

NFC Token vs. Card-Reader: A Large-Scale Study of Preferences in Smartphone Authentication

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AHEAD iTec Workshop: New trends in combining high security and user experience of mobile applications

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Project Introduction

- ***Innovation and adaptation of authentication technologies for secure digital environment***
- 2/2018-2/2020
- Supported by Technological Agency of Czech Republic
- Cooperation between Centre for Research and Applied Cryptography Faculty of Informatics Masaryk University, Interdisciplinary Research Team on Internet and Society at the Faculty of Social Studies MU, and AHEAD iTec, s.r.o./Monet+

Background

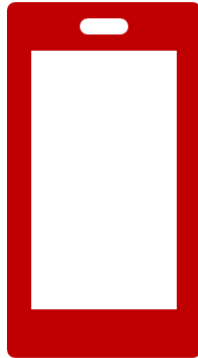
- Mandatory 2FA since September 2019
- Widely used SMS code
- Need for a different authentication method that is
 - Easy to use
 - Secure
 - Well-accepted

Large-Scale User Study

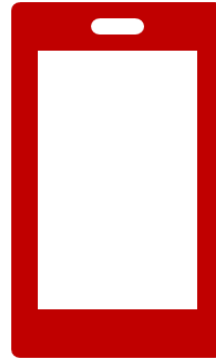
- Goal: To evaluate usability, perceived security, and preference of various authentication methods
 - Token vs. card-reader
 - PIN, fingerprint
- N = 250 (aged <55) + 250 (aged 55+)
- Undergoing data collection
- Preliminary results

Study Design

Task
TOKEN



Task
CARD-READER



Questionnaire

- Demographics
- Security Attitudes
- Smartphone Security Behavior



Task Evaluation
Questionnaire



Task Evaluation
Questionnaire



Questionnaire

- Authentication Method Evaluation
- Authentication Method Usage
- Online Banking Usage



IDport



YourBank



Sample

Age group <55

- N = 250
- Data collected by a professional survey agency
- Representative sample

Age group 55+

- N = 174 (ongoing data collection)
- Data collected by Masaryk university research team
- Convenience sampling + snowball sampling

Sample (continued)

Age group <55

- N = 238
- Age $M = 38.76$, $SD = 9.16$
- Males 45%, females 55%
- Education
 - Primary 4.2%
 - Secondary 62.6%
 - Tertiary 33.2%
- Work status
 - Full-time 69.3%
 - Part-time 9.2%
 - Maternity leave 11.8%

Age group 55+

- N = 174
- Age $M = 62.8$, $SD = 6.71$
- Males 37%, females 63%
- Education
 - Primary 3.5%
 - Secondary 56.1%
 - Tertiary 40.4%
- Work status
 - Full-time 49.4%
 - Part-time 4.2%
 - Retired 45.2%

Results

- Online Banking Experience
- Two-Factor Authentication Experience
- **Perceptions of „tested“ authentication methods:** PIN, fingerprint, token, card-reader
- **Preferences for specific authentication methods** and their combinations

Online Banking Experience

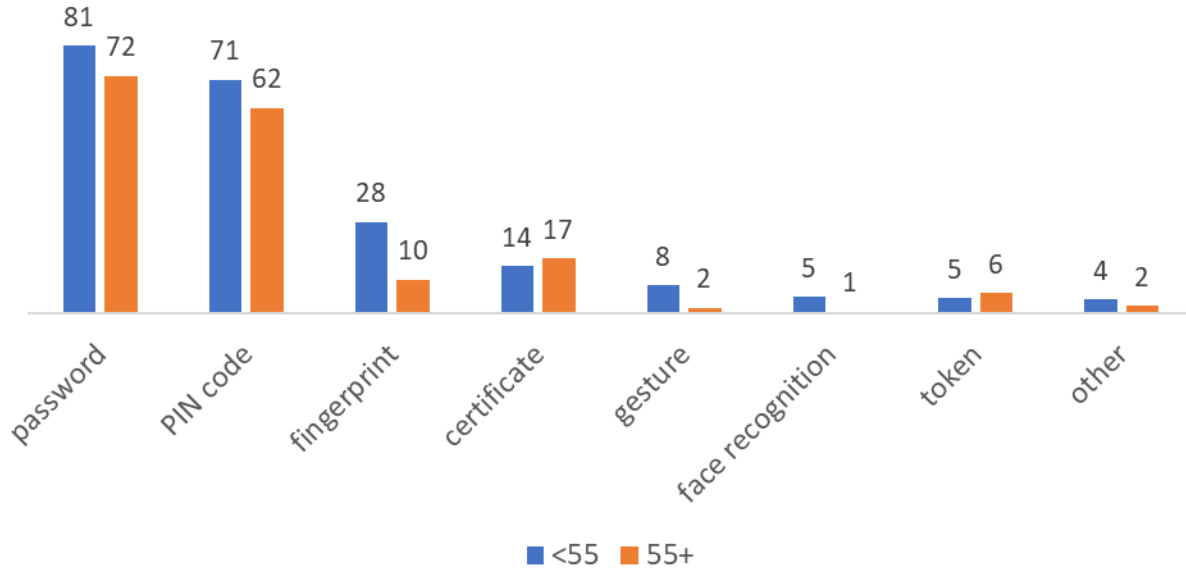
Age group <55

- 93.3% use online banking
 - Online banking on PC
 - 78.6% (N = 187)
 - $M = 8.50, SD = 4.54$
 - Banking application on a mobile device
 - 50.8% (N = 121)
 - $M = 4.39, SD = 2.85$
 - Internet browser on a mobile device
 - 20.2% (N = 48)
 - $M = 4.65, SD = 3.18$

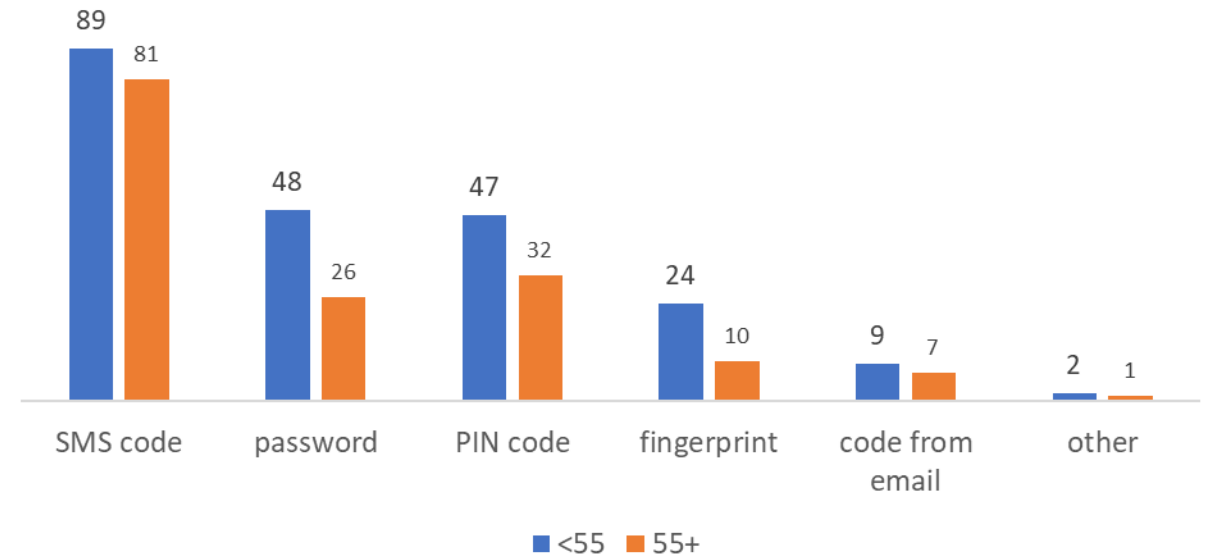
Age group 55+

- 87.4% use online banking
 - 82.8% (N = 144)
 - $M = 8.97, SD = 5.14$
 - 23% (N = 40)
 - $M = 4.50, SD = 3.55$
 - 9.2% (N = 16)
 - $M = 4.14, SD = 2.41$

Which authentication methods have you used to:
LOG IN to online banking?



Which authentication methods have you used to:
CONFIRM A PAYMENT in online banking?



Two-Factor Authentication Experience

Age group <55

- 84.5% use two-factor authentication

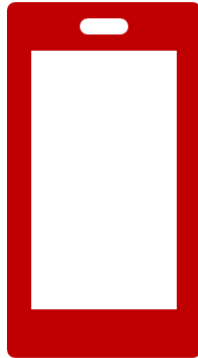
Age group 55+

- 83.9% use two-factor authentication

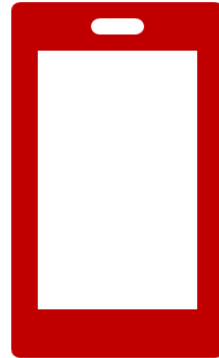
	% <55	% 55+
log-in information + SMS code	61.3	58.6
card details + SMS code	49.6	50.0
log-in information + fingerprint	16.0	8.0
fingerprint + SMS code	11.3	6.3
log-in information + token	7.0	7.5
other	3.4	1.7

Study Design - Refreshment

Task
TOKEN



Task
CARD-READER



Questionnaire

- Demographics
- Security Attitudes
- Smartphone Security Behavior



Task Evaluation
Questionnaire

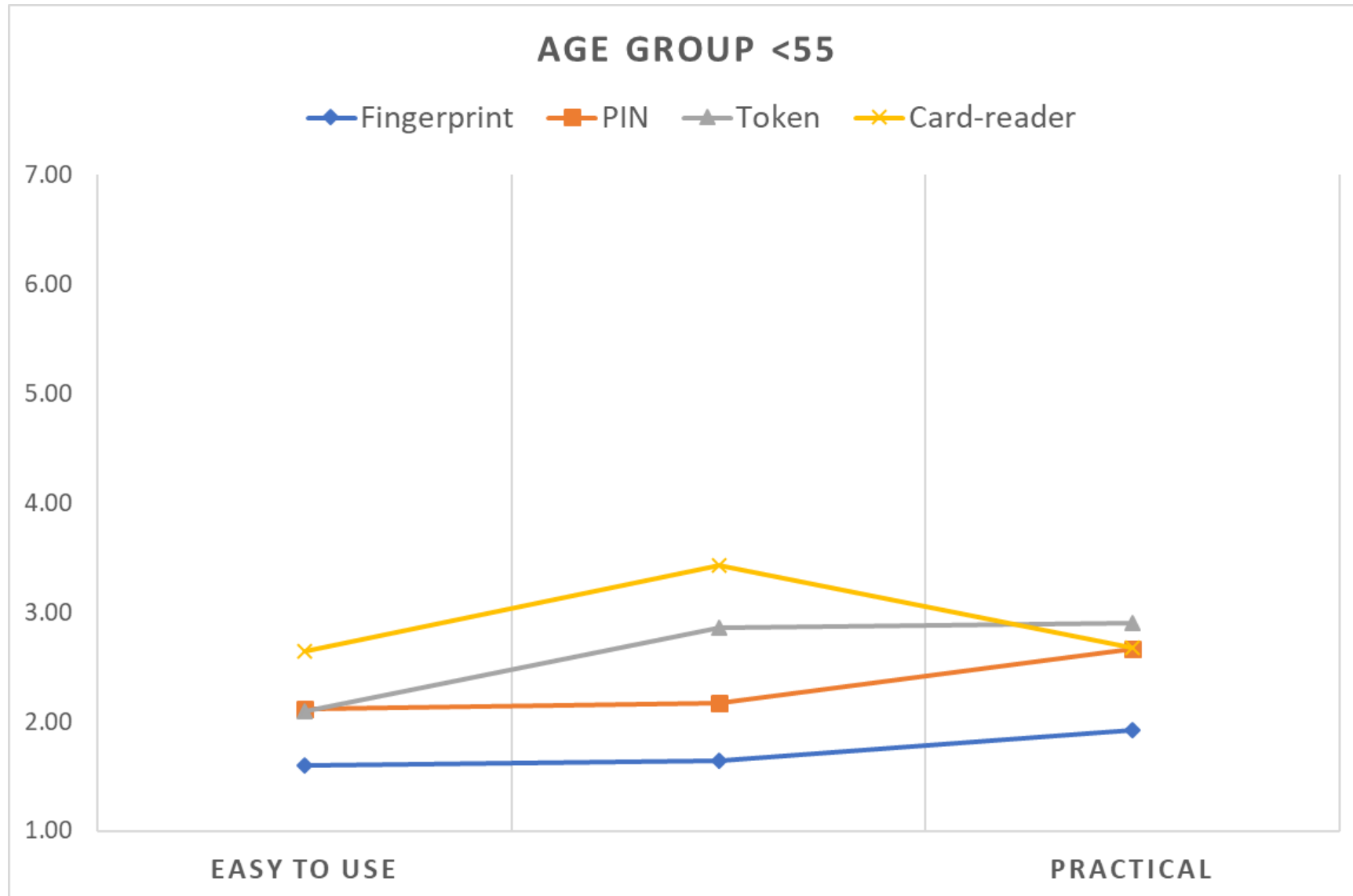


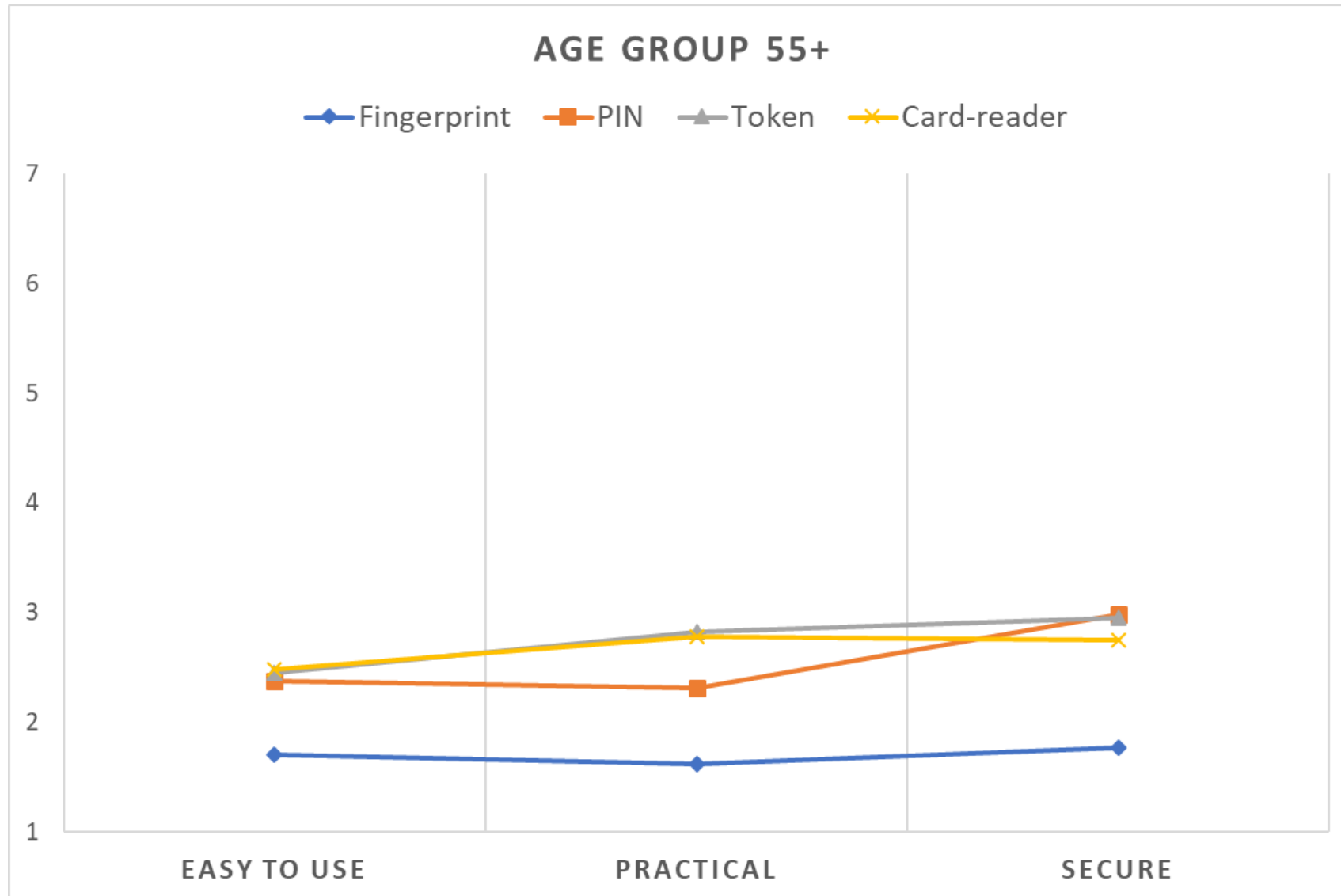
Task Evaluation
Questionnaire

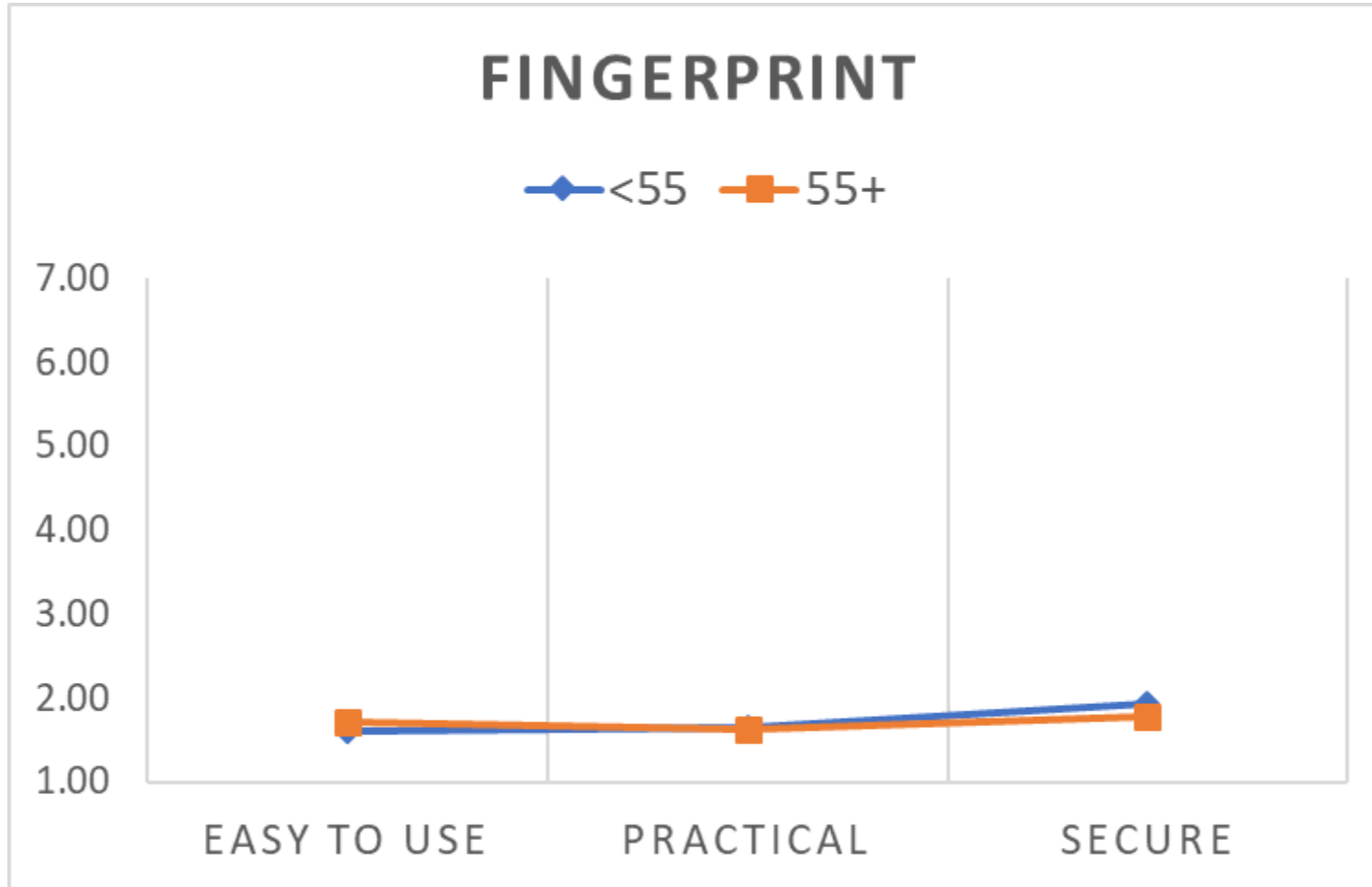


Questionnaire

- Authentication Method Evaluation
- Authentication Method Usage
- Online Banking Usage







EASY TO USE

$M = 1.60, SD = 1.34$

$M = 1.71, SD = 1.64$

PRACTICAL

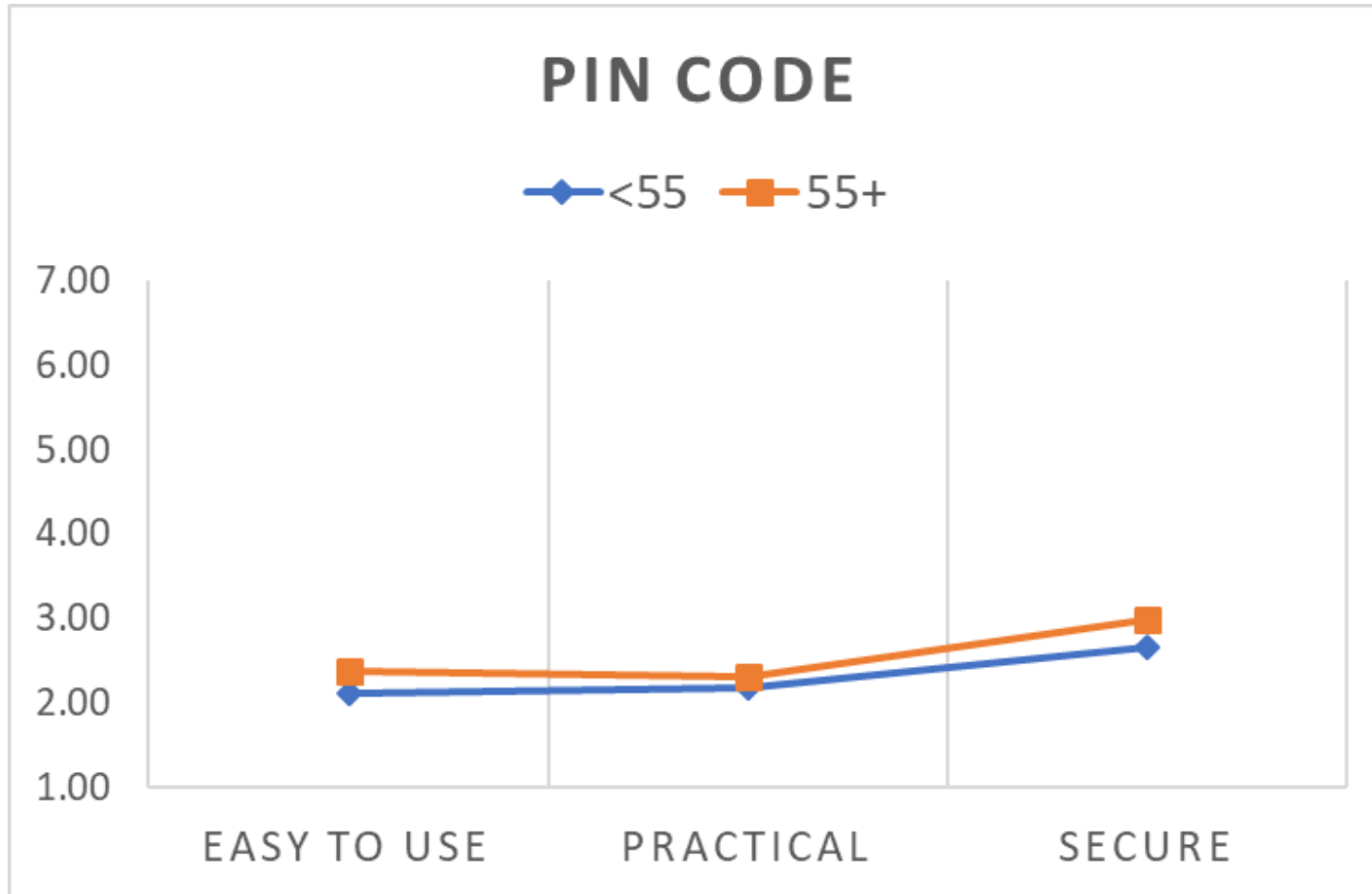
$M = 1.65, SD = 1.37$

$M = 1.62, SD = 1.53$

SECURE

$M = 1.93, SD = 1.58$

$M = 1.77, SD = 1.55$



EASY TO USE

$M = 2.11, SD = 1.47$

$M = 2.37, SD = 1.83$

PRACTICAL

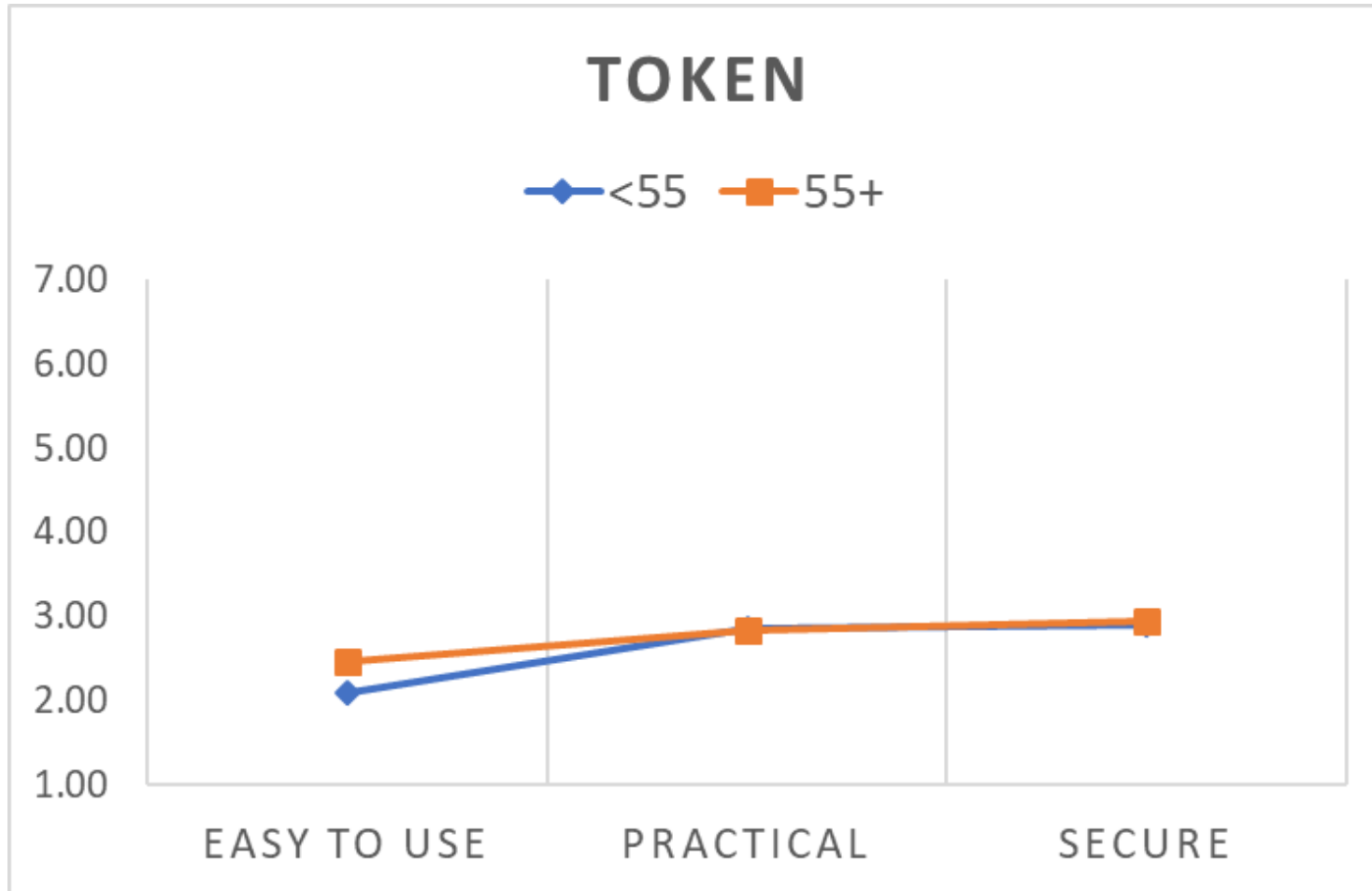
$M = 2.17, SD = 1.47$

$M = 2.32, SD = 1.69$

SECURE

$M = 2.67, SD = 1.47$

$M = 2.98, SD = 1.56$



EASY TO USE

M = 2.10 , *SD* = 1.69

M = 2.45, *SD* = 1.91

PRACTICAL

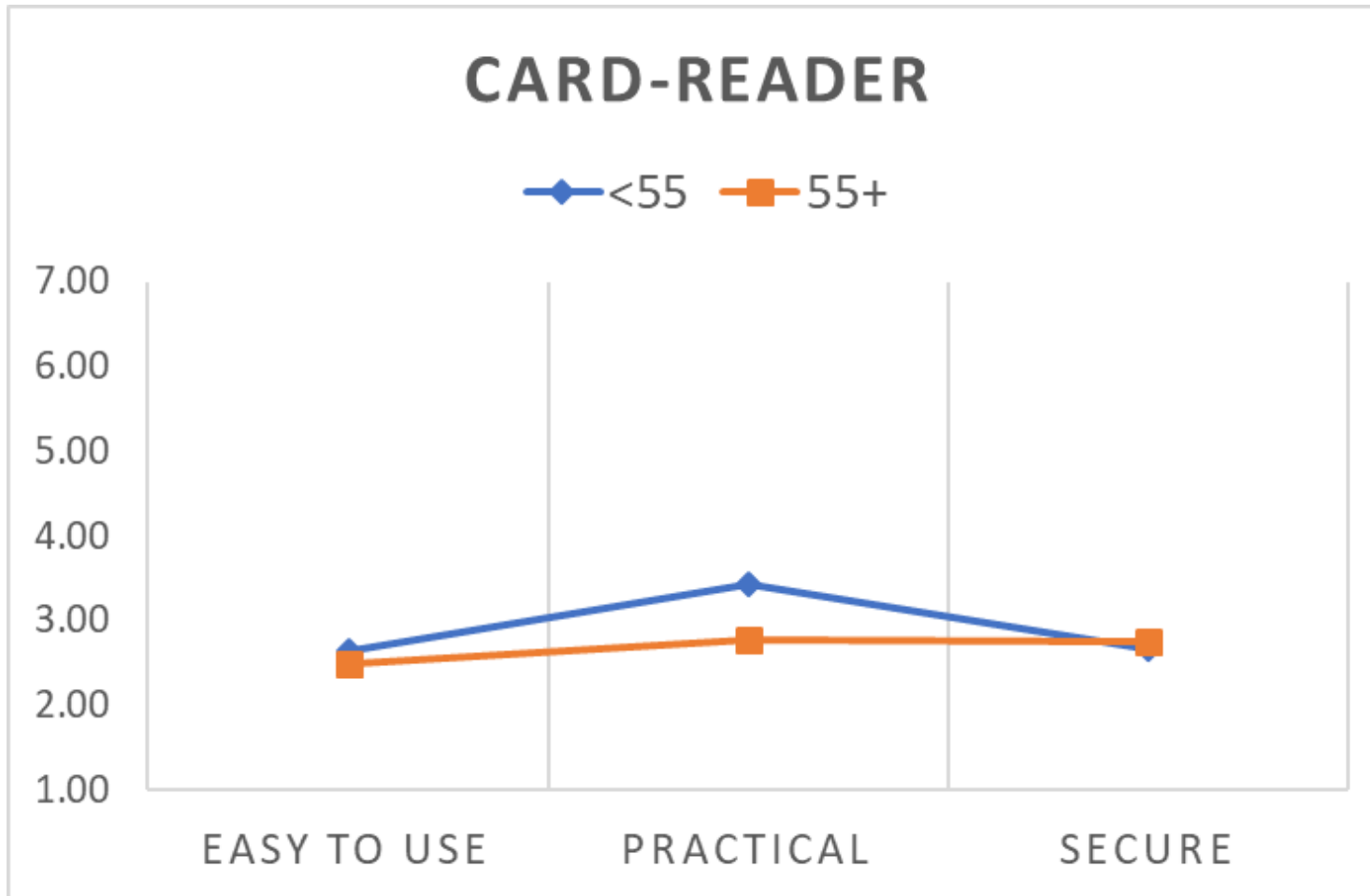
M = 2.86 , *SD* = 1.94

M = 2.83, *SD* = 2.07

SECURE

M = 2.90 , *SD* = 1.69

M = 2.95, *SD* = 1.82



EASY TO USE

$M = 2.64$, $SD = 1.91$

$M = 2.49$, $SD = 1.89$

PRACTICAL

$M = 3.43$, $SD = 2.10$

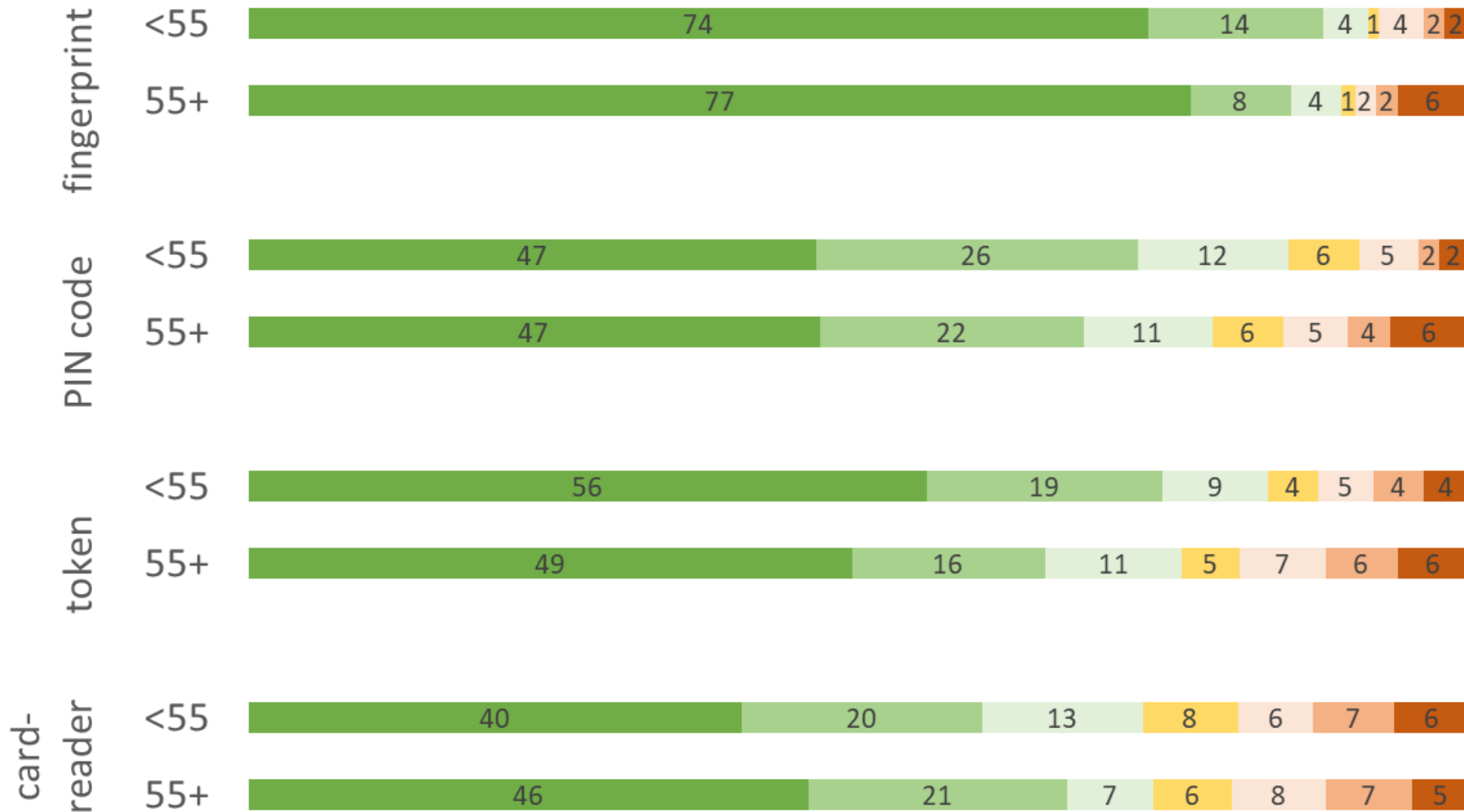
$M = 2.78$, $SD = 1.98$

SECURE

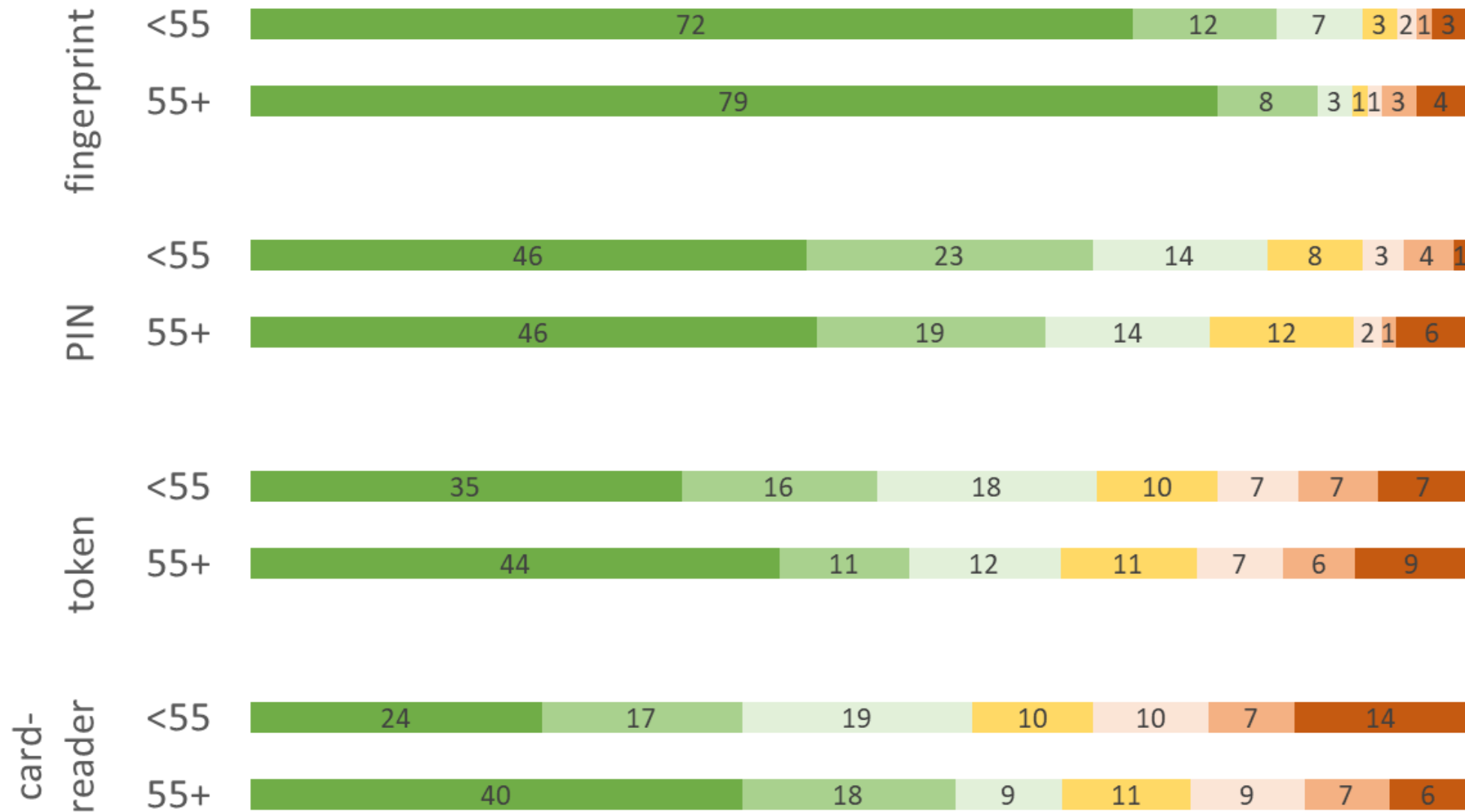
$M = 2.67$, $SD = 1.58$

$M = 2.75$, $SD = 1.67$

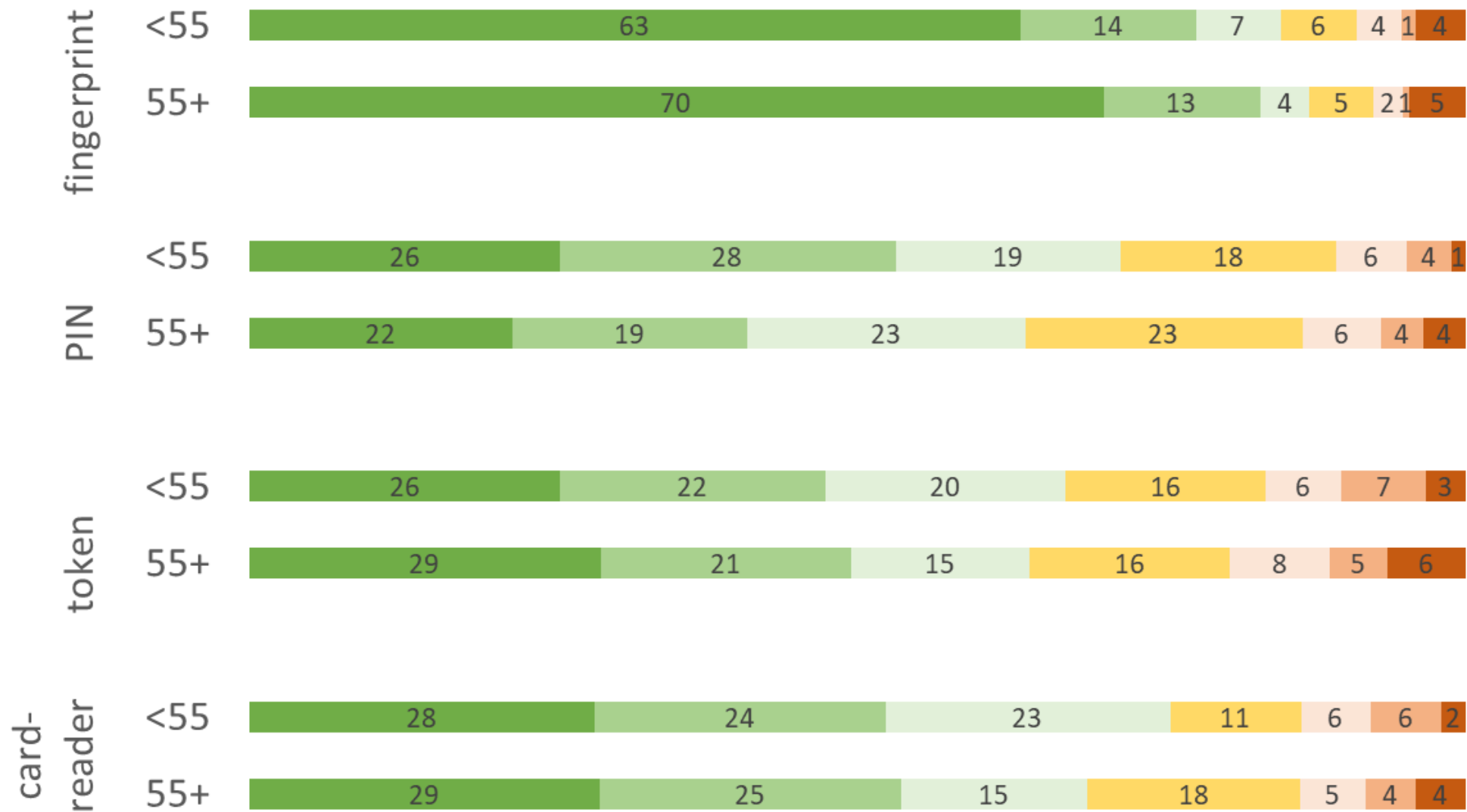
How EASY TO USE do you find these methods?



How PRACTICAL do you find these methods?

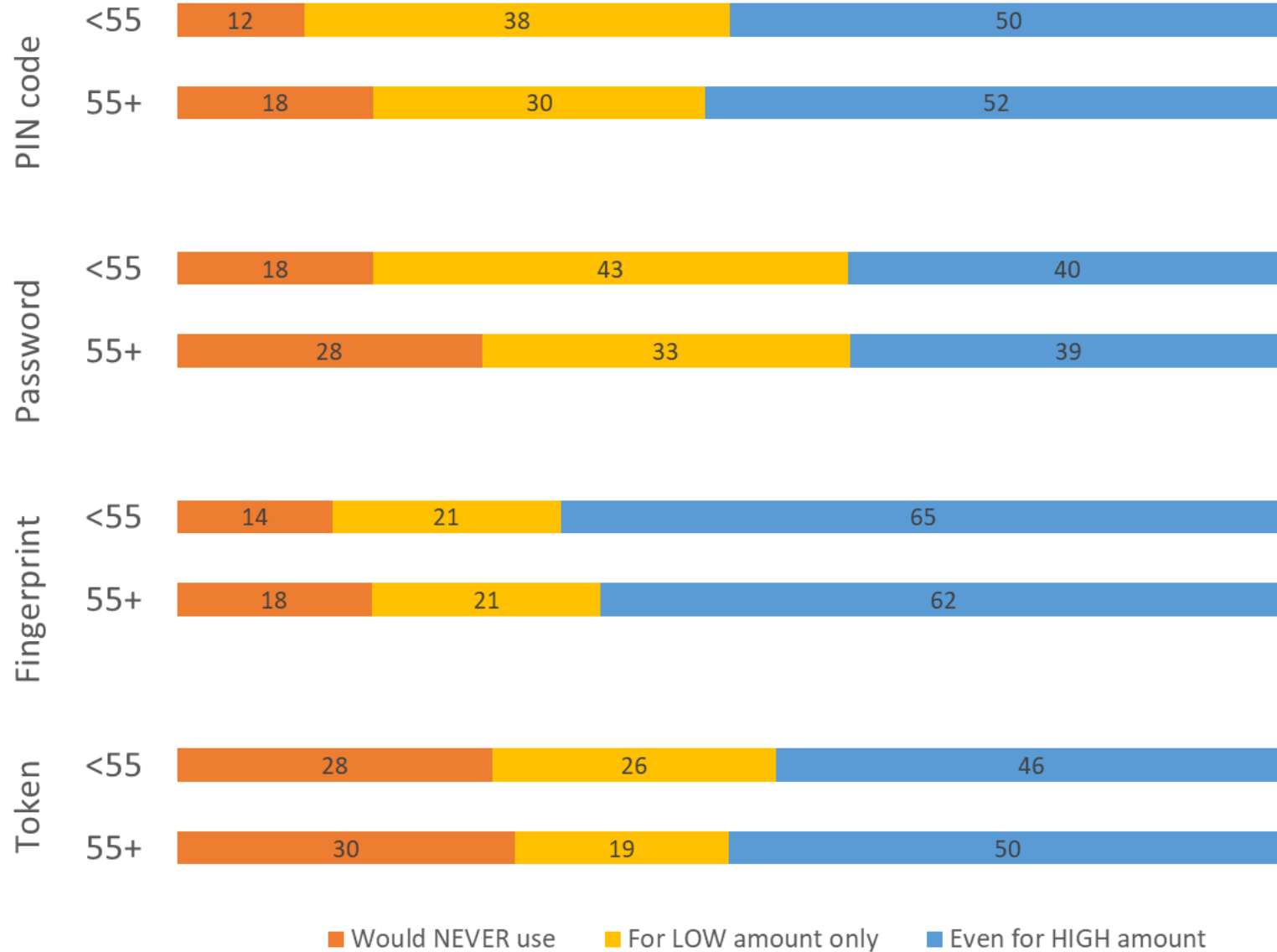


How SECURE do you find these methods?

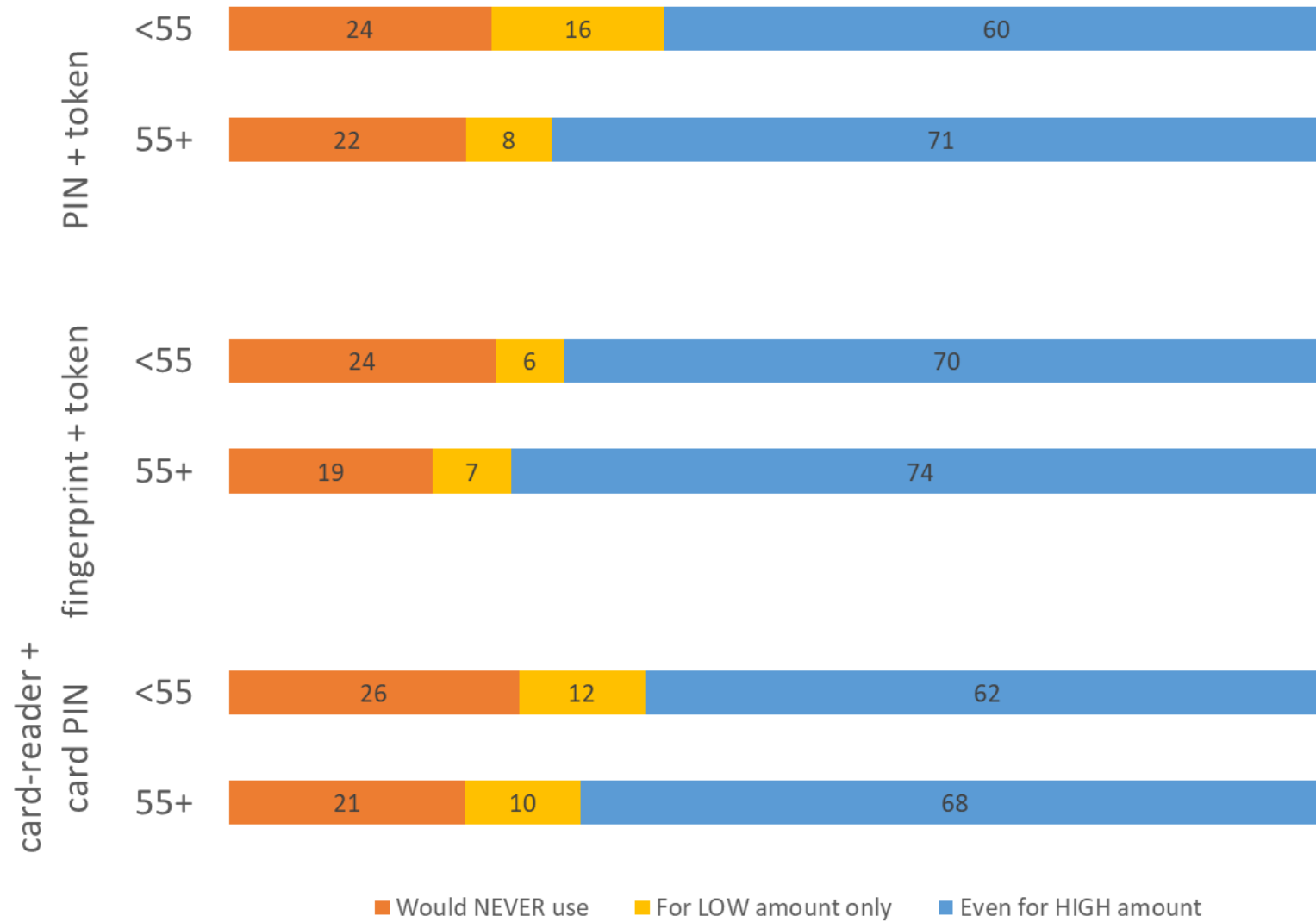


- EASY TO USE
 - PRACTICAL
 - SECURE
-
- Which methods would participants actually use for online banking?

Preferences for SINGLE AUTHENTICATION METHODS for online banking



Preferences for TWO-FACTOR AUTHENTICATION METHODS for online banking



Implications

- Perceptions of usability, practicality, and security of the four authentication methods generally positive
- *Fingerprint wins the game*: security perceptions vs. reality
- Card-reader vs. Token
 - Older adults: viewed similarly
 - Young/middle adults: token slightly easier to use and more practical
- Preferences for 2FA combinations
 - Not a clearly preferred or unpopular combination
 - Offer a choice?

Limitations and Future Steps

- Preliminary analyses
- Evaluation of methods affected by performed tasks on smartphone

- Finish data collection + data cleaning
- Evaluate preferences in more detail
 - Subgroups with strong preferences vs. flexible users
 - Include data from tasks

MUNI

Interdisciplinary Research Team
on Internet and Society

CR@CS

Thank you for Your attention.

Questions?