

# Age-Related Vulnerabilities to Social-Engineering Attacks

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## Background

- Spear-phishing emails apply different
  - Life Domains:** health, finance, legal, ideological, security, social *Baltes et al., 2006*
  - Psychological Weapons of Influence:** perceptual contrast, authority, scarcity, reciprocity, consistency, social proof *Cialdini, 2006*
- General Assumption:** older adults are particularly at risk for cyber attacks
  - General cognitive processing capacities and deception sensitivity decline with age, while self-reported trust increases *Ebner et al., 2016; Mather, 2006; Verhaeghen & Salthouse, 1997*

## Questions

- Do younger and older Internet users differ in susceptibility to spear-phishing attacks?
- Which weapon(s) is/are particularly effective?
  - Does effectiveness of weapons vary by age group?
- Which domain(s) is/are particularly effective?
  - Does effectiveness of domain vary by age group?

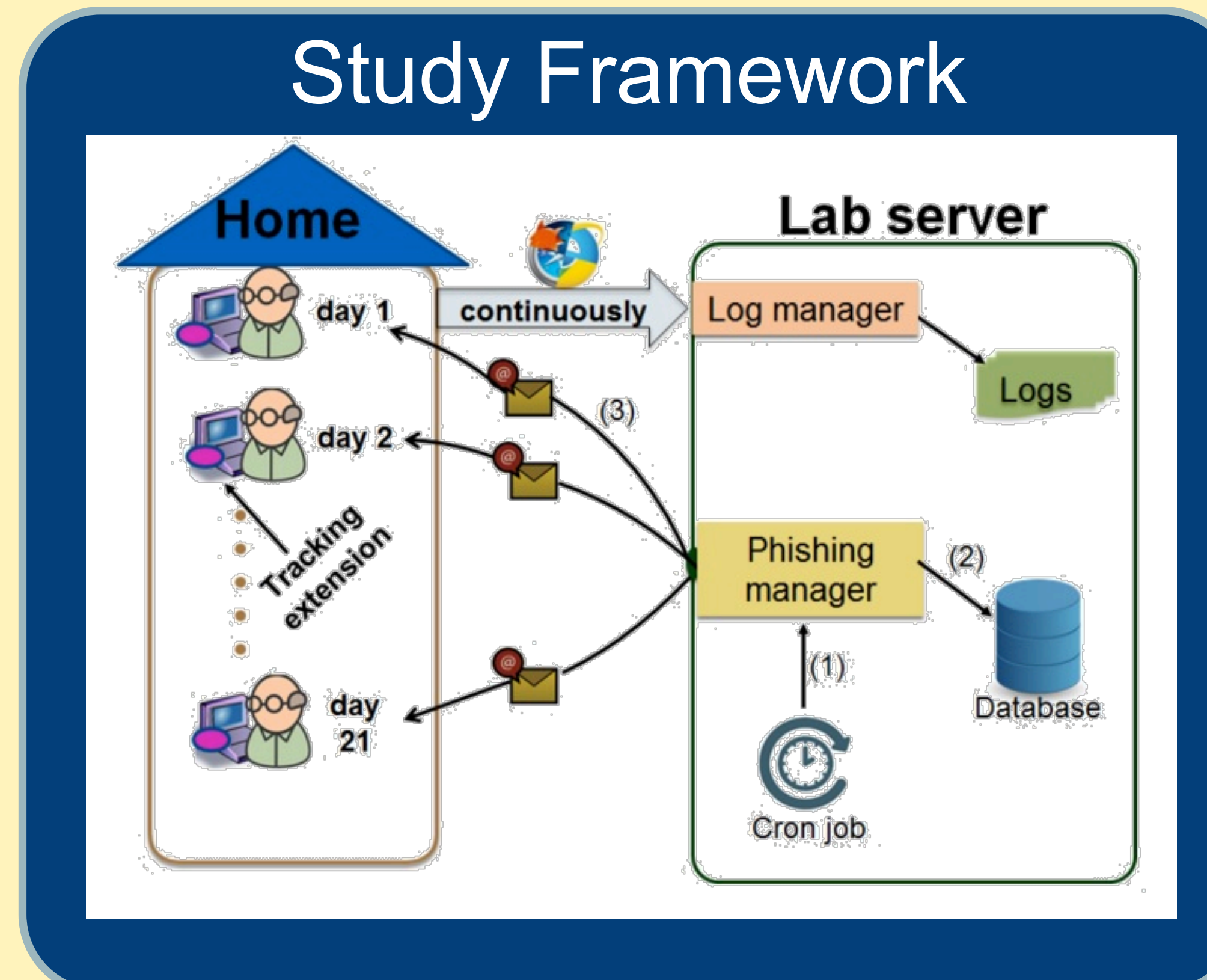
## Methods

### Sample:

- $n = 100$  young adults (range: 18-37 yrs, 56% female)
- $n = 58$  older adults (range: 62-89 yrs, 43% female)

### Study Procedure:

- Installation → 21 day study session → Uninstallation
- Participant web browsing activity; **Merlin web browser plugin** recorded URLs visited
- Participants received daily spear-phishing emails (counterbalanced by domains and weapons)
- On final day, participants were asked to rate perception of their susceptibility to a complementary set of phishing emails



Subject: Emergency Contact Notice

Hello \*Name\*,

You have been named an emergency contact for someone who was taken into custody as of yesterday at 7 p.m. You have two days to contact the prisoner in question by following the link below. Due to confidentiality protocols, all information about the signer's situation is held in a secure portal for you to view and cannot be displayed in this email.

Access our secure portal here: <http://www.harbenlock.com/contact-legal/>

Thank you,

~Name~

~County~ Corrections Correspondent

Box 1. Example of spear-phishing email utilizing **Authority** (Weapon of Influence) and **Legal** (Domain)

- Susceptibility to spear-phishing email attacks:** clicking on email link provided in email.

## Data Analysis

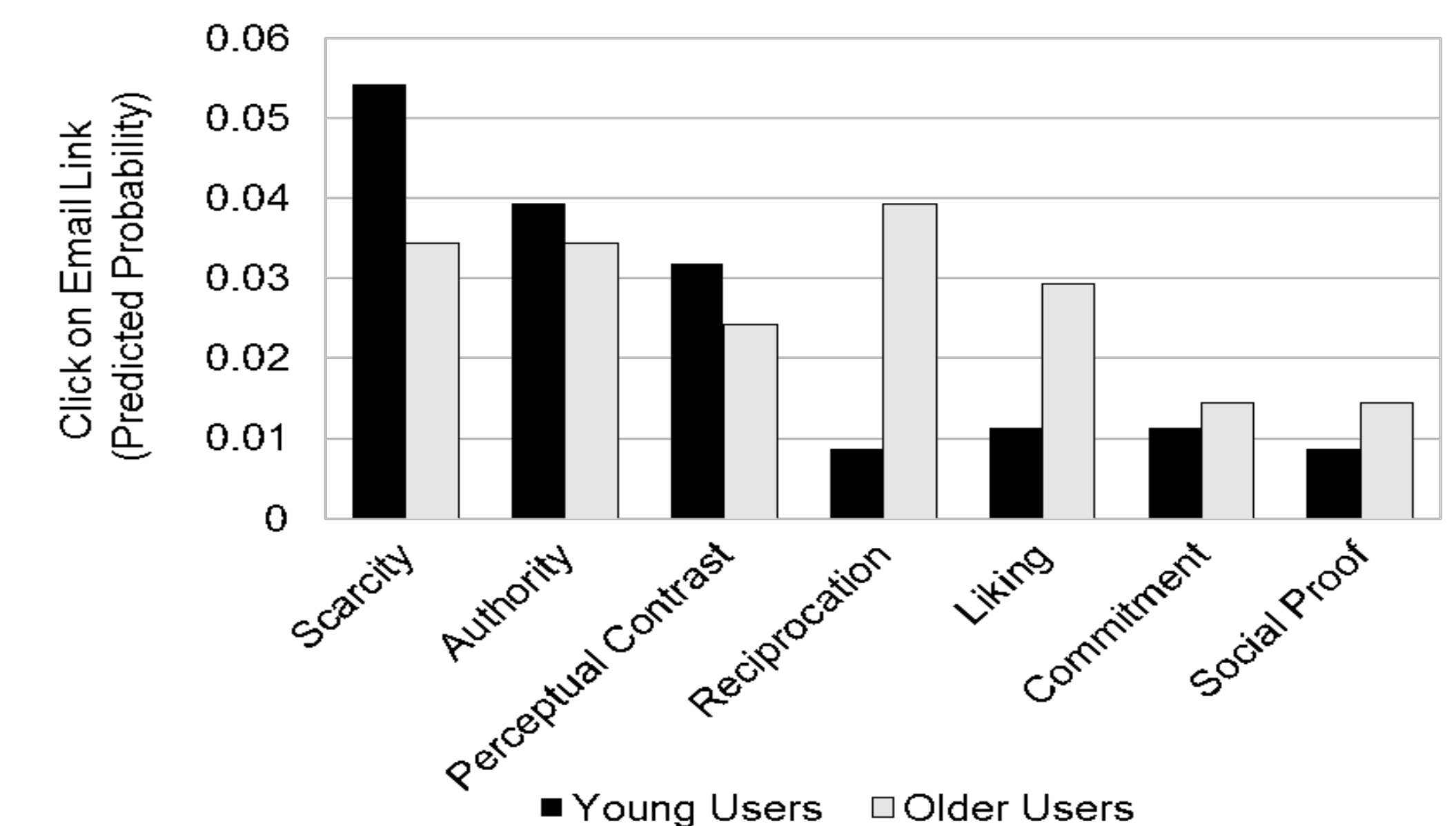
- Hypothesis 1. Age-related susceptibility**  
Multi-level logistic regression  
Significant Age x Gender interaction ( $B = .98, z = 2.02, p = .04$ )
- Hypothesis 2. Susceptibility to Weapons**  
Multi-level logistic regression  
Significant Age effect ( $B = -.34, z = -4.79, p < .001$ )
- Hypothesis 3. Susceptibility to Life Domains**  
Multi-level logistic regression  
Significant Age effect ( $B = -.41, z = -4.91, p = .001$ )

## Results

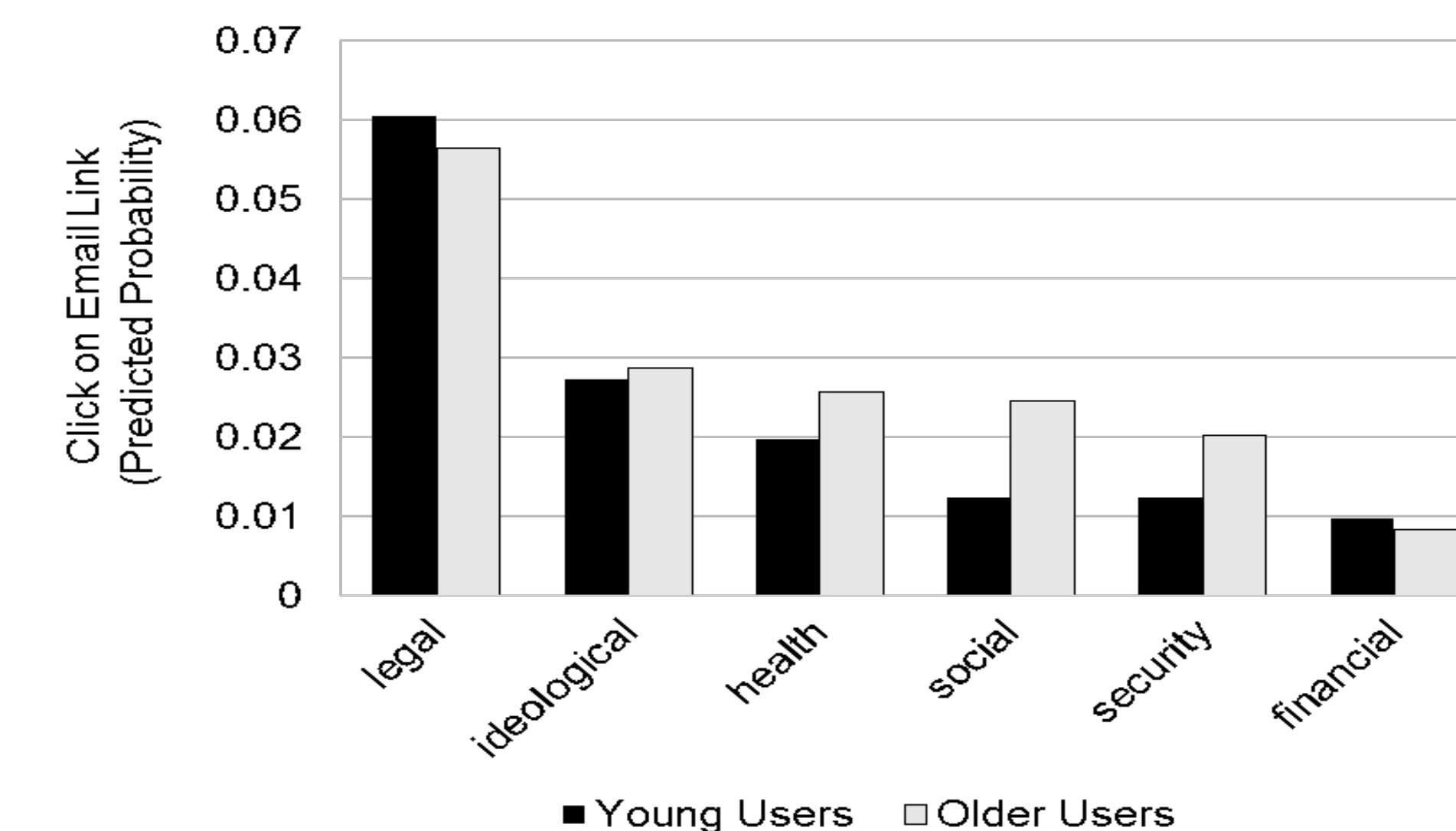
**1. High susceptibility to spear-phishing attacks across total sample**  
More than **40%** of participants clicked on at least one email link; 12% clicked on more than one email link.

**2. Significant Age by Gender interaction in susceptibility to spear-phishing.** In particular older women ( $B = .98, z = 2.02, p = .04$ ).

**3. Susceptibility to Weapons of Influence**  
Younger: Scarcity;  
Older: Reciprocation  
All: Authority



**4. Susceptibility to Life Domains**  
Younger: Legal most effective, minimal efficacy of other domains; Older: Legal most effective, moderate to low efficacy of other domains



**5. Exploratory: Susceptibility Awareness**  
Participants rated a complementary set of 21 spear-phishing emails on how **likely** (1=not at all; 5 = very much) they were to click on the email link.  
There was a significant age effect ( $B = -.78, z = -2.11, p = .035$ ) in that younger users ( $M = 2.30, SD = .92$ ) reported higher susceptibility awareness than older users ( $M = 1.96, SD = .93$ ). This is unique contrast to users' observed behavioral susceptibility.

## Discussion

- Overall high attack susceptibility, low susceptibility awareness - particularly pronounced in older women.
- Younger adults most susceptible to scarcity, older adults most susceptible to reciprocation, all susceptible to authority.
- Defense approaches **should not come as a "one-size-fits-all"**, but consider age-by-gender variations.
- Future Directions:** development and validation of detection and warning tool for age-tailored use.

Interested in meeting the PIs? Attach post-it note below!

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WHERE DISCOVERIES BEGIN

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