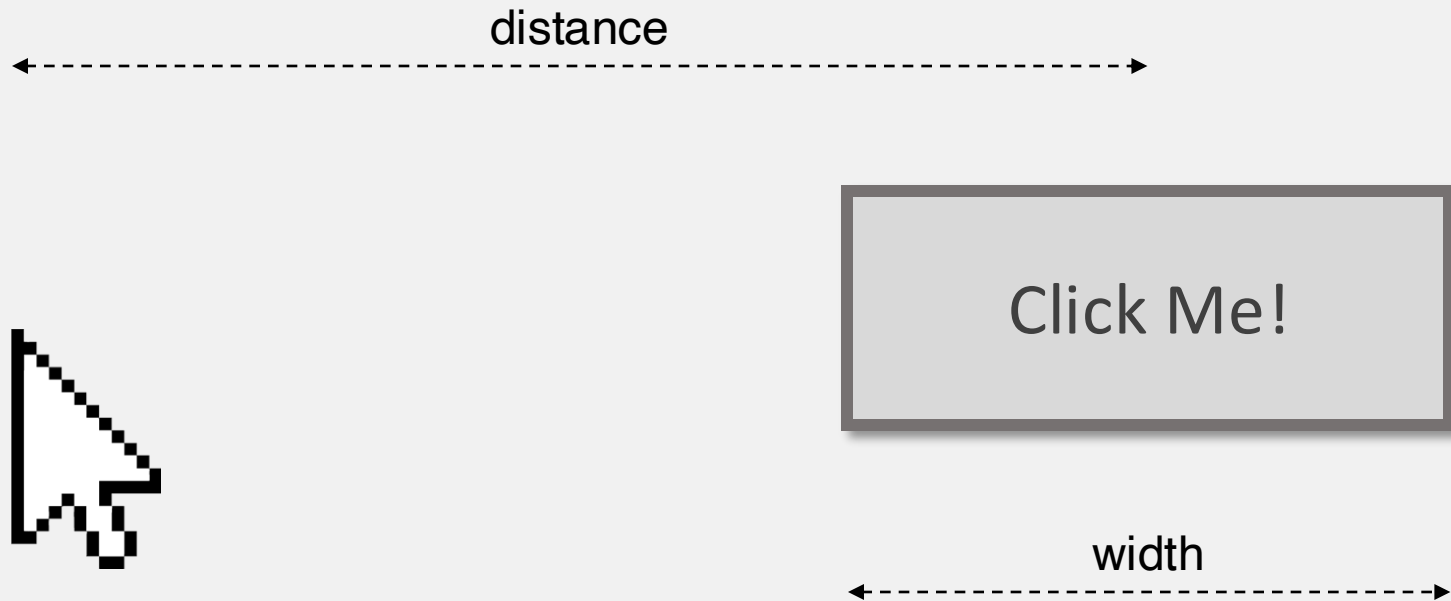
The Model Human Processor

Fitts' Law

distance

Click Me!

width

$$Movement\ Time = a+b{\times}log_2(distance/width+1)$$

MacKenzie, I. S. (1992) Fitts' law as a research and design tool in human-computer interaction. *Human Computer Interaction 7* (1), 91-139.

Fitts' Law

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Fitts' Law

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Pointing: an example interface

Banovic, Rao, Saravanan, Dey, Mankoff. 2017. Quantifying Aversion to Costly Typing Errors in Expert Mobile Text Entry. In *Proc.* CHI '17. ACM. (https://youtu.be/nEYMPFfrHI0)

What implications does the Fitts' Law have for interaction design? Select all that apply.

❑ It may be more difficult to select targets on large screens.

❑ It may take more time to select small (rather than large) targets on small screens.

❑ Grouping many targets together may increase pointing target selection errors.

❑ Grouping icons that the user may want to press in sequence closer together could decrease overall time it takes to complete the whole task.
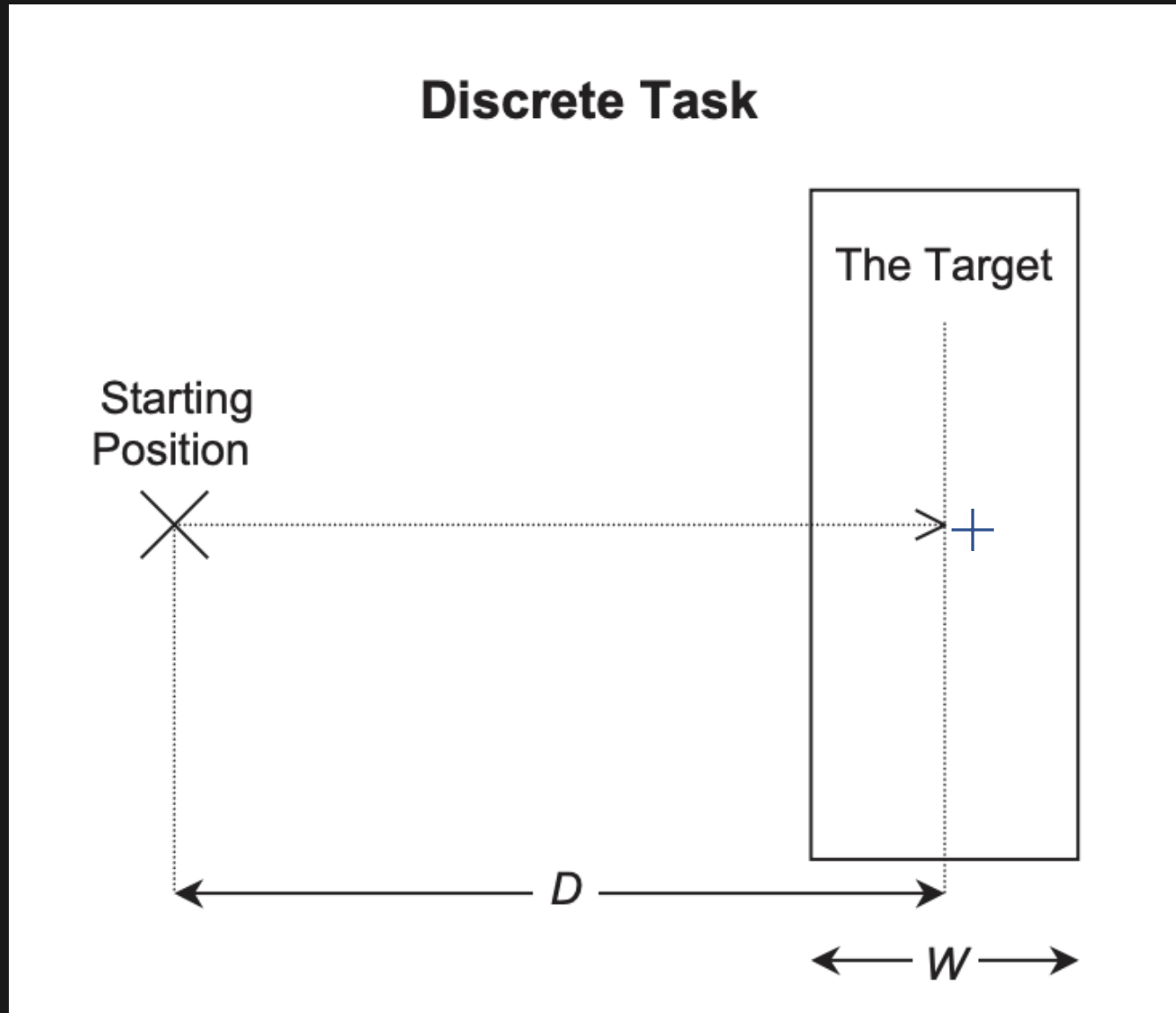
You have 120 seconds…

DONE!

Bubble Cursor
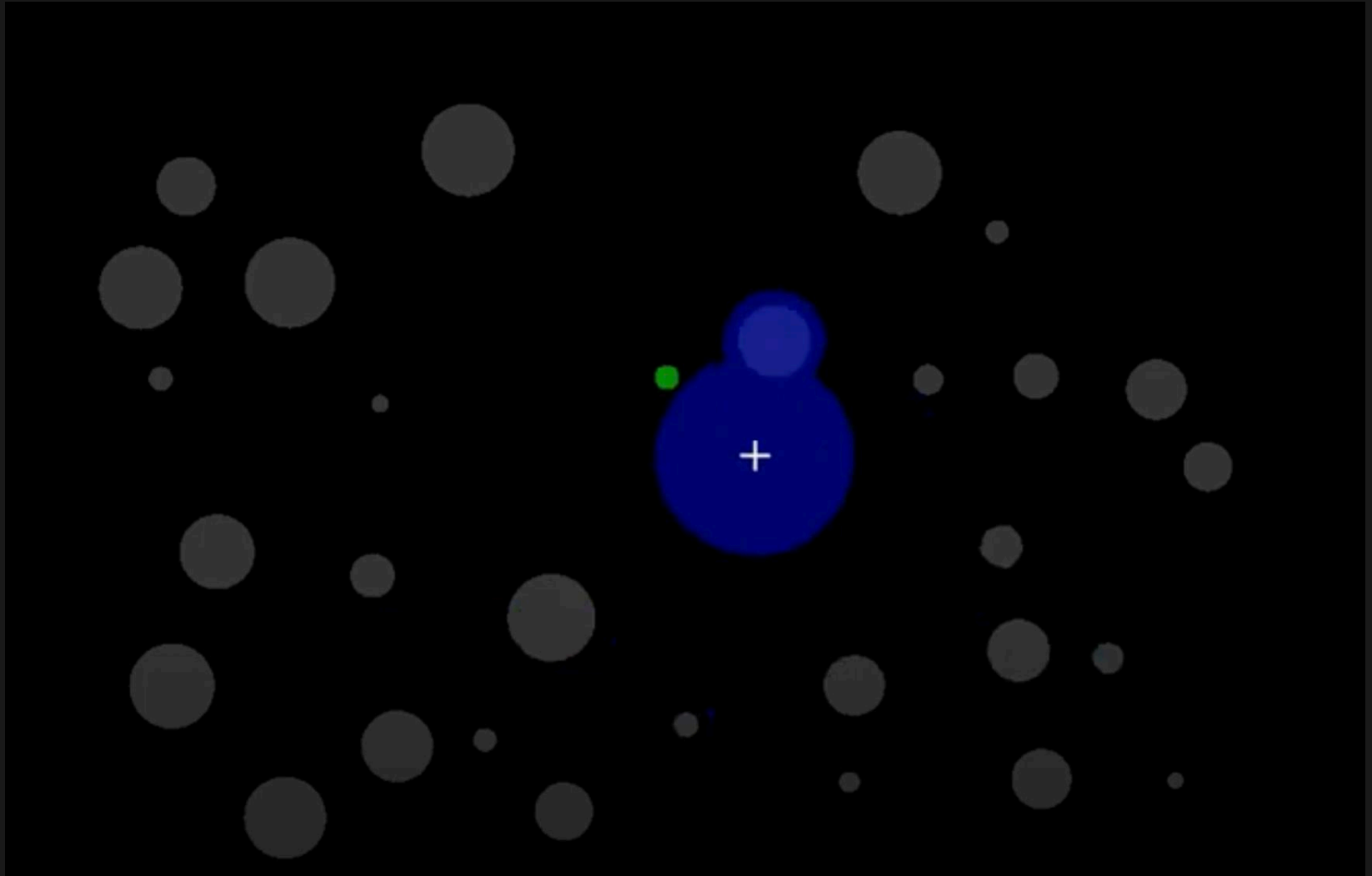
Fitts' Law study
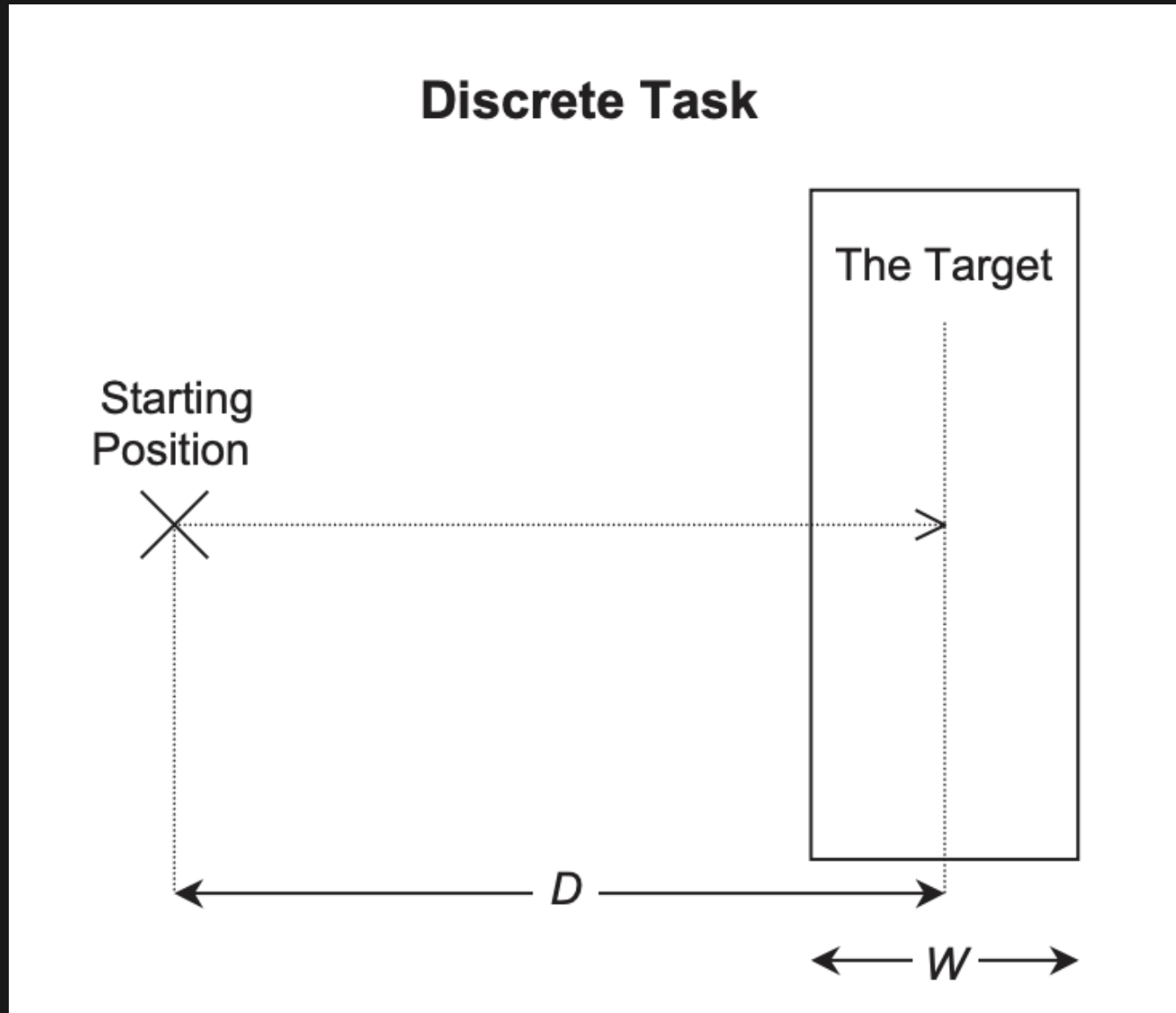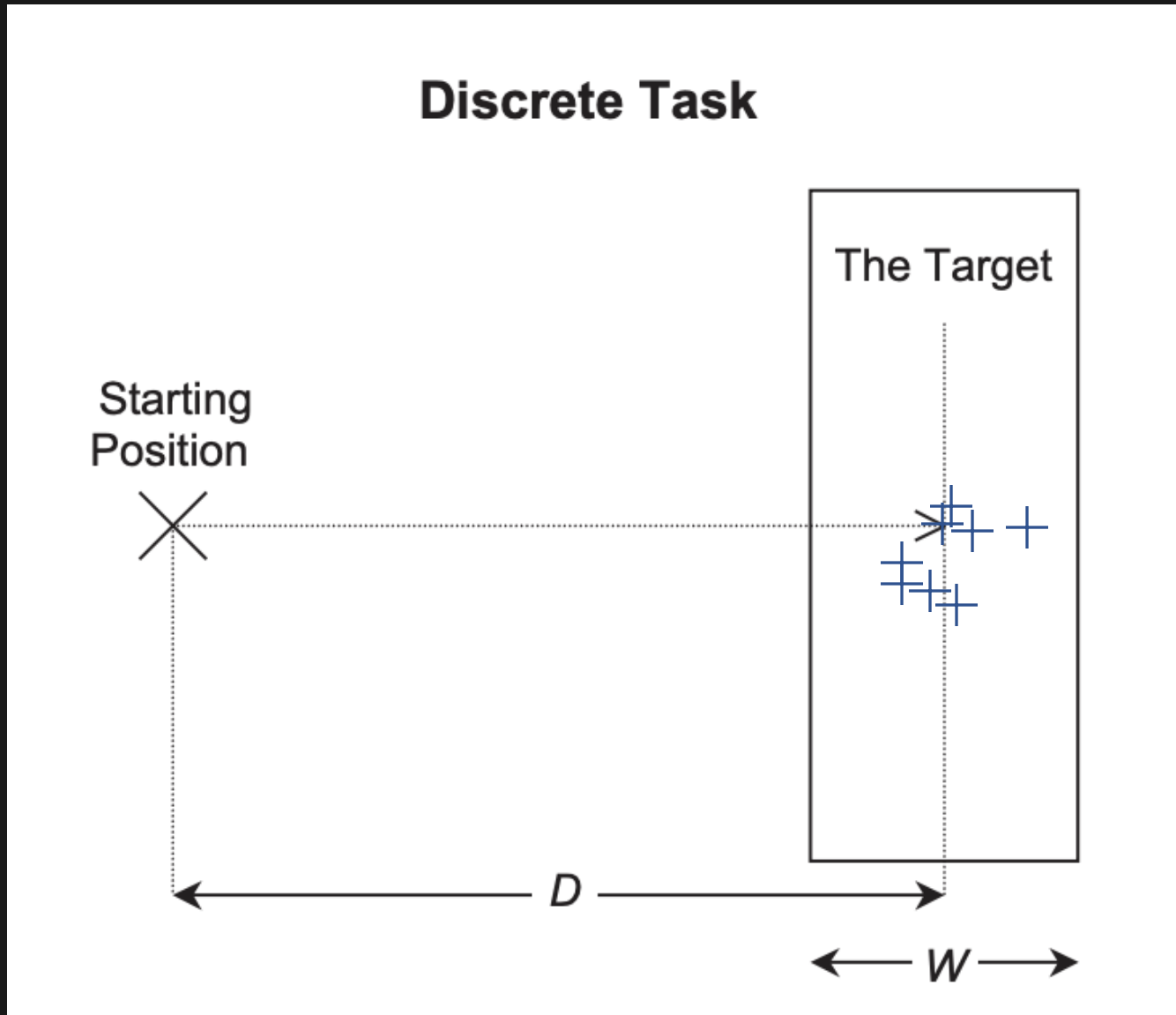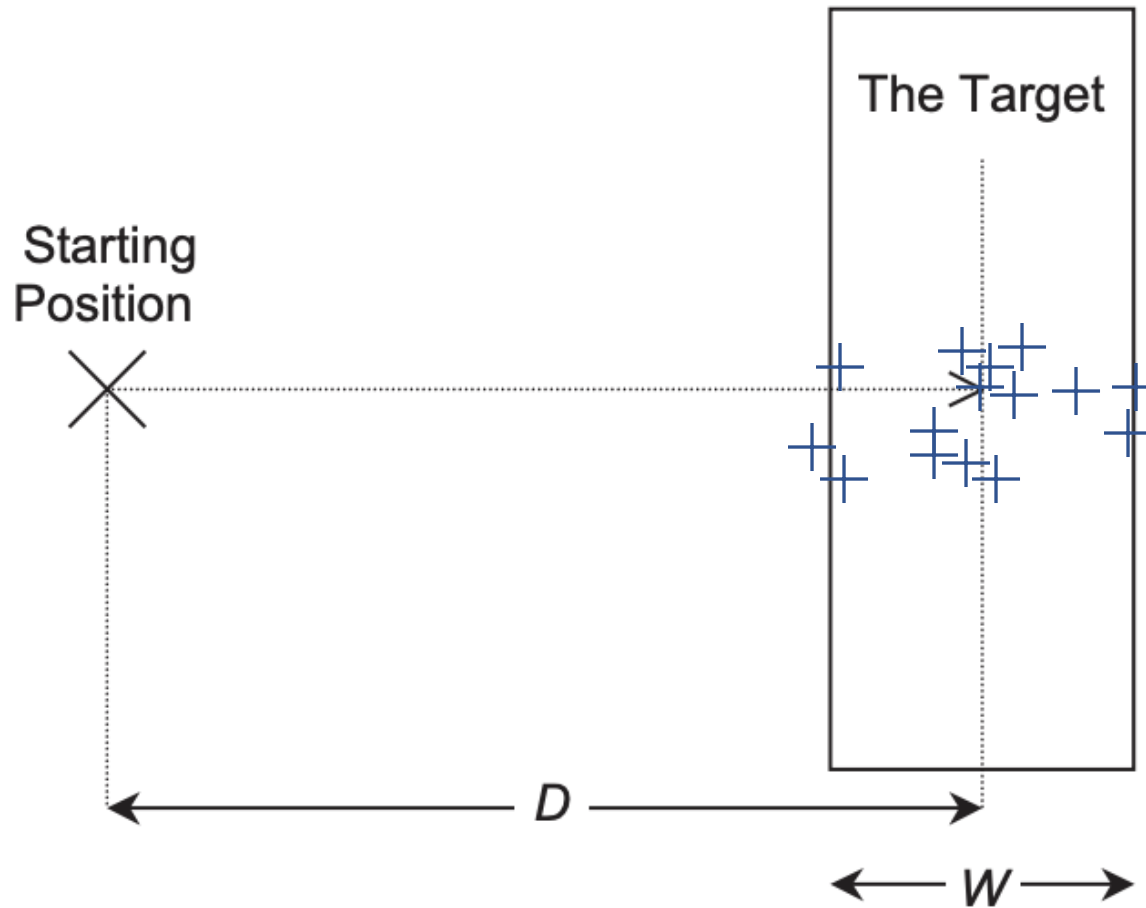
Discrete Task

The Target

Starting
Position

D

W

Fitts' Law study

Fitts' Law study

Fitts' Law study
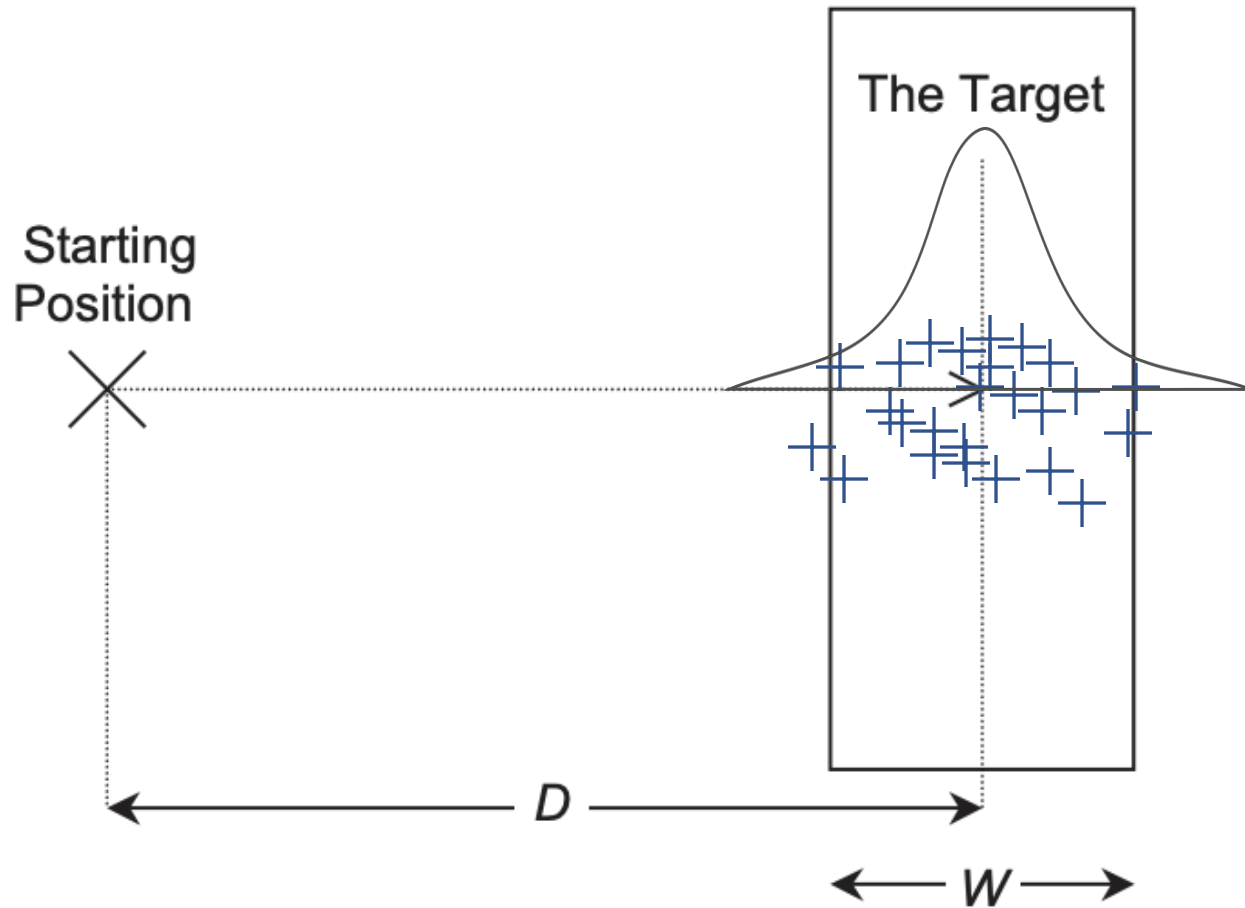
Fitts' Law study

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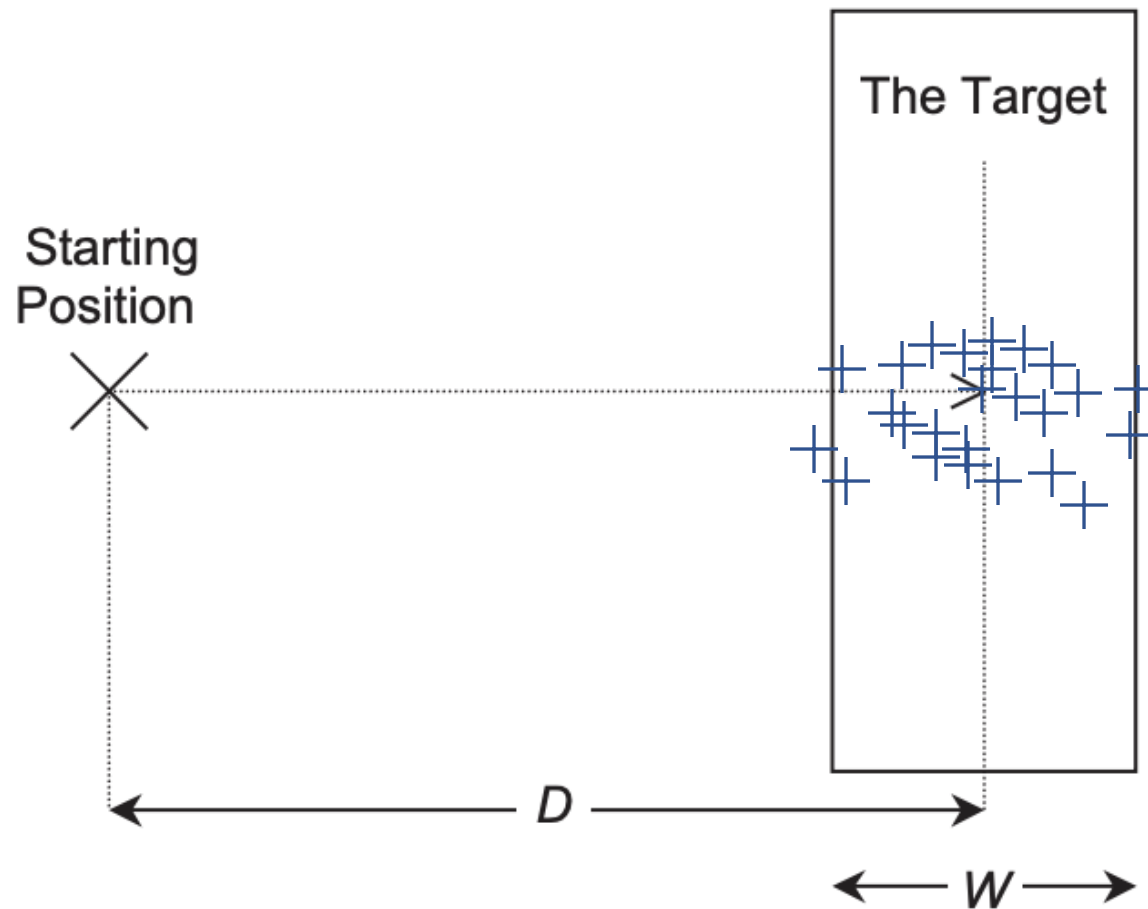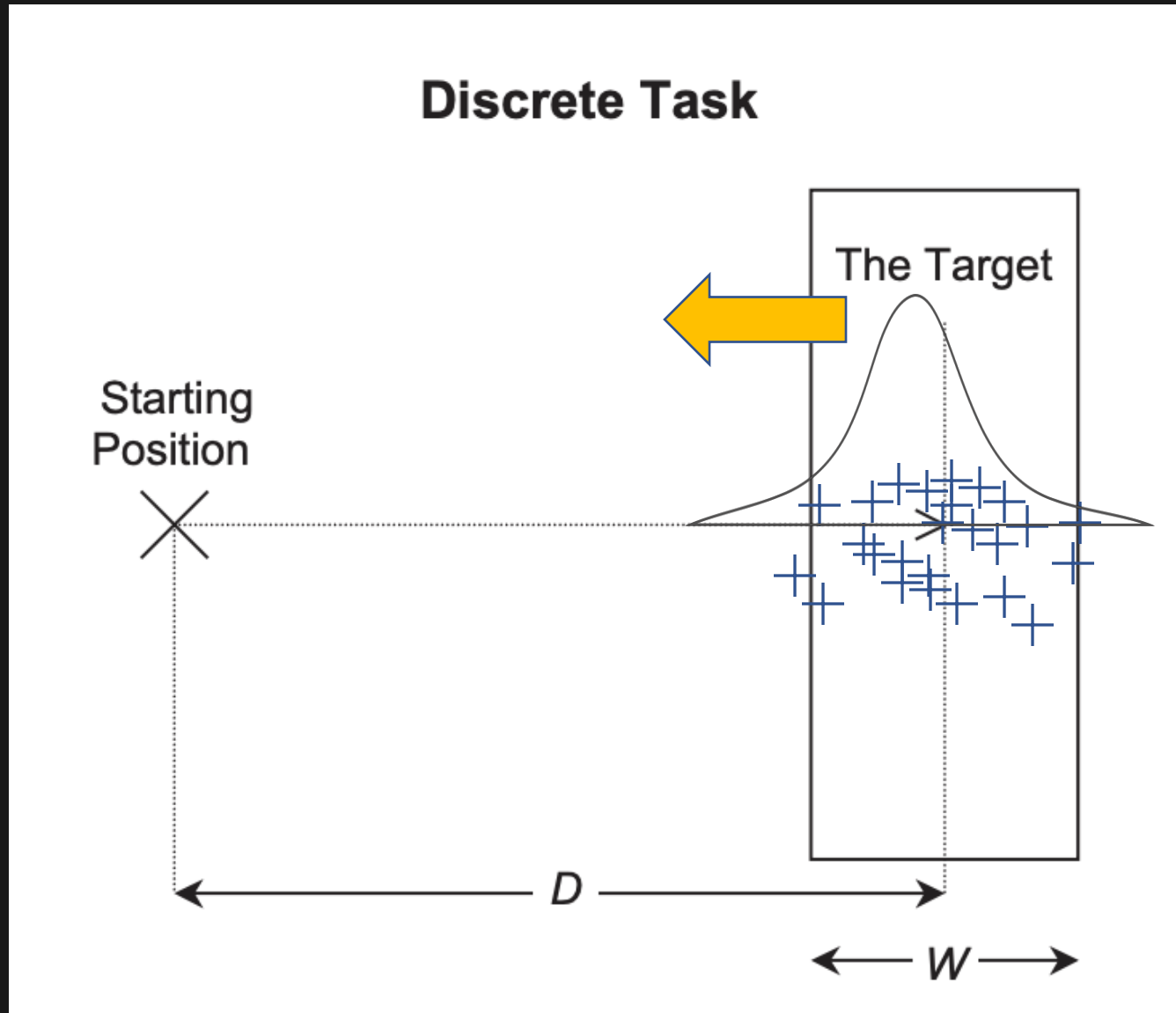
Fitts' Law study
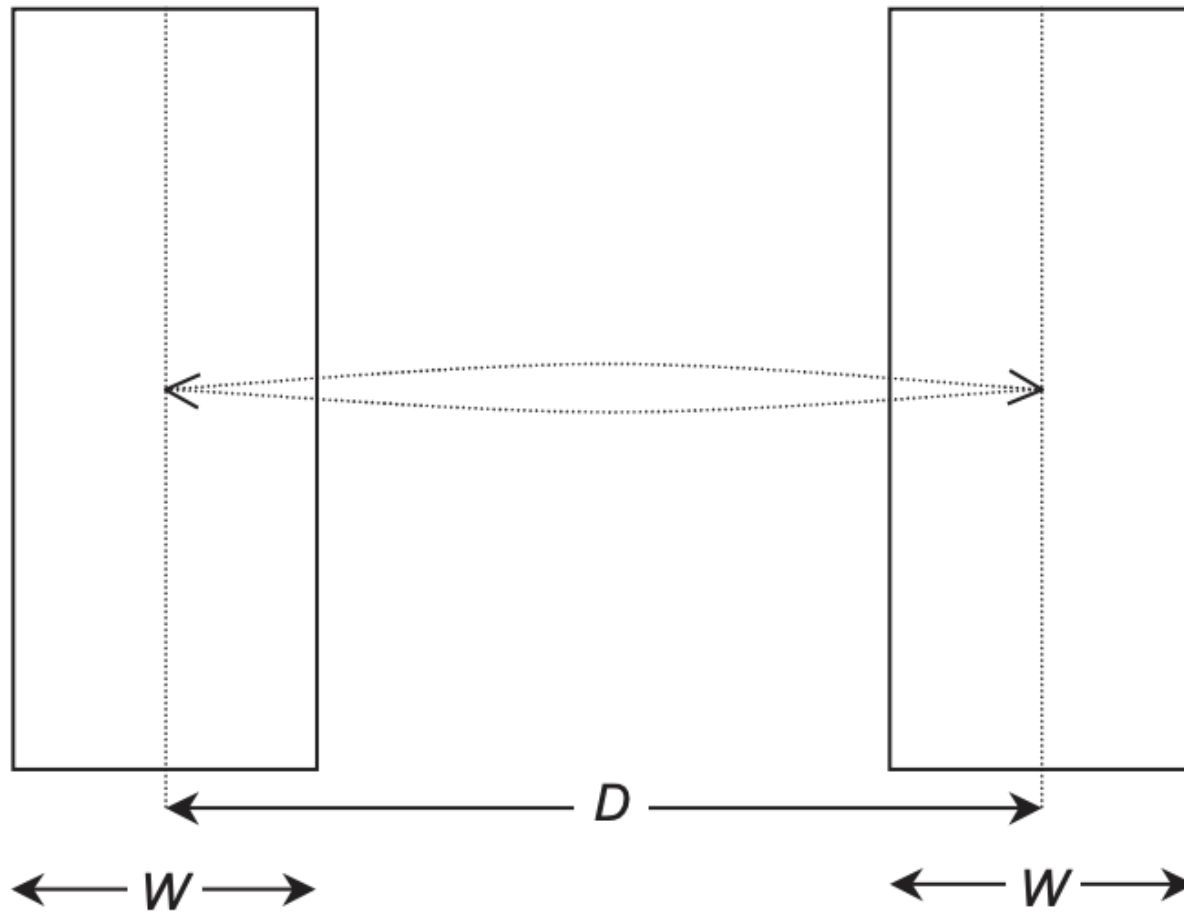
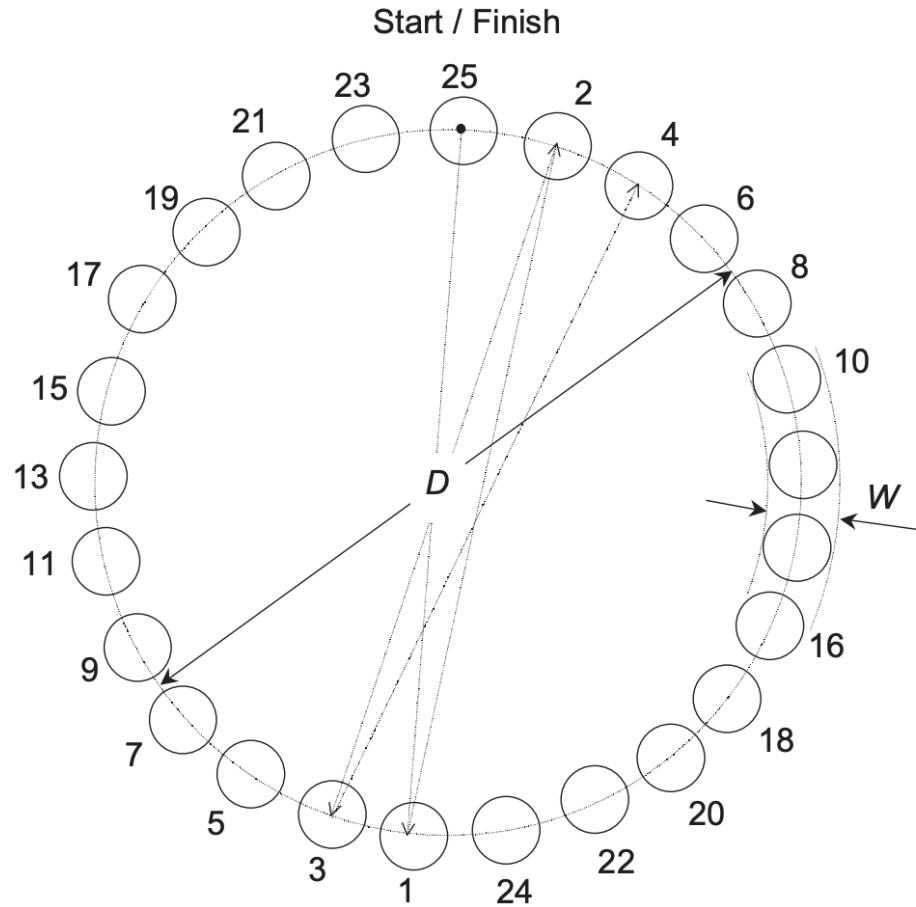# Fitts' Law study

Fitts' Law study

Fitts' Law

Fitts' Law

Fitts' Law

distance

Click Me!

width

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Movement time computed using the Fitts' Law is representative of how fast any user can point at a target of any size at any distance. True or false?

❑ True

❑ False

You have 120 seconds…

DONE!

44
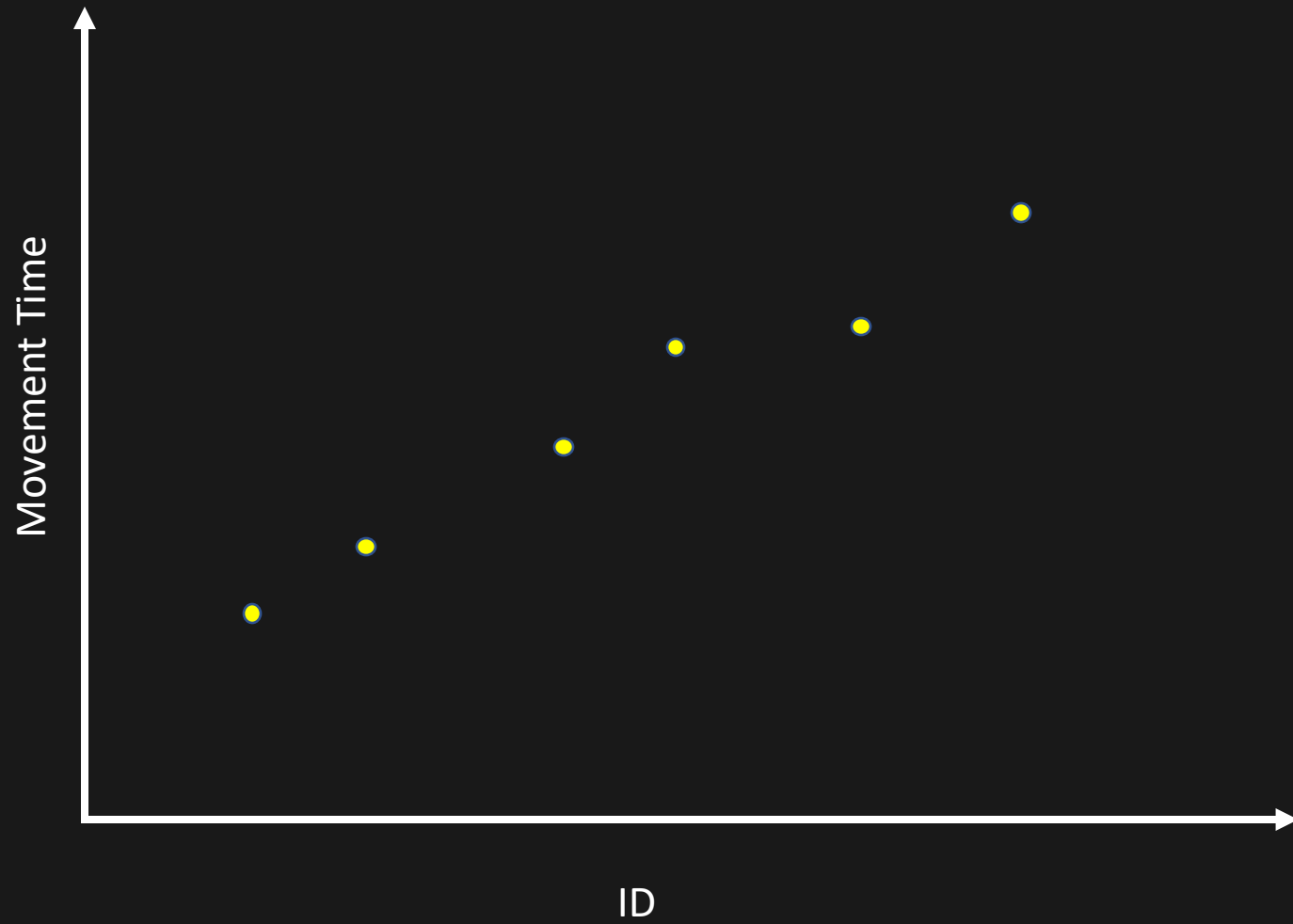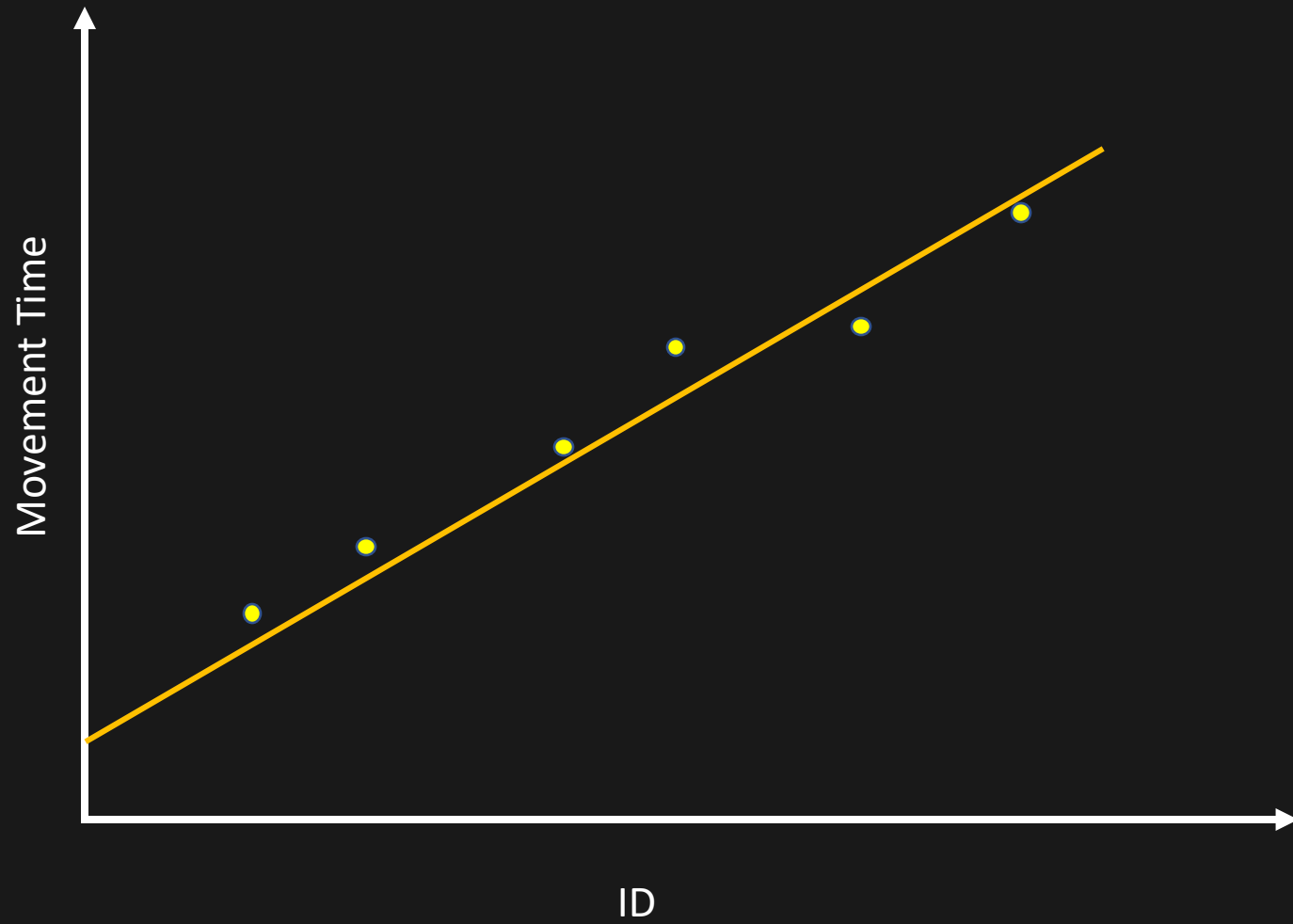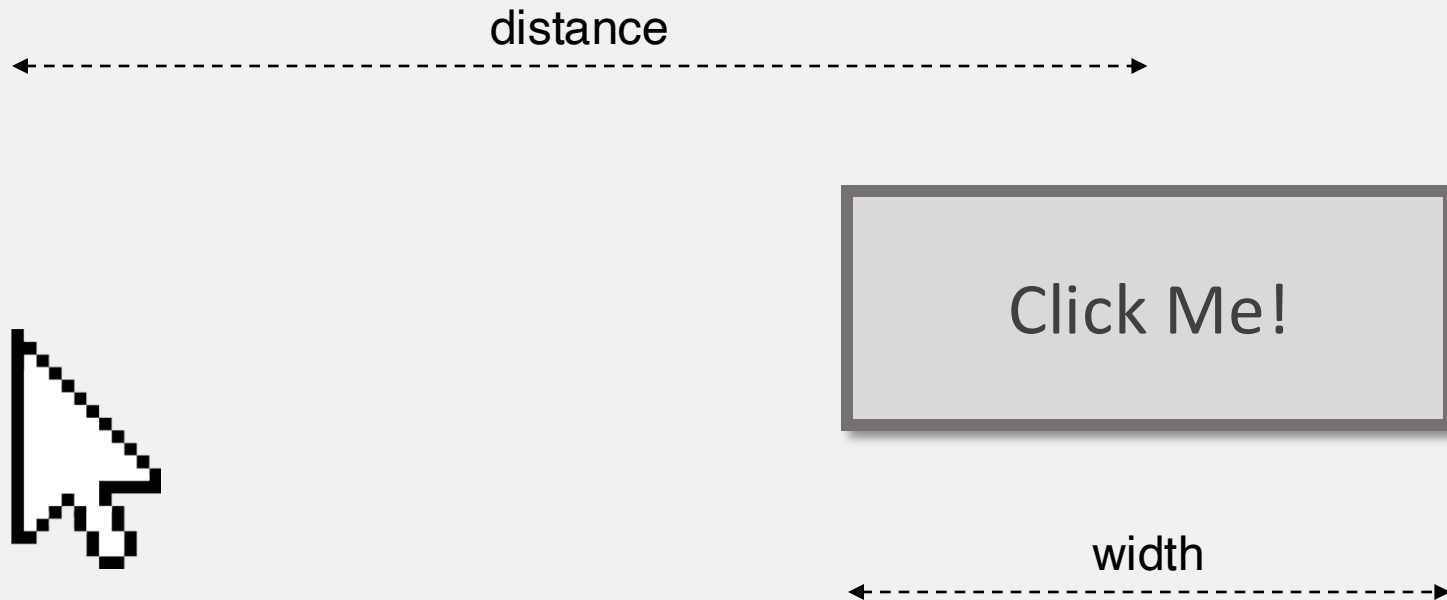
Please answer this question in Canvas

What is true about understanding context of use? Select all that apply.

☐ To understand context of use, one must conduct at least one user study.

☐ Existing knowledge about human abilities, user requirements, and breakdowns of existing technology can inform our understanding of context of use.

☐ Conducting a user study can help us confirm our understanding of context of use.

☐ Understanding context of use is only valuable if we plan to design interactive computer technology.

You have 120 seconds…

DONE!

Questions, comments, and/or concerns?

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