

On the Limited Impact of Visualizing Encryption: Perceptions of E2E Messaging Security

Christian Stransky

Leibniz University
Hannover

Dominik Wermke

CISPA Helmholtz Center
for Information Security

Johanna Schrader

Leibniz University
Hannover

Nicolas Huaman

CISPA Helmholtz Center
for Information Security

Yasemin Acar

Max Planck Institute for
Security and Privacy

Anna Lena

Fehlhaber

Leibniz University
Hannover

Miranda Wei

University of Washington

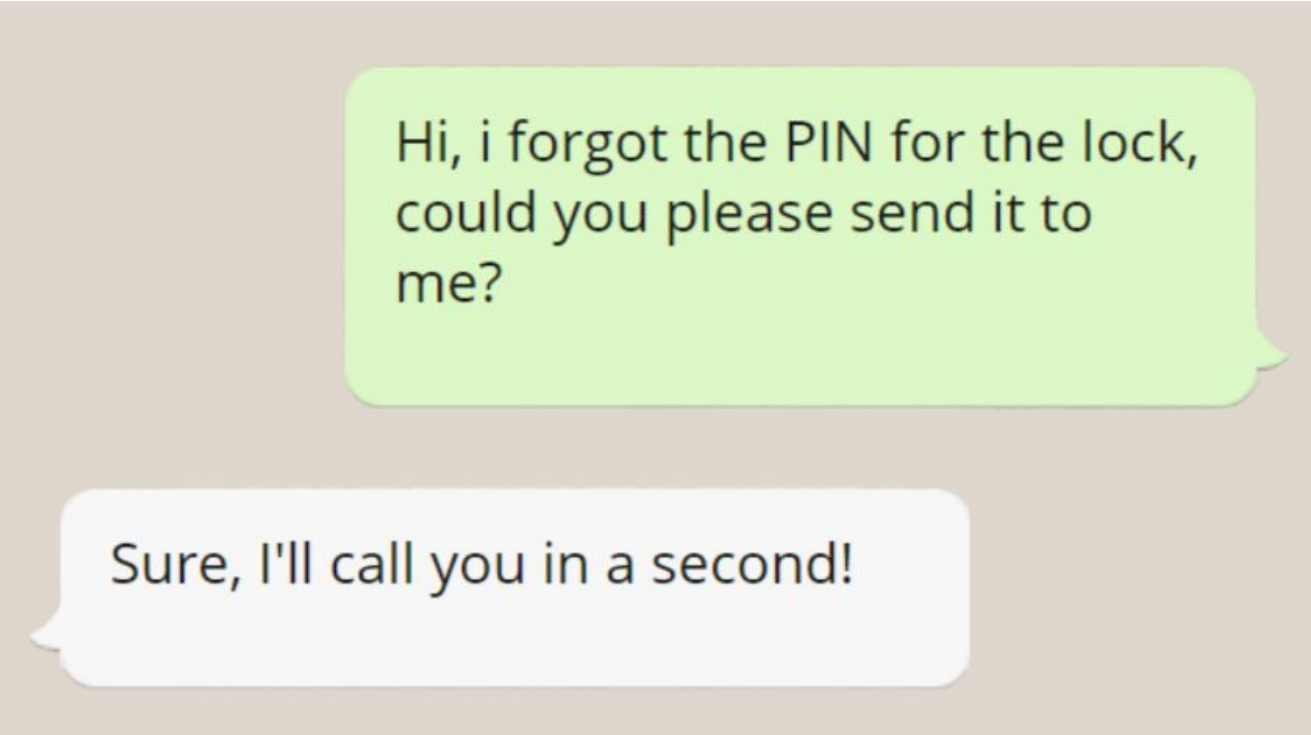
Blase Ur

University of Chicago

Sascha Fahl

CISPA, Leibniz University
Hannover

Do you know this situation?



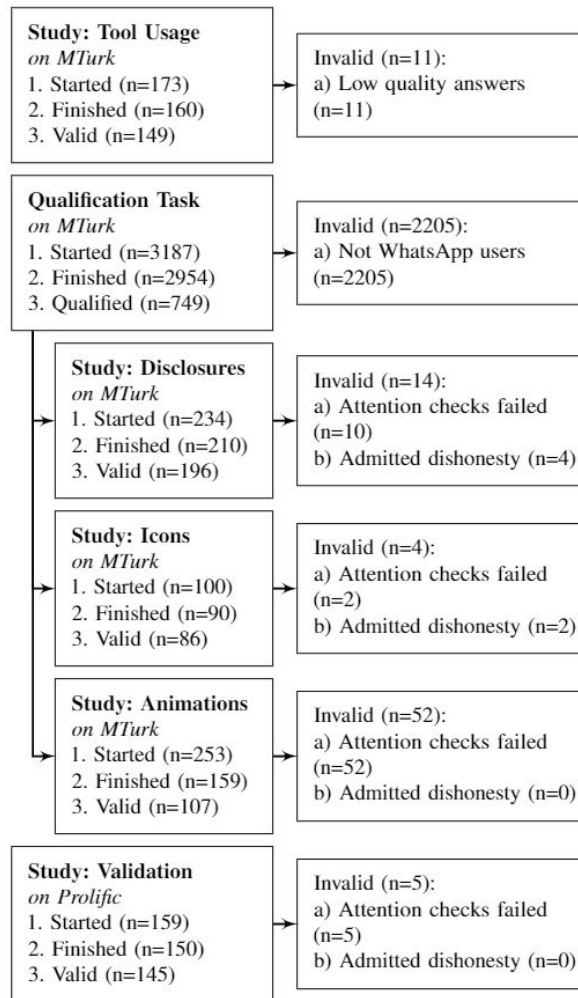
Hi, i forgot the PIN for the lock,
could you please send it to
me?

Sure, I'll call you in a second!

Methodology

Five Studies on MTurk and Prolific

1. Tool Usage
2. Texts
3. Icons
4. Animations
5. Validation



Tool Usage

Study: Tool Usage <i>on MTurk</i> 1. Started (n=173) 2. Finished (n=160) 3. Valid (n=149)	Invalid (n=11): a) Low quality answers (n=11)
--	--

Qualification Task <i>on MTurk</i> 1. Started (n=3187) 2. Finished (n=2954) 3. Qualified (n=749)	Invalid (n=2205): a) Not WhatsApp users (n=2205)
---	---

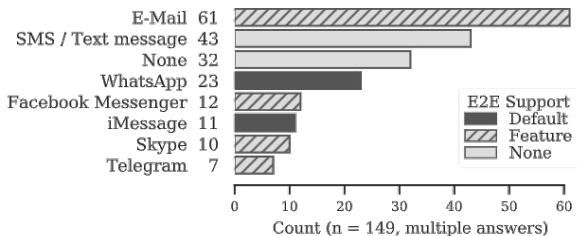
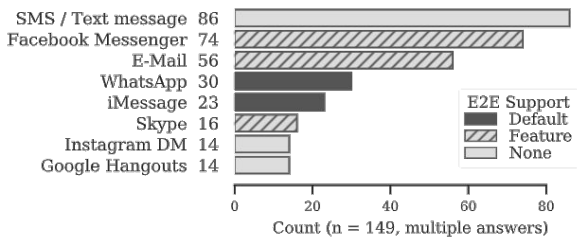
Study: Disclosures <i>on MTurk</i> 1. Started (n=234) 2. Finished (n=210) 3. Valid (n=196)	Invalid (n=14): a) Attention checks failed (n=10) b) Admitted dishonesty (n=4)
---	--

Study: Icons <i>on MTurk</i> 1. Started (n=100) 2. Finished (n=90) 3. Valid (n=86)	Invalid (n=4): a) Attention checks failed (n=2) b) Admitted dishonesty (n=2)
---	--

Study: Animations <i>on MTurk</i> 1. Started (n=253) 2. Finished (n=159) 3. Valid (n=107)	Invalid (n=52): a) Attention checks failed (n=52) b) Admitted dishonesty (n=0)
--	--

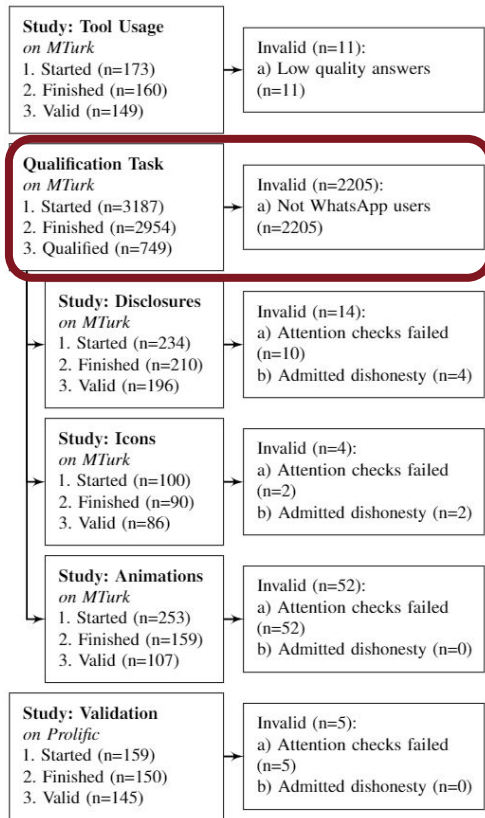
Study: Validation <i>on Prolific</i> 1. Started (n=159) 2. Finished (n=150) 3. Valid (n=145)	Invalid (n=5): a) Attention checks failed (n=5) b) Admitted dishonesty (n=0)
---	--

- Asked for preferred tools for day-to-day and sensitive conversations.



→ Switches do happen! What can we do?

Methodology

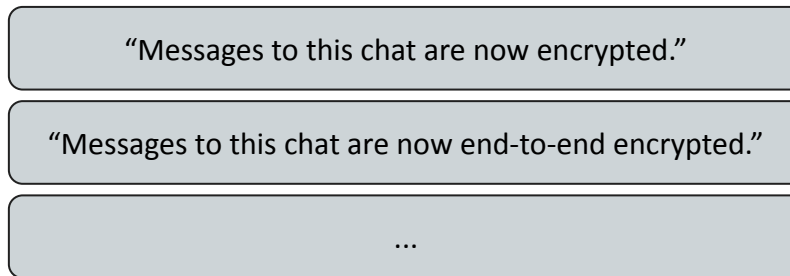


- MTurk
- Screening for WhatsApp users

- Screencasts with fictitious WhatsApp update

Disclosure

Study: Tool Usage <i>on MTurk</i> 1. Started (n=173) 2. Finished (n=160) 3. Valid (n=149)	Invalid (n=11): a) Low quality answers (n=11)
Qualification Task <i>on MTurk</i> 1. Started (n=3187) 2. Finished (n=2954) 3. Qualified (n=749)	Invalid (n=2205): a) Not WhatsApp users (n=2205)
Study: Disclosures <i>on MTurk</i> 1. Started (n=234) 2. Finished (n=210) 3. Valid (n=196)	Invalid (n=14): a) Attention checks failed (n=10) b) Admitted dishonesty (n=4)
Study: Icons <i>on MTurk</i> 1. Started (n=100) 2. Finished (n=90) 3. Valid (n=86)	Invalid (n=4): a) Attention checks failed (n=2) b) Admitted dishonesty (n=2)
Study: Animations <i>on MTurk</i> 1. Started (n=253) 2. Finished (n=159) 3. Valid (n=107)	Invalid (n=52): a) Attention checks failed (n=52) b) Admitted dishonesty (n=0)
Study: Validation <i>on Prolific</i> 1. Started (n=159) 2. Finished (n=150) 3. Valid (n=145)	Invalid (n=5): a) Attention checks failed (n=5) b) Admitted dishonesty (n=0)



→ “Encrypted” disclosure performed best

→ No impact on usability and satisfaction

Icons

Study: Tool Usage <i>on MTurk</i> 1. Started (n=173) 2. Finished (n=160) 3. Valid (n=149)	Invalid (n=11): a) Low quality answers (n=11)
Qualification Task <i>on MTurk</i> 1. Started (n=3187) 2. Finished (n=2954) 3. Qualified (n=749)	Invalid (n=2205): a) Not WhatsApp users (n=2205)
Study: Disclosures <i>on MTurk</i> 1. Started (n=234) 2. Finished (n=210) 3. Valid (n=196)	Invalid (n=14): a) Attention checks failed (n=10) b) Admitted dishonesty (n=4)
Study: Icons <i>on MTurk</i> 1. Started (n=100) 2. Finished (n=90) 3. Valid (n=86)	Invalid (n=4): a) Attention checks failed (n=2) b) Admitted dishonesty (n=2)
Study: Animations <i>on MTurk</i> 1. Started (n=253) 2. Finished (n=159) 3. Valid (n=107)	Invalid (n=52): a) Attention checks failed (n=52) b) Admitted dishonesty (n=0)
Study: Validation <i>on Prolific</i> 1. Started (n=159) 2. Finished (n=150) 3. Valid (n=145)	Invalid (n=5): a) Attention checks failed (n=5) b) Admitted dishonesty (n=0)

- Closed letter



- Shield



- Lock



→ Negative effect for all icons

Animations

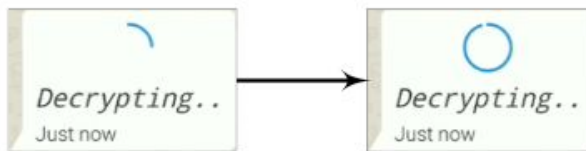
Study: Tool Usage <i>on MTurk</i> 1. Started (n=173) 2. Finished (n=160) 3. Valid (n=149)	Invalid (n=11): a) Low quality answers (n=11)
Qualification Task <i>on MTurk</i> 1. Started (n=3187) 2. Finished (n=2954) 3. Qualified (n=749)	Invalid (n=2205): a) Not WhatsApp users (n=2205)
Study: Disclosures <i>on MTurk</i> 1. Started (n=234) 2. Finished (n=210) 3. Valid (n=196)	Invalid (n=14): a) Attention checks failed (n=10) b) Admitted dishonesty (n=4)
Study: Icons <i>on MTurk</i> 1. Started (n=100) 2. Finished (n=90) 3. Valid (n=86)	Invalid (n=4): a) Attention checks failed (n=2) b) Admitted dishonesty (n=2)
Study: Animations <i>on MTurk</i> 1. Started (n=253) 2. Finished (n=159) 3. Valid (n=107)	Invalid (n=52): a) Attention checks failed (n=52) b) Admitted dishonesty (n=0)
Study: Validation <i>on Prolific</i> 1. Started (n=159) 2. Finished (n=150) 3. Valid (n=145)	Invalid (n=5): a) Attention checks failed (n=5) b) Admitted dishonesty (n=0)



(a) Condition: Disappearing Messages



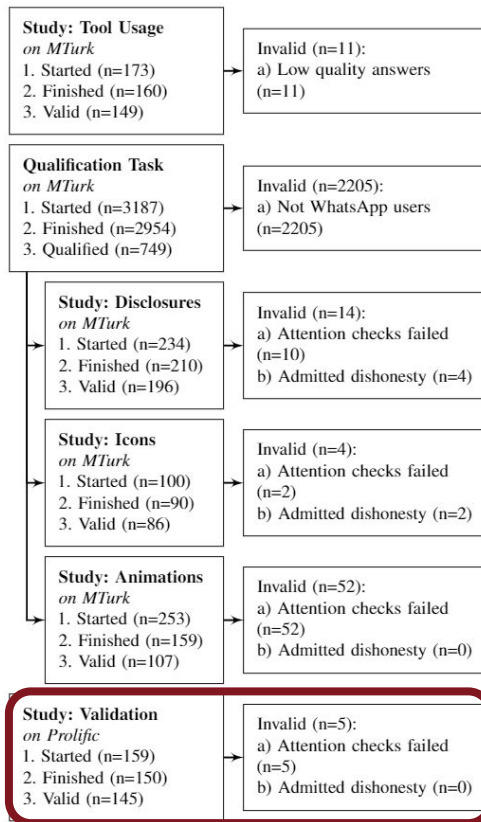
(b) Condition: Encryption/Decryption



(c) Condition: Progress Circle

→ None significant, progress circle weak positive effect

Validation



- Confirmed results from study 2-4

→ Any visualization is better than none

→ Animation not better than text

“Honestly, I guess I just trust in the brand that it’s safe. I do this through the popularity, good press and confidence in their service.” - P18

→ App reputation greatly impacts perceptions

On the Limited Impact of Visualizing Encryption: Perceptions of E2E Messaging Security

Christian Stransky

Leibniz University
Hannover

Dominik Wermke

CISPA Helmholtz Center
for Information Security

Johanna Schrader

Leibniz University
Hannover

Nicolas Huaman

CISPA Helmholtz Center
for Information Security

Yasemin Acar

Max Planck Institute for
Security and Privacy

Anna Lena

Fehlhaber

Leibniz University
Hannover

Miranda Wei

University of Washington

Blase Ur

University of Chicago

Sascha Fahl

CISPA, Leibniz University
Hannover