

Phishing in International Waters

Exploring cross-national differences in phishing conceptualizations between Chinese, Indian, and American samples

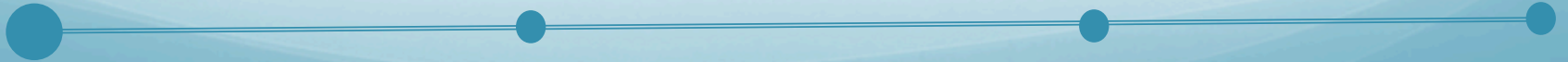
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Outline

- Background
- Method
- Results
- Discussion



Phishing phenomenon

I applied for a **part time job through Craigslist** and had to do a **credit check** to successfully apply. I thought it was OK since lots of employers now do credit checks. I **entered my social** and lots of other information... By next week I had several pings in my credit report of **suspicious activity**. Someone had taken out a credit card in my name and also tried to get a loan. I was scared, honestly, that someone could use my information in that way. I was also angry...

- Some statistics...
 - 37000 unique phishing attacks monthly
 - 3 billion dollars lost annually
- Additional personal costs as well

Introduction



Dear Customer,

Currently we are trying to upgrade our on-line security measures. All accounts have been temporarily suspended until each person completes our secure online form. For this operation you will be required to pass through a series of authentications.

We won't require your ATM PIN number or your name for this operation!

To begin unlocking your account please click the link below.

https://www.chase.com/security/do_auth.jsp

Please note:

If we don't receive your account verification within 72 hours from you, we will further lock down your account until we will be able to contact you by e-mail or phone.

2006 JPMorgan Chase & Co.

Steps to tackle phishing

- More concentration on the technology
 - Client-side anti-phishing tools
 - Browser plug-ins
- Crucial to deal with people problem to ensure security
- Downs, Holbrook & Cranor (2006)
 - Lack of perceived vulnerability
 - Inability to use effective strategies to identify phishing emails
 - Do not generalize cautious behavior to unfamiliar risk

Studies regarding phishing susceptibility

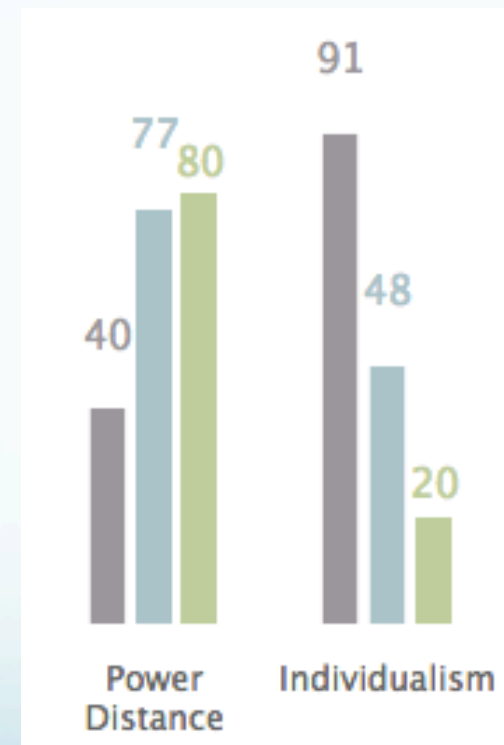
- Downs, Holbrook & Cranor (2006)
 - Users have difficulty understanding the security mechanisms like encryption
 - Users utilize defective techniques
- Downs, Holbrook & Cranor (2007)
 - Users knowledgeable about internet mechanisms less likely to fall for phishing
- Sheng et al. (2010)
 - Participants between 18-25 years and females more likely to fall for phishing
- But all these studies were conducted in the US
 - Results may not generalize to people from other nations

Cross-National Differences

- Kumaraguru & Cranor (2006)
 - Overall lack of awareness of privacy issues
 - Less concern about privacy in India
- Marshall et al. (2008)
 - American students were more cautious about online privacy as compared to Indian students
- Gupta, Iyer & Weisskirch (2010)
 - Indian consumers were more willing to share potentially sensitive information
- Kshetri (2013) studied cybersecurity issues in China
 - Recent access to the Internet
 - Predominant use of English on the Internet
 - Positive perception of hackers

Cross-national differences

- Tsai & Men (2012)
 - Compared Americans and Chinese in social networking sites
 - Chinese Society
 - High power-distance
 - Collectivist
 - Value interdependence
 - Emphasize group goals
 - American Society
 - Low power-distance
 - Individualist
 - Value independence
 - Emphasize personal goals
- India is similar to China



Source: <http://geert-hofstede.com/united-states.html>

Current study

Our study aims to shed light on

- Phishing conceptualization by Americans, Indians and Chinese participants
- Understanding the likely response to phishing attacks
- Necessity of considering nationality to customize training and other anti-phishing solutions

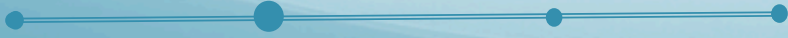
Method: Participants

- Total sample size = 164
 - American participants = 50
 - Indian participants = 61
 - Chinese participants = 63
- American and Indian participants recruited using mTurk
- Chinese participants recruited using snowball sampling
- Age and Education acted as covariates in the analysis

Table 1. Participants' Characteristics.

<i>N</i> = 164			
	American (<i>n</i> =50)	Indian (<i>n</i> =61)	Chinese (<i>n</i> =53)
Age	<i>M</i> = 37.84 <i>SD</i> = 15.85	<i>M</i> = 28.28 <i>SD</i> = 7.85	<i>M</i> = 25.04 <i>SD</i> = 5.41
Education ¹	<i>M</i> = 3.72 <i>SD</i> = 1.03	<i>M</i> = 4.10 <i>SD</i> = 0.72	<i>M</i> = 3.64 <i>SD</i> = 1.37
Gender	Males = 25 Females = 25	Males = 40 Females = 21	Males = 23 Females = 29
Race	White = 37 Asian = 7 Black = 3 Hispanic/Latino = 3 Multiracial = 1	Asian = 58 Other = 3	Asian = 53

Note:¹ Choices were: 1 = Did not graduate high school, 2 = High school graduate/ GED, 3 = Some college or technical, trade, or business school, 4 = Bachelor's Degree, 5 = Master's Degree, 6 = M.D., Ph.D. or some advanced Degree



Method: Tools

- **Computer Usage and Risk Profile Tool**

Information about demographics and computer usage as well as a risk profile (Nyeste & Mayhorn, 2009).

- **Phishing Survey**

A survey using the Qualtrics online survey tool for collecting data

- **Perceptions of phishing**

Sought definition of phishing in participants' own words

- **Factors related to phishing**

Asked about the perceived consequences of phishing, characteristics of phishing attacks and types of media where phishing occurs

- **Personal Phishing experiences**

Asked to share their personal phishing experiences



Method

Method: Procedure & Data Analysis

- Procedure
 - Participants followed a link to the survey
 - At first, informed consent and demographic information was obtained
 - Then other set of questionnaires followed
- Data Analysis
 - Responses to each question were averaged across samples
 - Frequency data
 - Logistic Regression Analysis
 - Multivariate analysis of covariance (MANCOVA)

Method



Results

- Cross-national differences
 - Likelihood of being phished
 - Risk profile
 - Agreement regarding
 - Characteristics of phishing
 - Types of media where phishing occurs
 - Consequences of phishing



Results

Results: Likelihood of Being Phished

- Victims of phishing
 - 14% American participants
 - 31% Indian participants
 - 9% Chinese participants
- Logistic regression analysis conducted
- Indians significantly more likely to be phished than Americans
 - Americans 69% less likely to be phished than Indians
- No significant difference between American and Chinese participants
- Age & Education were not significant

Results



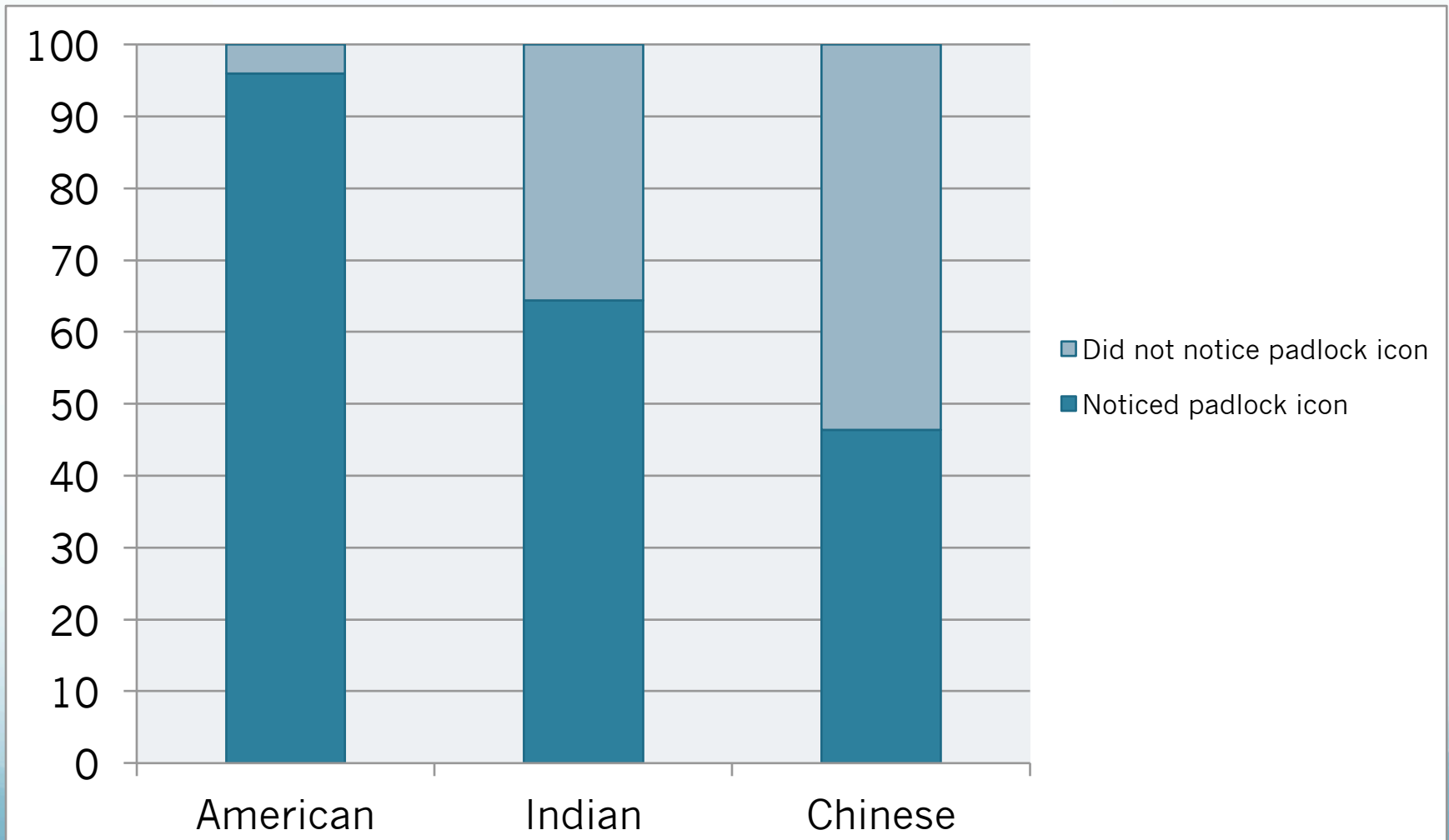
Results: Noticing the padlock icon

- Logistic regression analysis conducted
- Chinese & Indian participants were significantly different than Americans.
- Americans were 93% more likely to *notice the padlock icon* than Indians
- Americans were 97% more likely to *notice the padlock icon* than Chinese
- Age and education were not significant



Source: <http://www.electroflip.com/customer-service/>

Results: Noticing the padlock icon



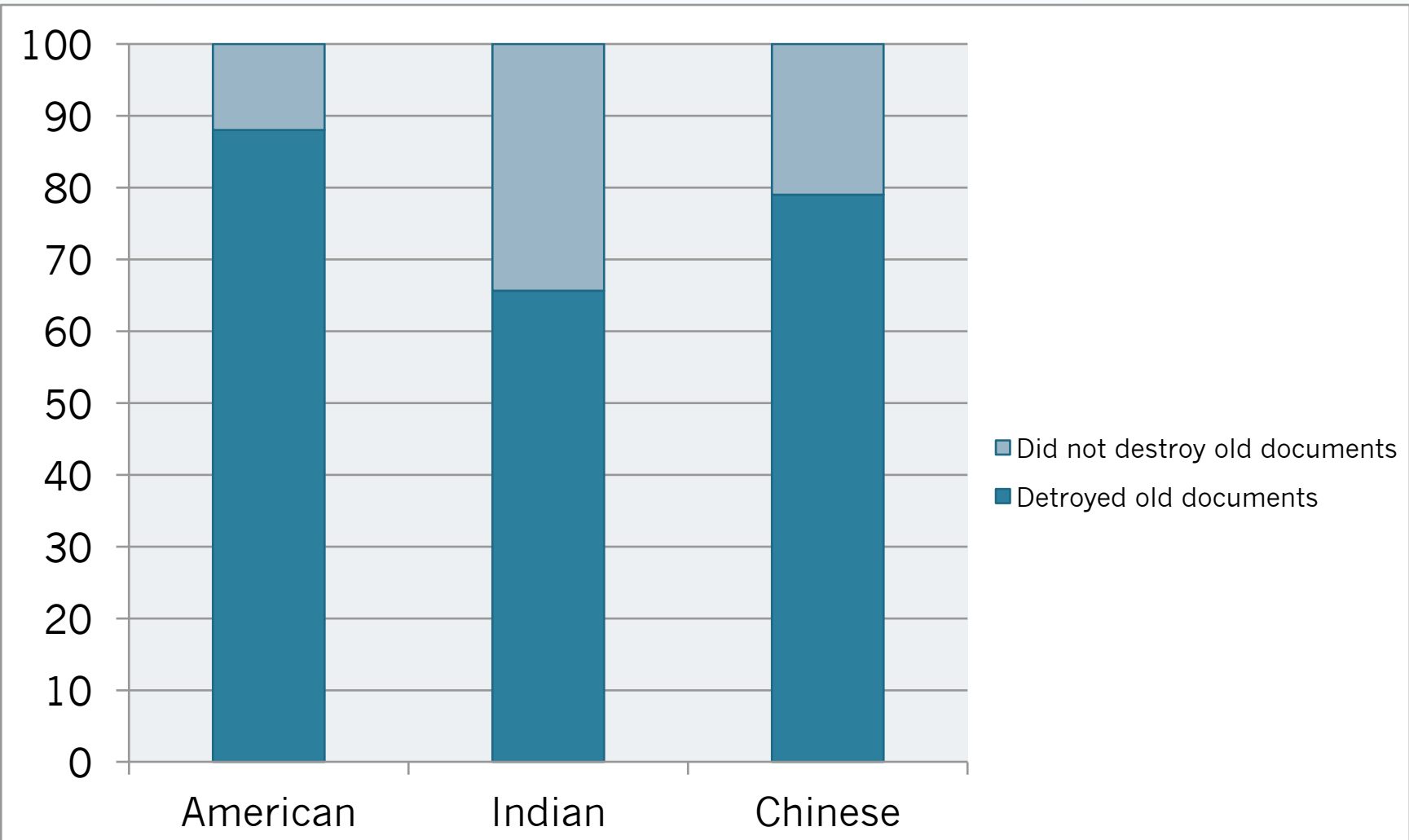
Results: Destroying Old Documents

- Logistic regression analysis conducted
- Indian participants were significantly different than Americans
- No difference between American and Chinese
- Americans were 73% more likely to *take measures to destroy old documents* than Indians
- Age and education were not significant



Results

Results: Destroying Old Documents



Results: Agreement ratings

- Multivariate analysis of covariance (MANCOVA) was conducted
 - Five characteristics of phishing as DV, *for example*
 - *sender pretending to be member of an organization one belongs to*
 - *sender pretending to be a friend or a family member and*
 - *sender pretending to be a member of an organization one does not belong to*
 - Six types of media as DV, *for example*
 - *Email*
 - *Facebook and other networking sites*
 - *Webpage*
 - Seven phishing consequences as DV, *for example*
 - *Providing private information to unauthorized person*
 - *Experiencing identity theft*
 - *Lost money or property*

Results



Results: Agreement ratings

- Multivariate analysis of covariance (MANCOVA)
 - Nationality (*American vs. Indian vs. Chinese*) as grouping variable
 - Age and Education as covariates
- MANCOVA results were significant
 - $F(36,286) = 2.27, p < .001, \eta^2 = .22$
- Three nationalities differed in all the agreement ratings

- Age did not influence the agreement ratings
 - $F(18,142) = 1.29, p = .20$

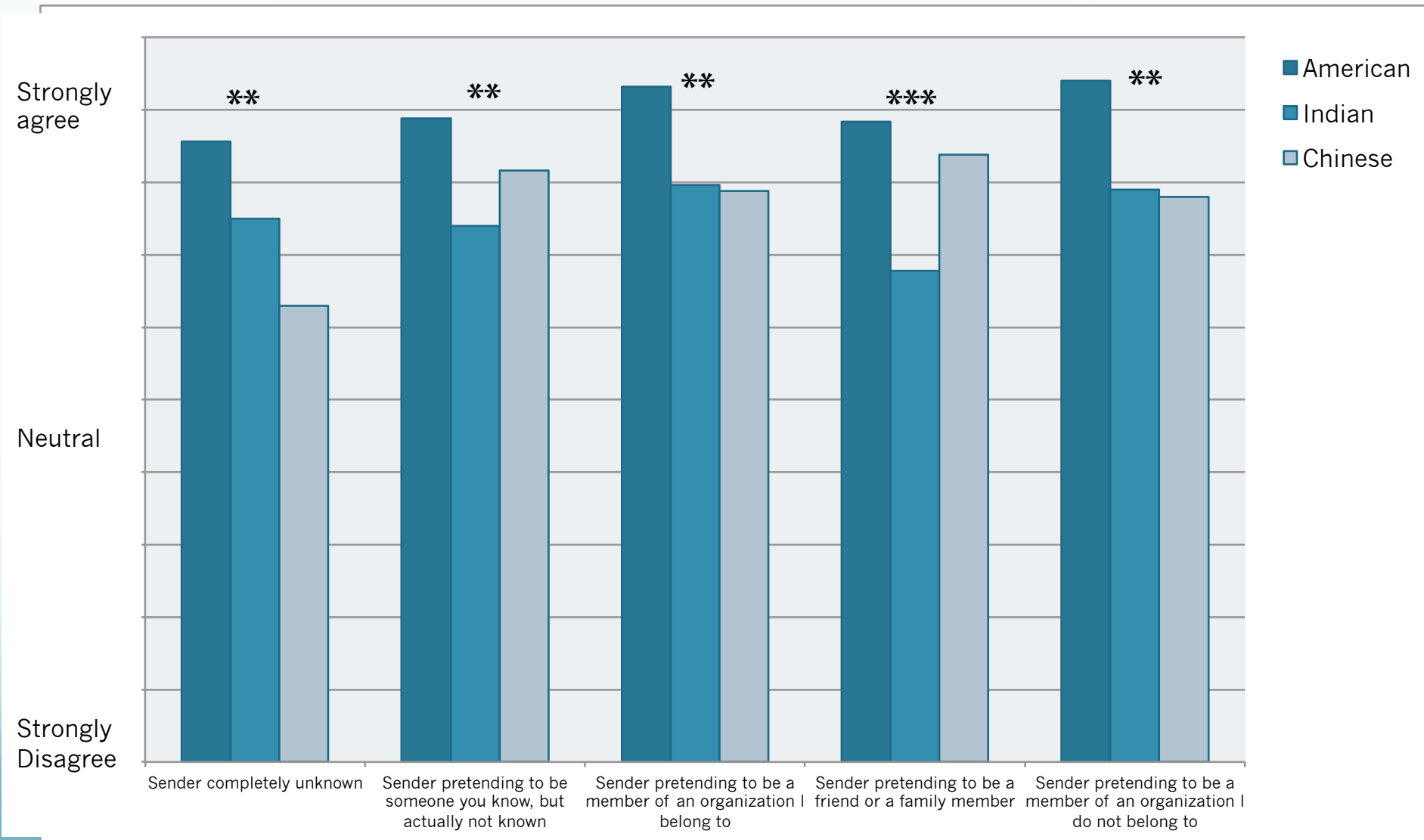
- Education did not influence the agreement ratings
 - $F(18,142) = .64, p = .86$

- Univariate analysis indicated differences in agreement ratings for all sub-factors except
 - *face-to-face communication*

Results

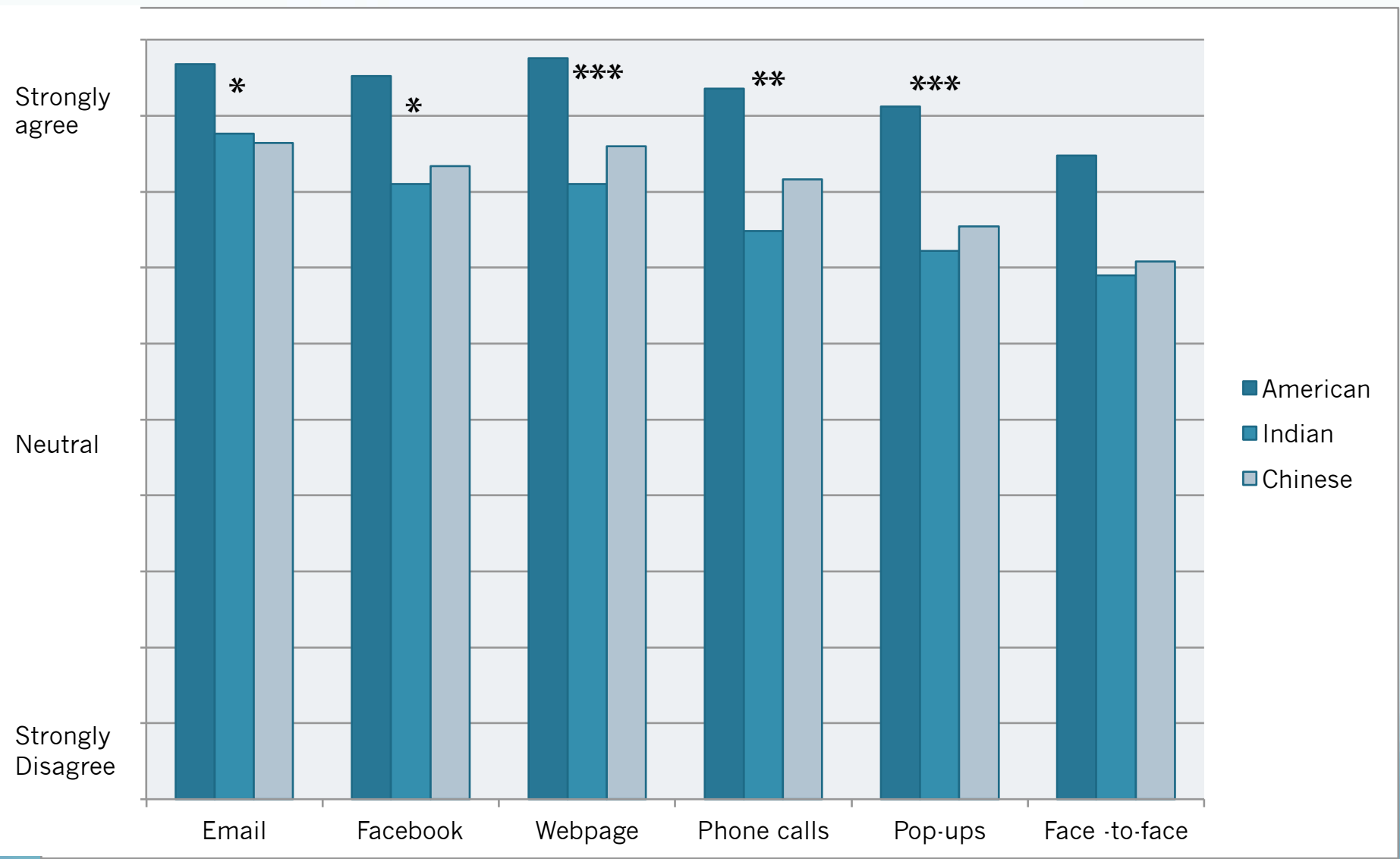


Results: Characteristics of Phishing



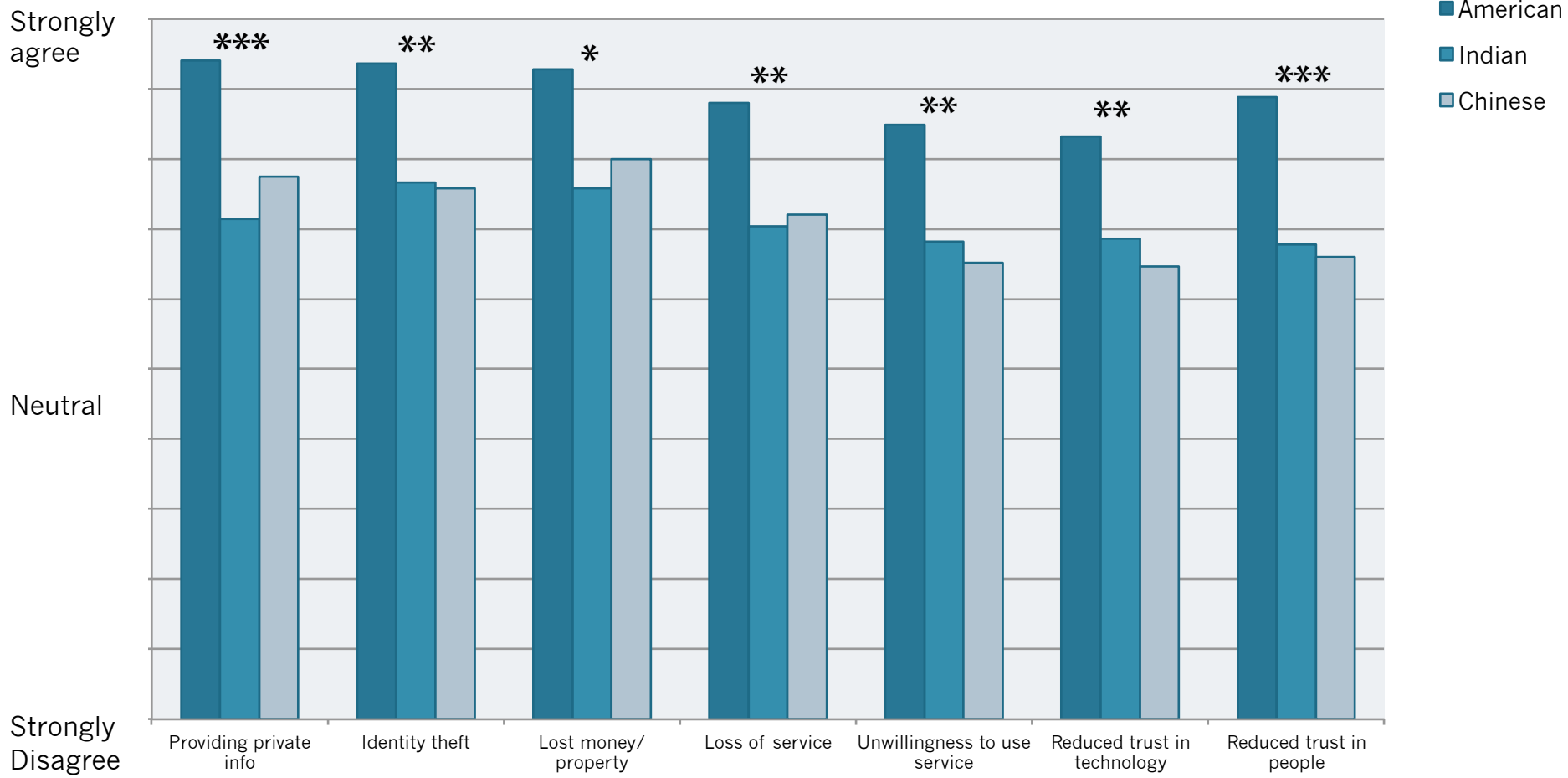
Note: *** $p < .001$; ** $p < .01$; * $p < .05$. 1= strongly disagree, 2= partly disagree, 3= neutral, 4=partly agree, and 5=strongly agree

Results: Types of media where Phishing occurs



Note: *** $p < .001$; ** $p < .01$; * $p < .05$. 1= strongly disagree, 2= partly disagree, 3= neutral, 4=partly agree, and 5=strongly agree

Results: Phishing consequences



Note: *** $p < .001$; ** $p < .01$; * $p < .05$. 1= strongly disagree, 2= partly disagree, 3= neutral, 4=partly agree, and 5=strongly agree

Discussion

- Almost everyone recruited for this study had experienced a phishing attempt
- Phishing victims
 - Indians more likely to fall for phishing
- Indian participants may not be engaging in optimum online safety behaviors
 - India as a culture has high power distance
 - Indians may show more deference to someone they perceive to be in an authority position
 - Surprisingly, Chinese participants do not show the same pattern
 - Expression of power distance different in web domain

Discussion

- Cross national differences in risk profile
 - Americans are more aware of privacy
 - May generalize it to safer online behavior
 - But current Asian sample may have started engaging in safer online behavior in general
- Agreement regarding factors related to phishing
 - American participants agreed significantly more than Indians & Chinese participants
 - Difference in agreement regarding characteristics of sender belonging to organizations
 - American participants are more vigilant against and knowledgeable about phishing
 - Translated into online safety practices
 - Difference in Internet experience

Informing the Science of Security

- Realization that culture may influence cyber-security
- American society low on power-distance
 - Americans may verify the source of the communication
 - Acts as protective factor in addition to higher Internet experience
- Indian and Chinese societies high on power-distance
 - May show more deference and no verification of authority
 - Power distance may be expressed differently in web domain for Chinese
- Design of training needs to be sensitive to cultural differences
 - Consider the possible lack of knowledge of safe online behavior
 - Should include an educational component tailored to meet individual as well as group needs
 - Can emphasize loss for community due to falling for phishing
 - More hand-holding based on nationality to verify the security

Limitations

- Self-report data may not reflect actual behavior
- Cultural bias in interpreting the rating scale
- Using mTurk,
 - Possibility that participants may have chosen an arbitrary option to just complete the task

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Thank you!

Cross- national differences in conceptualizing phishing exist.

Americans seem more knowledgeable about phishing and thus cautious and wary as compared to other two Asian participants.