Lecture 9 Behavioral Economics in HCI

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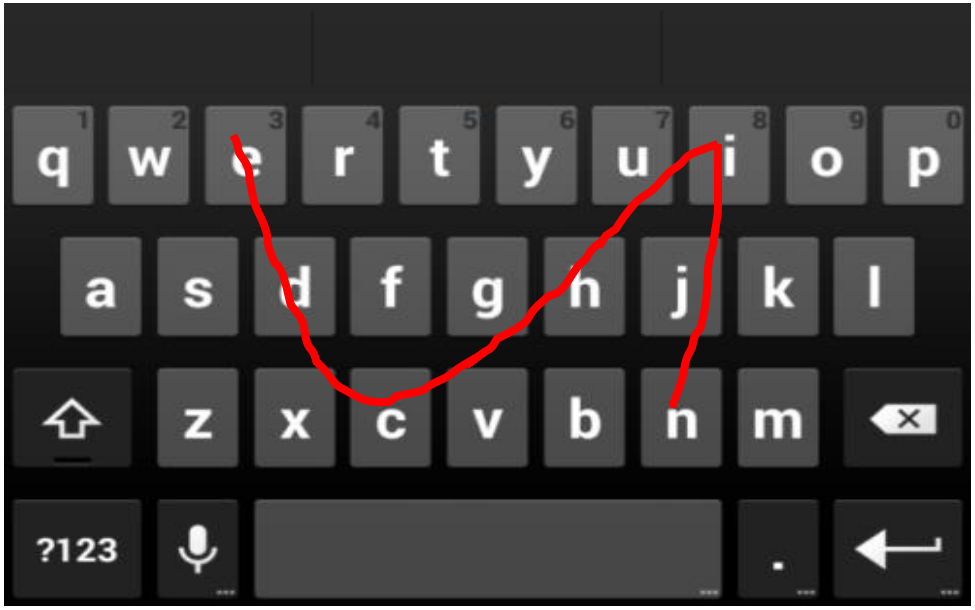
Previous Lectures

Smart Touch Keyboard

Gesture Keyboard

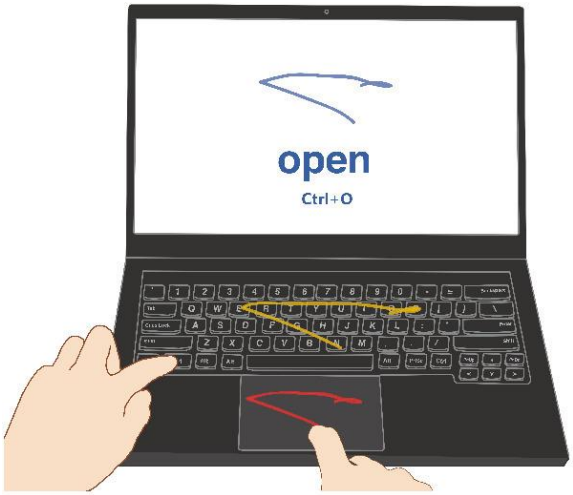
Entering *nice*




hello_
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Examples of Research Projects

Example 1. HotStrokes: Word-Gesture Shortcuts on a Trackpad



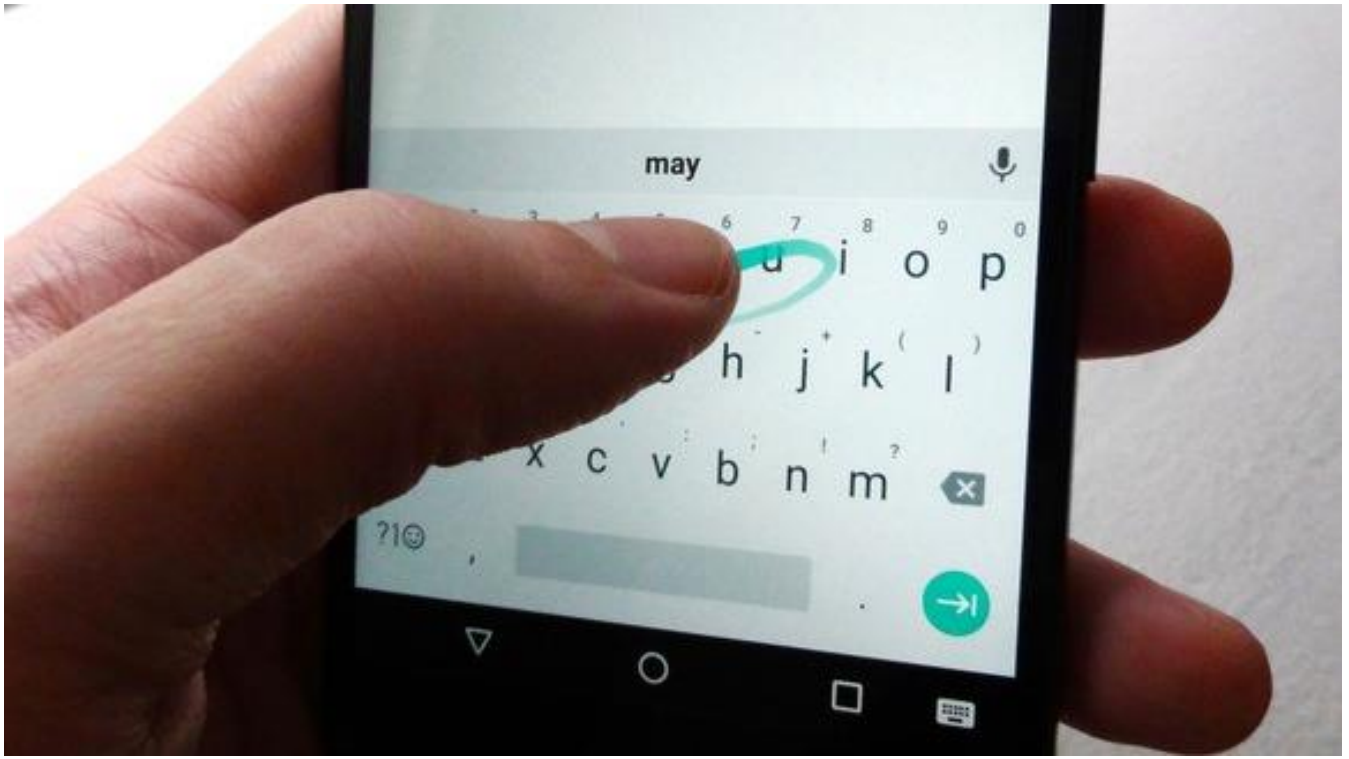
Idea #2. Smartphone Authentication via Typing

Recognize people by the way they type

Idea #2. Smartphone Authentication via Typing

Authentication via typing has been investigated for desktop computers, but not for smartphones.

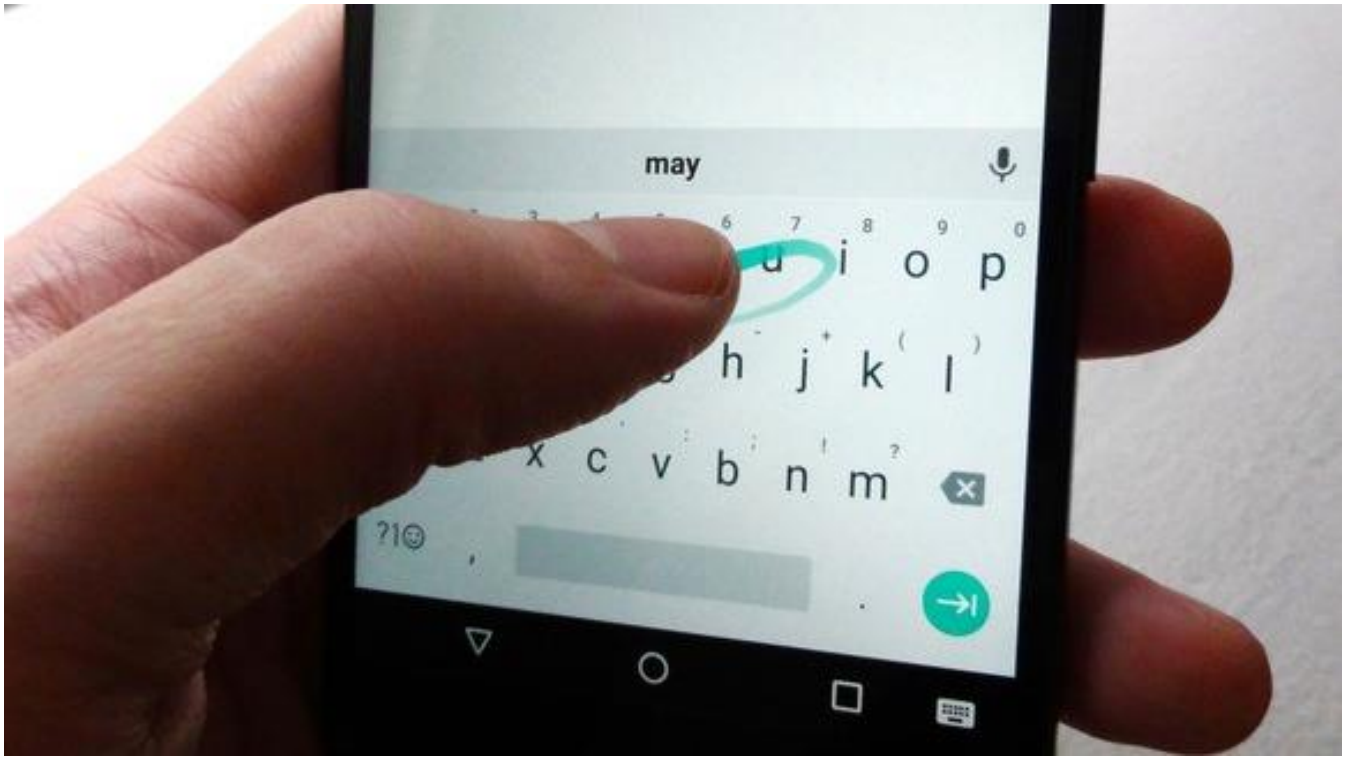
Idea #3. Back-of-device Gesture Typing



Gesture Typing Algorithm:

Per-Ola Kristensson and Shumin Zhai. 2004. SHARK2: a large vocabulary shorthand writing system for pen-based computers. In *UIST '04*., 43-52.

Idea #4. Gesture Typing in Mid-Air

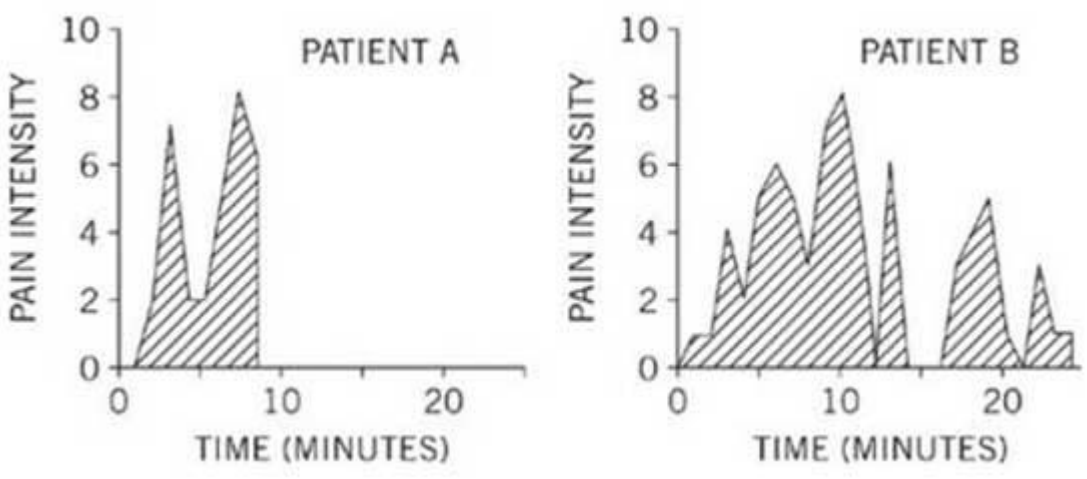


Tracking hand/finger movement with a regular camera

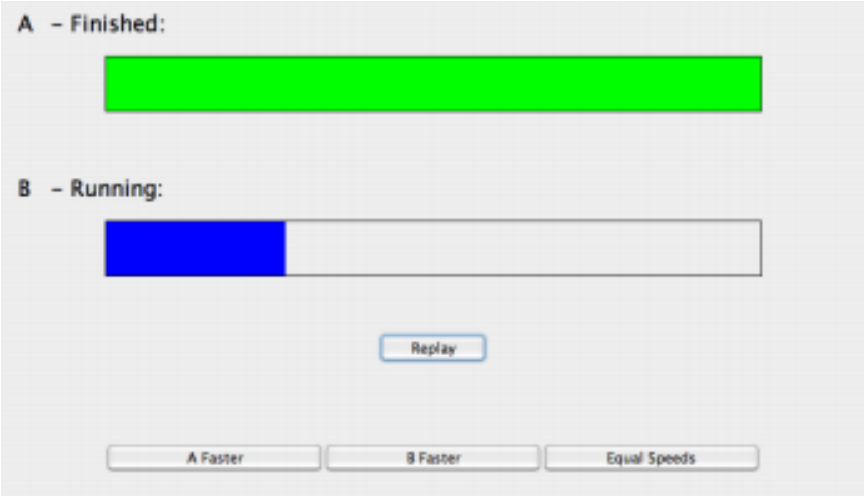
Peak-End Effect

- **Peak-End Rule**
  - The most intensive (peak) and ending moments play a dominant role

- **Judgments of unpleasantness are unaffected by their timespan**
  Experiment. Patients undergoing colonoscopy examination



App #1. Progress Bar Designs



- Each progress bar took 5.5 seconds
- Progress behaviors varied, including
  linear, early pause, late pause, slow wavy, fast wavy
  poser, inverse power, fast power, inverse fast power

Chris Harrison, Brian Amento, Stacey Kuznetsov, and Robert Bell. 2007. Rethinking the progress bar. UIST '07, 115-118.

Name	Description	Rate Trend	Acceleration	Function
Linear	Progresses linearly	Constant	None	$f(x) = x$
Early Pause	Almost linear; large pause around 25%	Speeds up	Unstable near beginning	$f(x) = x+(1-\sin(x*\pi*2+\pi/2))/-8$
Late Pause	Almost linear; large pause around 75%	Slows down	Unstable near end	$f(x) = x+(1-\sin(x*\pi*2+\pi/2))/8$
Slow Wavy	Three large steps separated by pauses	Constant	Highly unstable	$f(x) = x+\sin(x*\pi*5)/20$
Fast Wavy	Increments in small, quick steps	Constant	Highly unstable	$f(x) = x+\sin(x*\pi*20)/80$
Power	Accelerates	Speeds up	Constant	$f(x) = (x+(1-x)*0.03)^2$
Inverse Power	Decelerates	Slows down	Constant	$f(x) = 1+(1-x)^{1.5}*-1$
Fast Power	Rapidly accelerates	Speeds up	Stable	$f(x) = (x+(1-x)/2)^8$
Inv. Fast Power	Rapidly decelerates	Slows down	Stable	$f(x) = 1+(1-x)^3*-1$

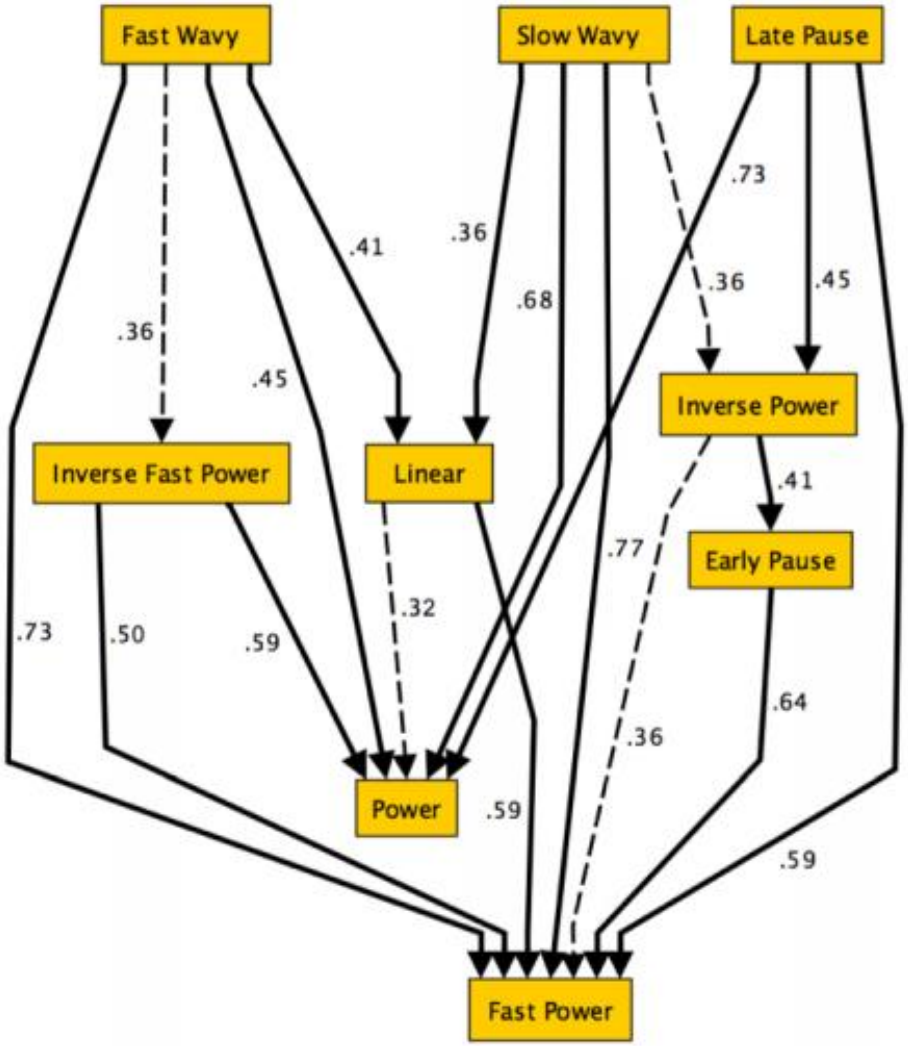


Figure 3: A rough hierarchy of the nine progress functions. Statistically significant edges are shown with solid lines ($p<.05$). Dashed edges show relationships approaching significance. Mean preference scores are labeled on the edges.

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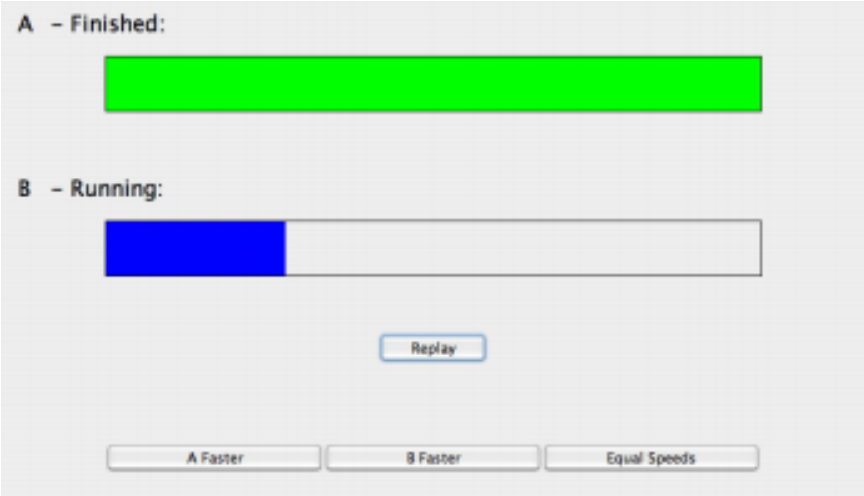
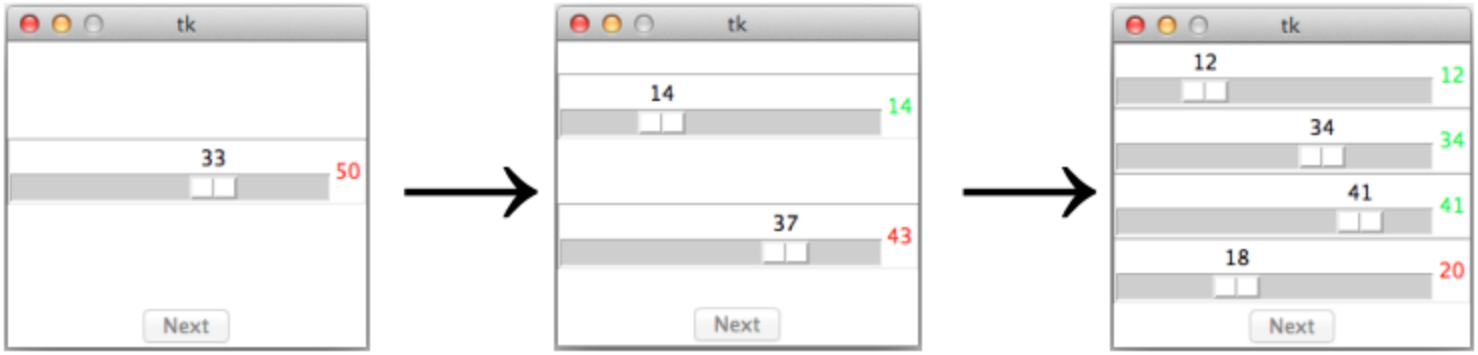


- Progress bars with pauses as taking longer to complete (peak effect)
- Accelerating progress was strongly favored (end effect).

Chris Harrison, Brian Amento, Stacey Kuznetsov, and Robert Bell. 2007. Rethinking the progress bar. UIST '07, 115-118.

App #2. Subjective Preferences of Interactive Tasks



Andy Cockburn, Philip Quinn, and Carl Gutwin. 2015. Examining the Peak-End Effects of Subjective Experience. *ACM CHI,* 357-366.

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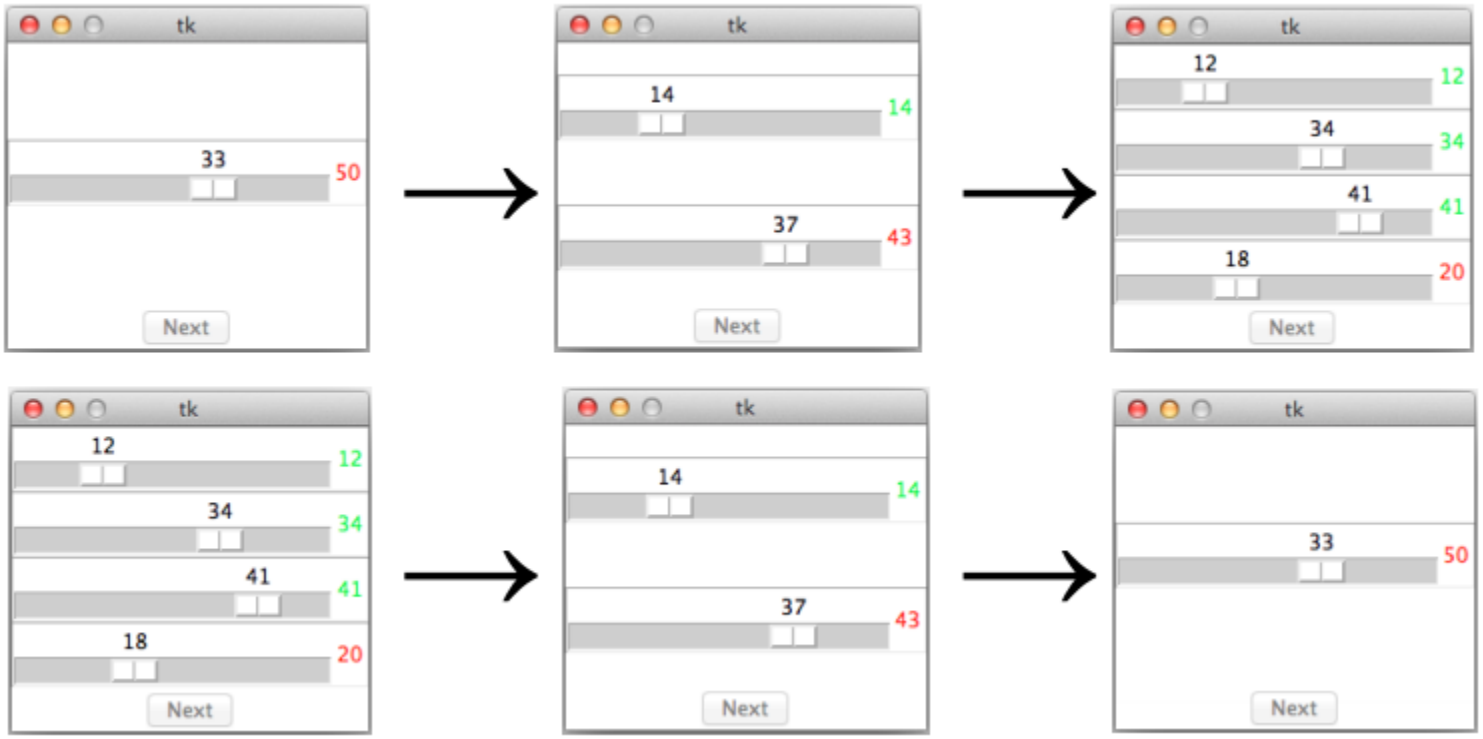

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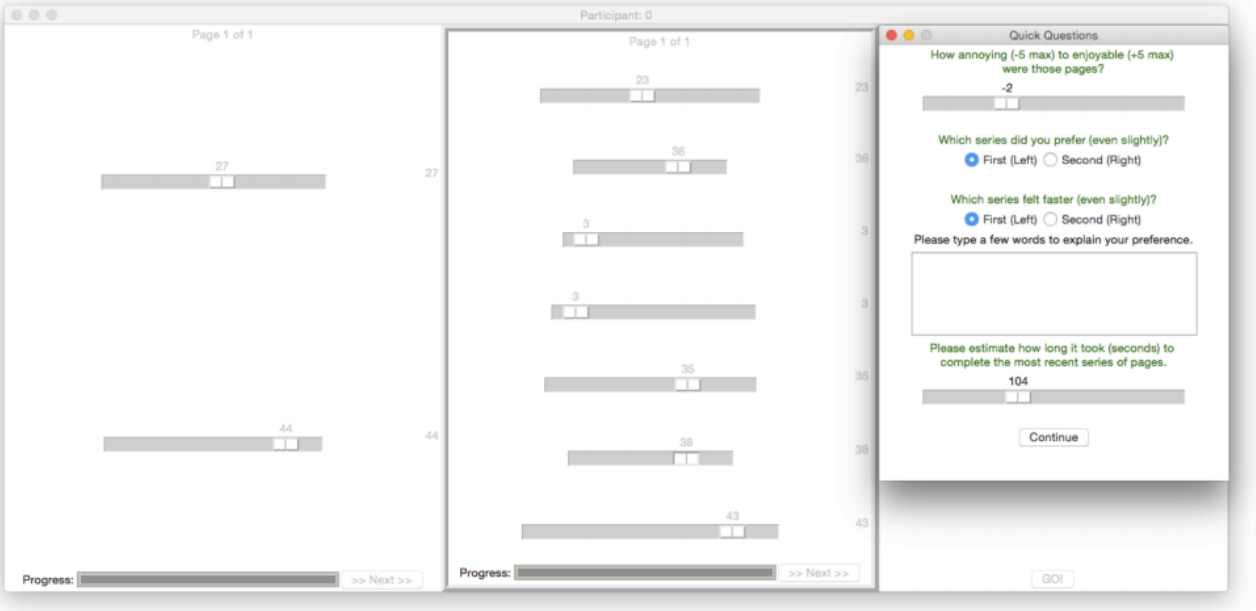
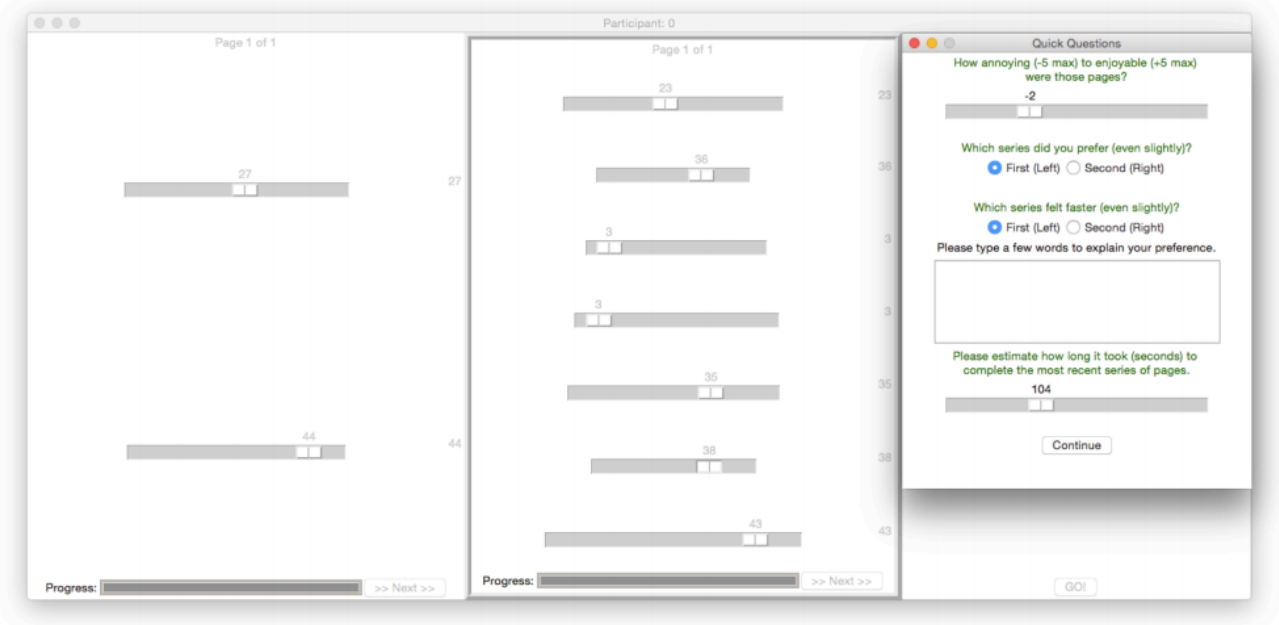
Experiment



Condition		Even first	Odd first	
end	62.5%	*+{7, 7, 6, 3, 2}*	*–{4, 4, 4, 5, 8}*	37.5%
peak	53%	*–{3, 3, 9, 4, 6}*	*+{6, 6, 1, 6, 6}*	47%
peak-and-end	72%	*+{7, 2, 7, 6, 3}*	*–{3, 8, 4, 4, 6}*	28%

Andy Cockburn, Philip Quinn, and Carl Gutwin. 2015. Examining the Peak-End Effects of Subjective Experience. *ACM CHI,* 357-366.

Findings

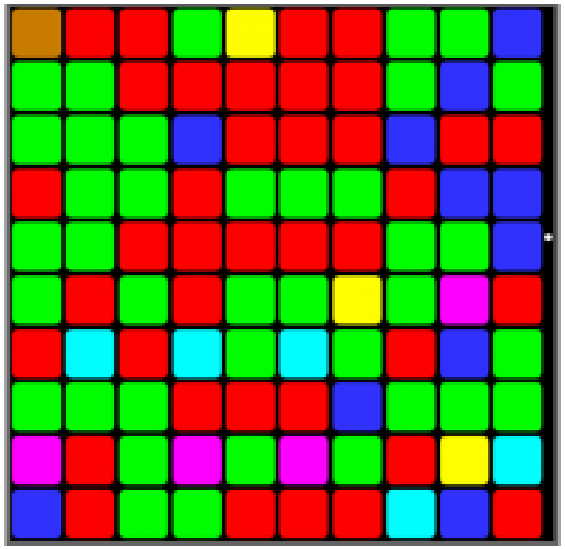


- Manipulating only the peak or the end of the series did not significantly change preference, but that a combined manipulation of both peak and end did lead to significant differences in preference, even though all series had the same overall effort

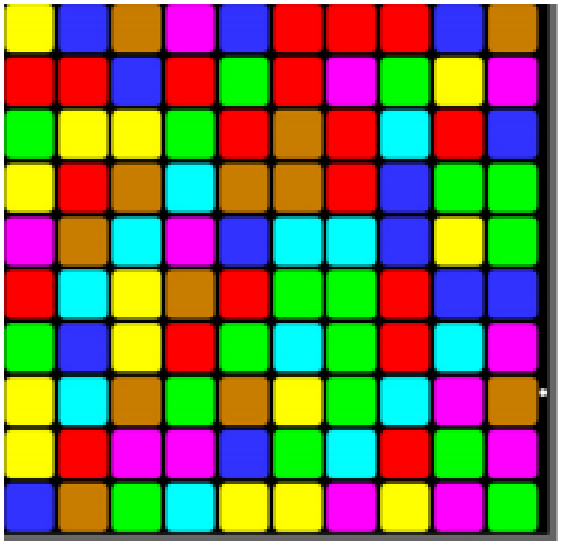
Andy Cockburn, Philip Quinn, and Carl Gutwin. 2015. Examining the Peak-End Effects of Subjective Experience. *ACM CHI,* 357-366.

App #3. Player Experience in Casual Games

- Effects of sequences of game difficulty



Easy



Hard

Carl Gutwin, Christianne Rooke, Andy Cockburn, Regan L. Mandryk, and Benjamin Lafreniere. 2016. Peak-End Effects on Player Experience in Casual Games ACM, CHI 5608-5619.

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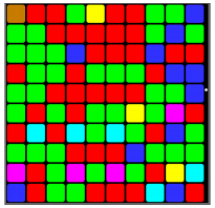
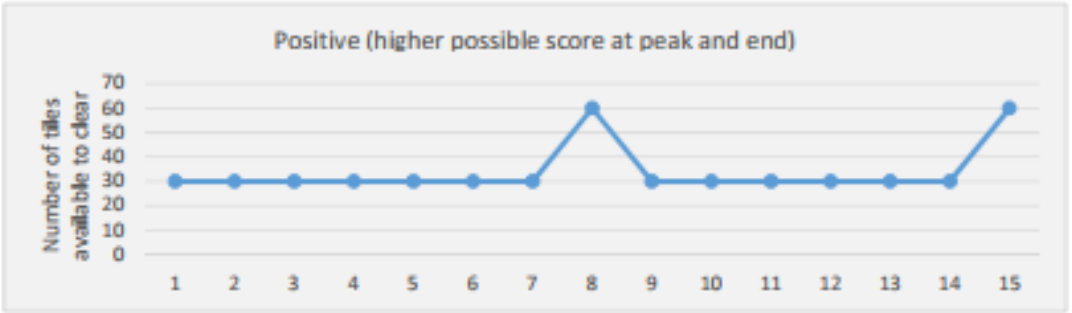
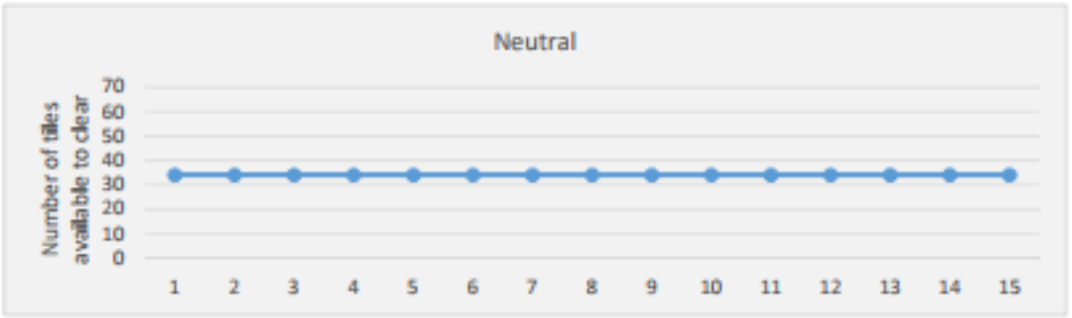
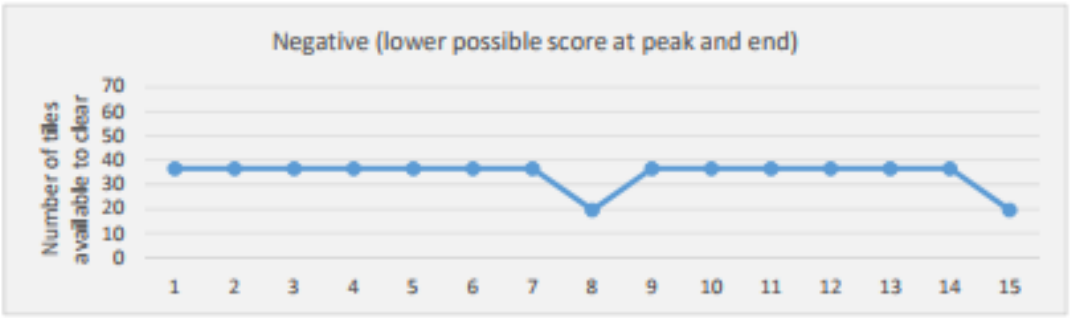
- Effects of sequences of game difficulty









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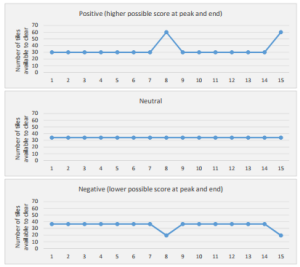
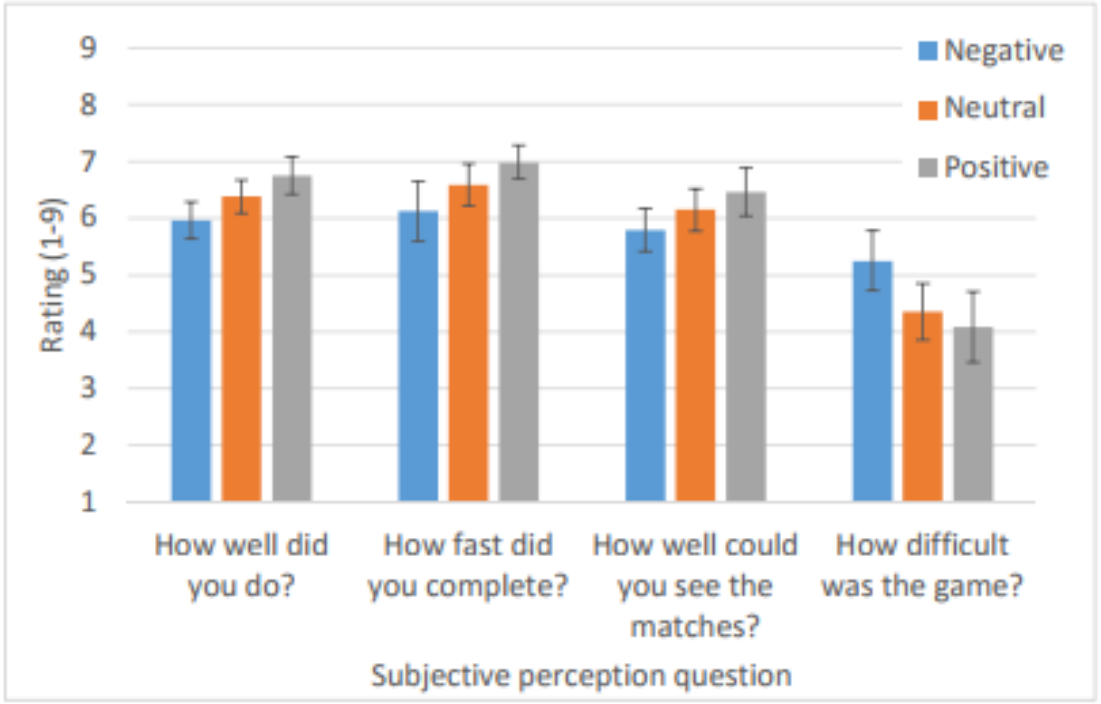
- Effects of sequences of game difficulty





Recollection of challenge was strongly influenced by peak-end effects.

Judgment and Decision Making

$3,000 for sure vs. 80% chance at $4,000.

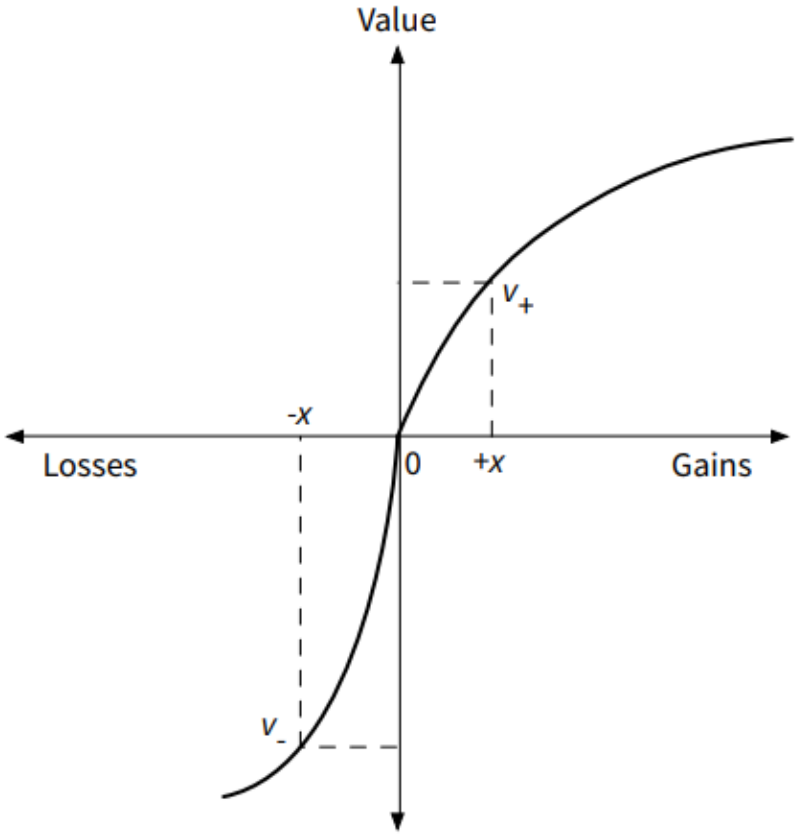
80% chance at losing $4,000 vs. a loss of $3,000 for sure.

Prospect Theory

- Daniel Kahneman and Amos Tversky (1979)
- Models the *psychological value* of outcomes
- Outcomes are measured as *gains* and *losses* relative to a neutral *reference point*.

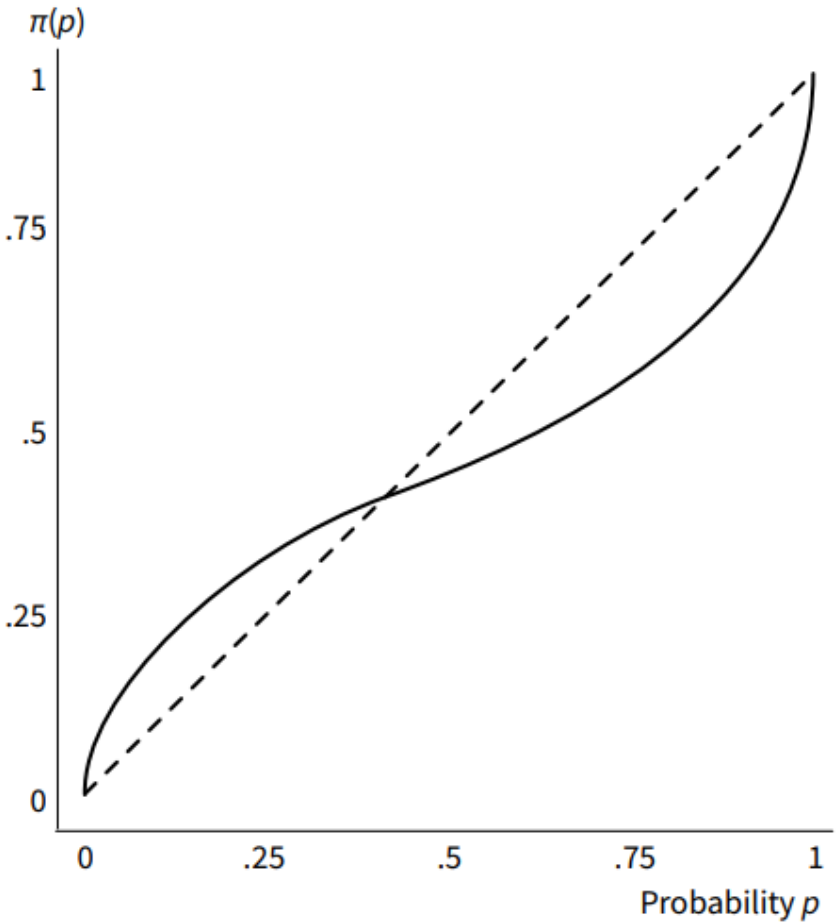
Prospect Theory

- Value function

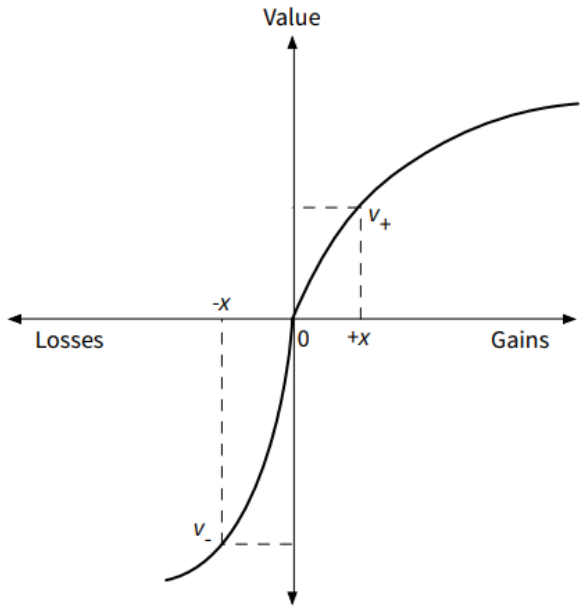


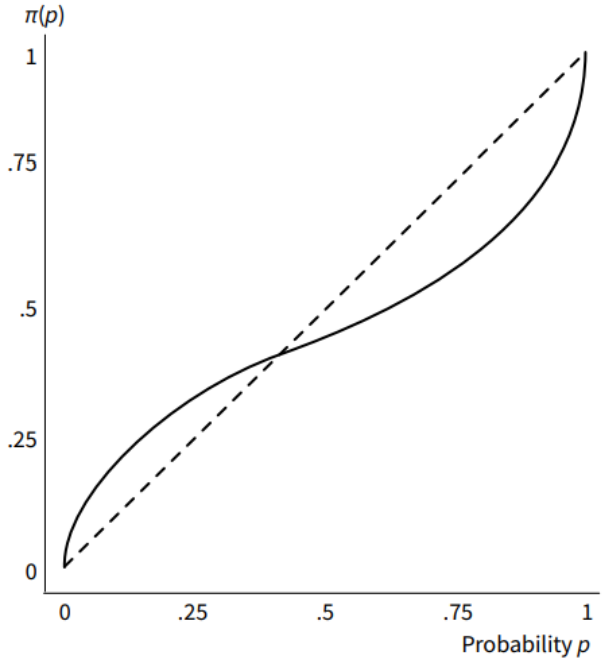
Prospect Theory

- Decision Weighting Function



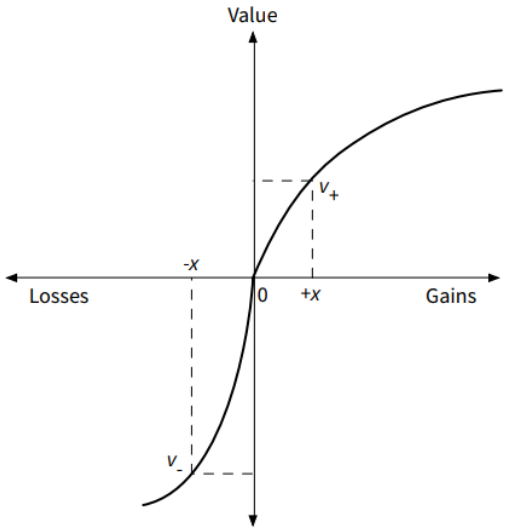
Prospect Theory

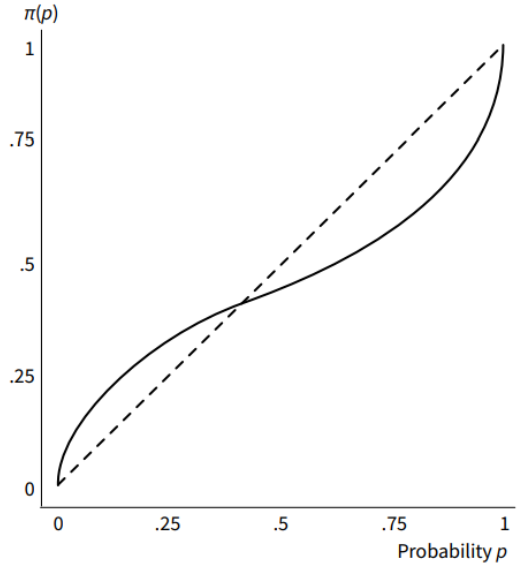




$$V(X,P) = \sum_{i=1}^{n} \pi(p_i)v(x_i).$$

Prospect Theory

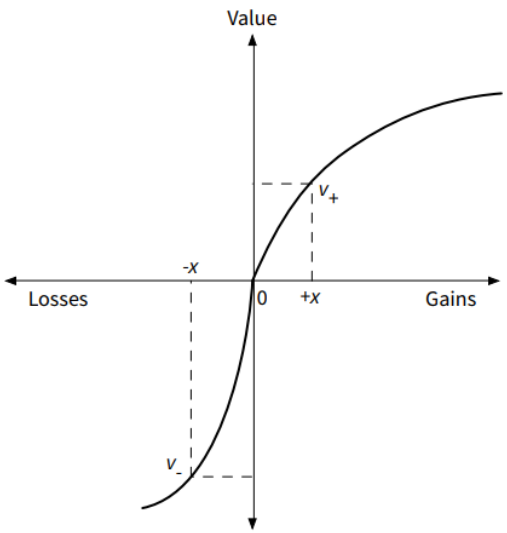


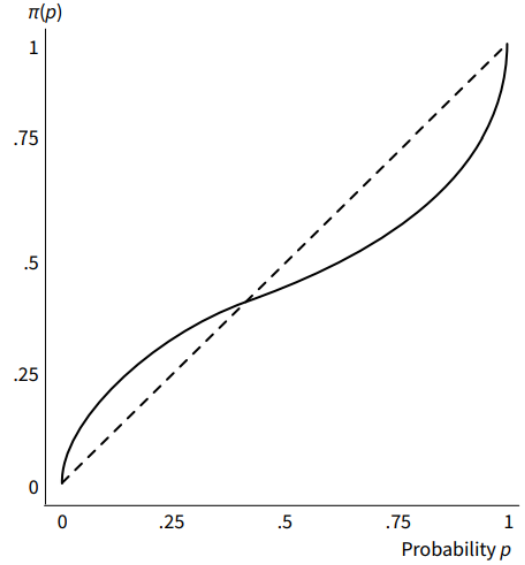


$$V(X,P) = \sum_{i=1}^{n} \pi(p_i)v(x_i).$$

Risk aversion when all outcomes of a prospect are in the domain of gains: people prefer a certain $3,000 to an 80% chance at $4,000.

Prospect Theory

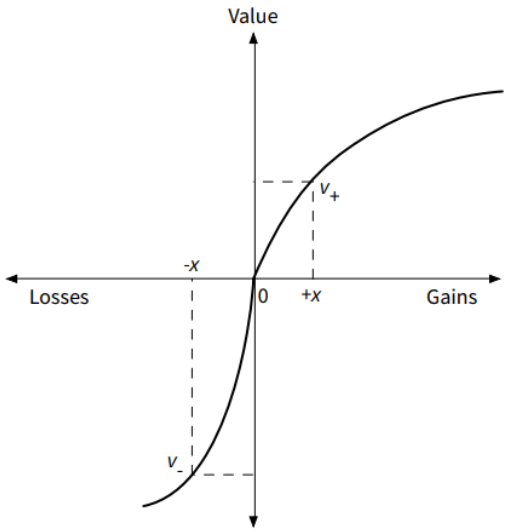


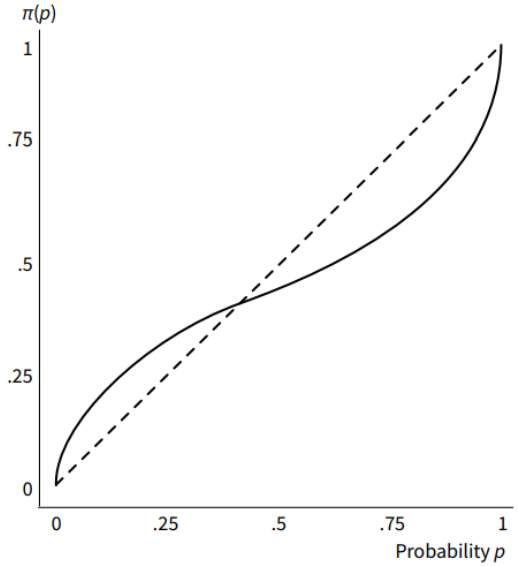


$$V(X,P) = \sum_{i=1}^{n} \pi(p_i)v(x_i).$$

Risk seeking when all outcomes of a prospect are in the domain of losses: people prefer to gamble on an 80% chance at losing $4,000 than to accept a loss of $3,000 with certainty.

Prospect Theory





$$V(X,P) = \sum_{i=1}^{n} \pi(p_i)v(x_i).$$

Loss aversion when the outcomes of a prospect are mixed: people reject a gamble with a 50% chance of winning less than $15 and a 50% chance of losing $10.

The Status-quo Bias

- A preference for the current state of affairs. The current baseline (or status quo) is taken as a reference point, and any change from that baseline is perceived as a loss.

- Why?
  - Loss aversion
  - Asymmetric experienced regret

Applications (Defaults)

- 401(k) Savings Plans
  - Default Automatic Enrollment vs. Opt-in
  - 50% higher for default automatic enrollment
- Organ donation card
  - Default Automatic Enrollment vs. Opt-in
  - 4 times higher for default automatic enrollment

Enhanced Active Choice

- First Step - Make a real choice between two options.

- Flu shot experiment
  - Group 1. (the opt-in group) People were simply asked to “Check the box if you would like to receive a flu shot”

  - Group 2. (Active Choice) check one of the following options
    - I will get a flu shot this fall
    - I will not get a flu shot this fall.

Enhanced active choice: A new method to motivate behavior change, by Punam Anand Keller et al. Journal of Consumer Psychology 21(4):376-383 · October 2011

Enhanced Active Choice

- Results

  Many more people were willing to get a flu shot in the active choice condition (62%) than the opt-in condition (42%)

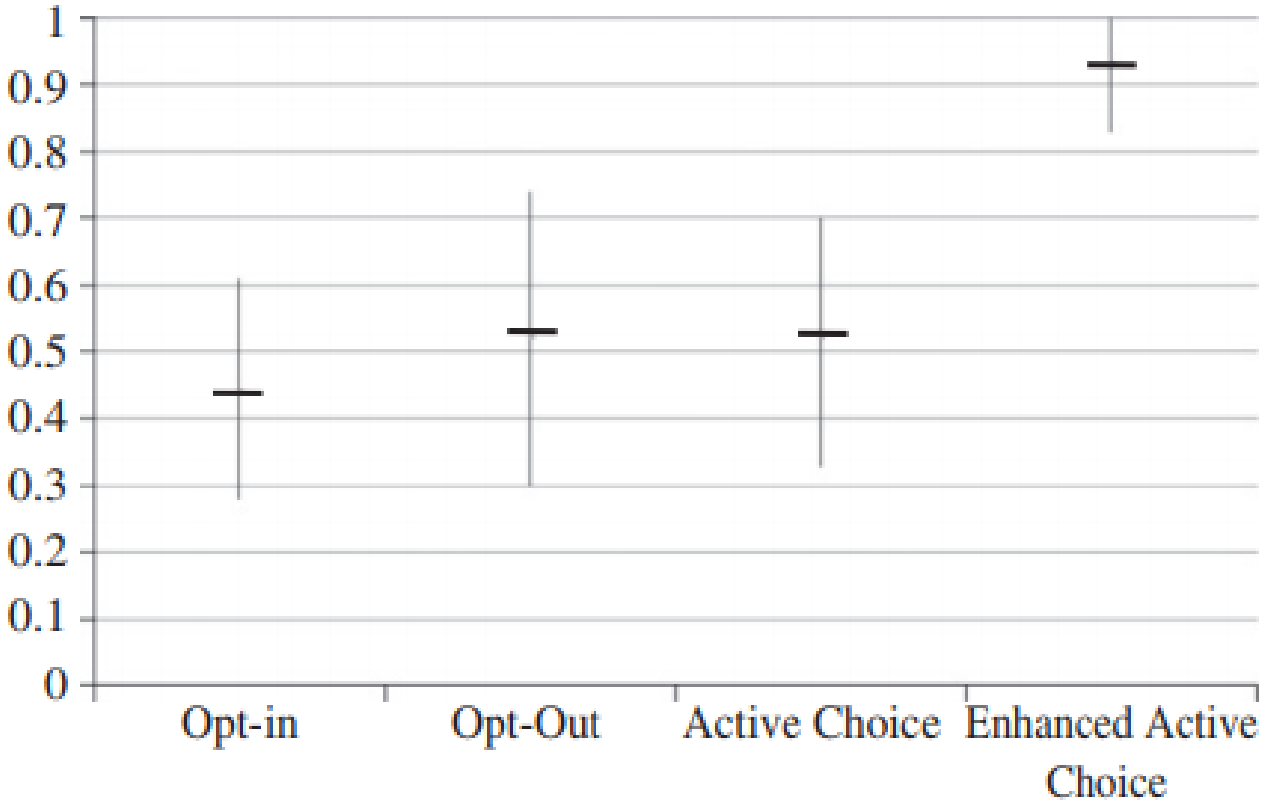
- Group 3. Enhanced Active Choice
  - I will get a flu shot this fall to reduce my risk of getting the flu and I want to save $50
  - I will not get a flu shot this fall even if it means I may increase my risk of getting the flu and I will not save $50

75%

Enhanced Active Choice

- Opt-in: Place a check in the box if you want a reminder to get a Flu Shot.
- Opt-out: Place a check in the box if you DO NOT want a reminder to get a flu shot.
- Active Choice:
  - I don’t want a reminder to get a flu shot.
  - I want a reminder to get a flu shot.
- Enhanced Active Choice:
  - I want a reminder to get a flu shot
  - I want to remind myself to get a flu shot

Enhanced Active Choice



Proportion of employees who requested a reminder to get a Flu Shot

Implication for HCI

- How to encourage users to move from a free, feature-limited version to a fully functioning paid-for one?
  - Users are required to actively choose between *two options*
  - Pointing out what users stand to lose if they remain with the free version (e.g., lose faster download times, and extra features)

Questions?