

# Better Passwords Through Prospect Theory

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## Motivation

### Challenges

- Passwords are crucial for online security; however, people continue to choose weak passwords. Password recipes and meters have limited efficacy in enforcing strong passwords.

### Research Question

- Can password selection mechanism designed under the guidance of prospect theory nudge users to select stronger passwords?

## Background

**Prospect theory** is a behavioral economic model of how people evaluate risk.

- **Framing effect:** People evaluate outcomes as positive or negative deviations from a neutral reference point; responses to losses are more extreme than responses to gains.
- **Source-dependence:** People weigh information based on its specificity; ambiguous or vague information has less impact on user decisions.

## Methods

577 participants recruited on Amazon Mechanical Turk

Each participant asked to create an account to beta-test an example website.

Users who selected weak or moderate passwords were shown interactive prompt

Condition	Interactive Prompt
Neutral (vague)	Weak passwords put your account at risk. Would you like to choose a stronger password? - Yes - No
Neutral (specific)	Weak passwords can be guessed or learned by attackers in x seconds, which may lead to the loss of personal information, including credit card info, and identity theft. Would you like to choose a stronger password? - Yes - No
Negative (vague)	Weak passwords put your account at risk. - Choose a stronger password - Ignore potential risks of financial loss and identity theft and create an account with current password.
Negative (specific)	Weak passwords can be guessed or learned by attackers in x seconds, which may lead to the loss of personal information, including credit card info, and identity theft. Would you like to choose a stronger password? - Choose a stronger password - Ignore potential risks of financial loss and identity theft and create an account with current password.
Positive (vague)	Weak passwords put your account at risk. - Choose a stronger password to reduce the risks of financial loss and identity theft. - Create account with current password.
Positive (specific)	Weak passwords can be guessed or learned by attackers in x seconds, which may lead to the loss of personal information, including credit card info, and identity theft. Would you like to choose a stronger password? - Choose a stronger password to reduce the risks of financial loss and identity theft. - Create account with current password.

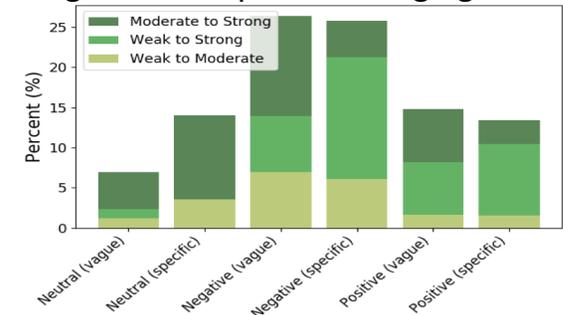
## Results

### Framing-effect

- Negative framing nudges 25% of users to improve their passwords (significantly higher than alternate interventions)
- Negative framing reduce the number of weak passwords by 20-25%.

### Source-dependence

- Source alone did not appear to have a significant impact on nudging.



## Discussion

Interventions framing weak passwords as having a negative impact on security can nudge users to select stronger passwords.

Prospect theory can form a foundation for understanding how users make security decisions and for designing mechanisms with improved security.