How safe do we feel?

.Developing a Scale to Measure Perceived Personal Safety Fostered through Technology during Door-to-Door Transportation.

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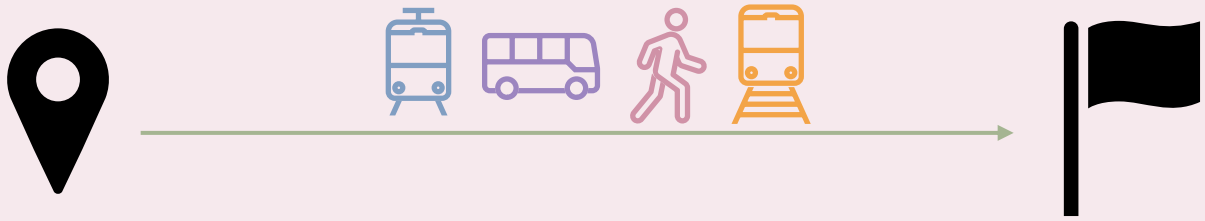
Daily Supervisor



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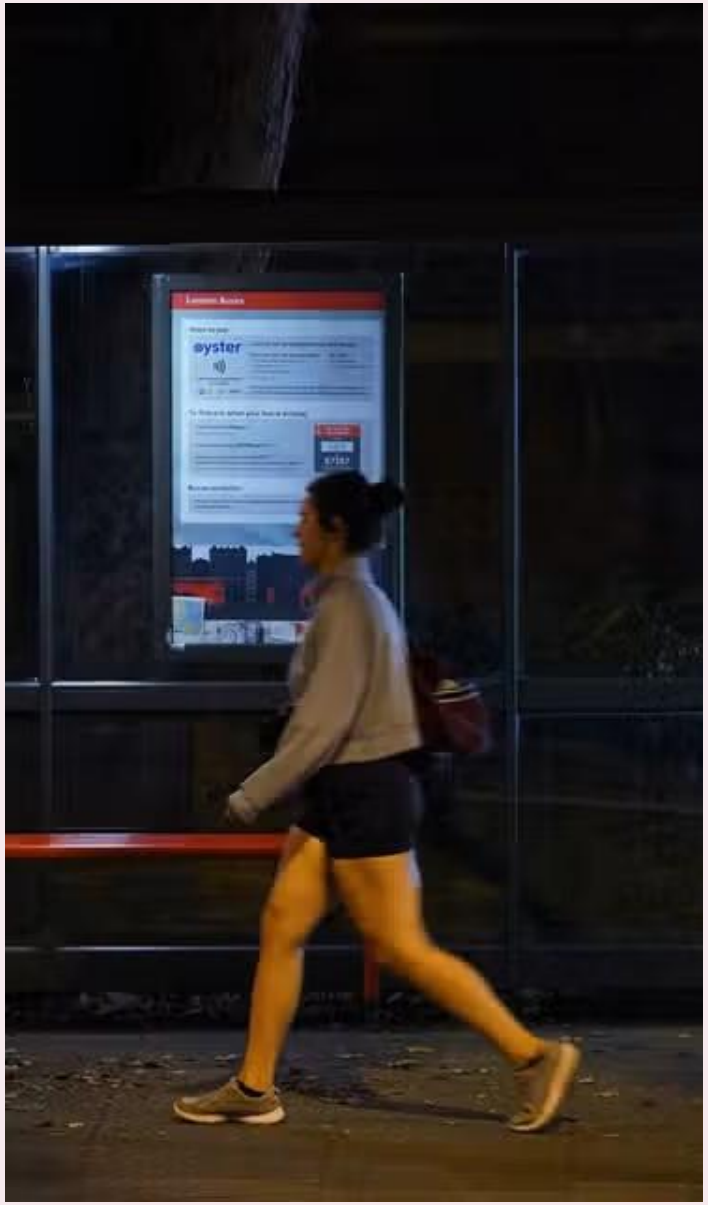
[3]



[1]

[5]

[4]

[2]

[1] "Dutch public transport system one of the most expensive in the world". In: IamExpat (2023). URL: https://www.iamexpat.nl/expat-info/dutch-expat-news/dutch-public-transport-system-one-most-expensive-world
[2] "Amtrak's overnight sleeper trains are an adventure. Here's what it's like to ride". In: The Washington Post (2022). URL: https://www.washingtonpost.com/travel/2022/06/23/amtrak-trains-overnight-sleeper-car/
[3] "Strut Safe: the service helping women feel safe at night in the wake of Sarah Everard". In: Evening Standard (2022). URL: https://www.standard.co.uk/lifestyle/strut-safe-service-helping-women-feel-safe-night-sarah-everard-b979310.html
[4] "Wilhelminaplein metro station". In: Wikipedia (2023). URL: https://en.wikipedia.org/wiki/Wilhelminaplein_metro_station
[5] "Tips on how to board the bus". In: Buzzer Blog (2023). URL: https://buzzer.translink.ca/2023/08/tips-on-how-to-board-the-bus/

What is that feeling ?

What is that feeling ?

“.Developing a Scale to Measure **Perceived Personal Safety** Fostered by Technology during Door-to-Door Transportation.”

“An individual’s subjective assessment and emotional response regarding their safety, uniquely shaped by personal experiences and context”

- how you evaluate your safety
- varies from person to person

*“An individual’s **subjective assessment** and emotional response regarding their safety, uniquely shaped by personal experiences and context”*

- not just logical evaluations
- how you feel about your safety

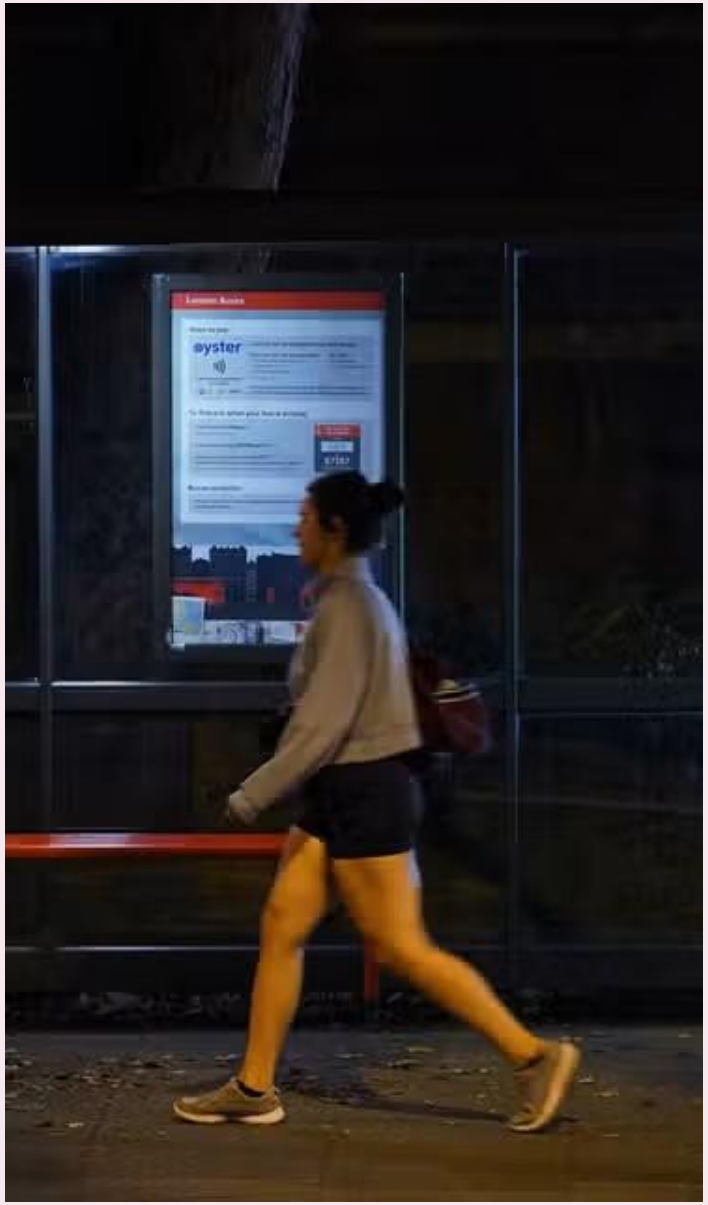
“An individual’s subjective assessment and ***emotional response***

regarding their safety, uniquely shaped by personal experiences and context”

“An individual’s subjective assessment and emotional response regarding their safety, ***uniquely shaped by personal experiences and context****”*

- influenced by unique life experiences and the specific contexts you find yourself in

[3]



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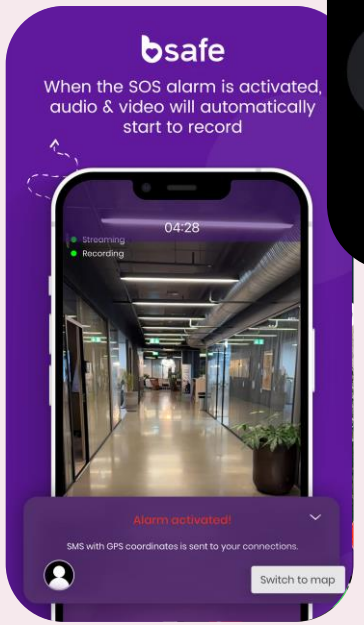
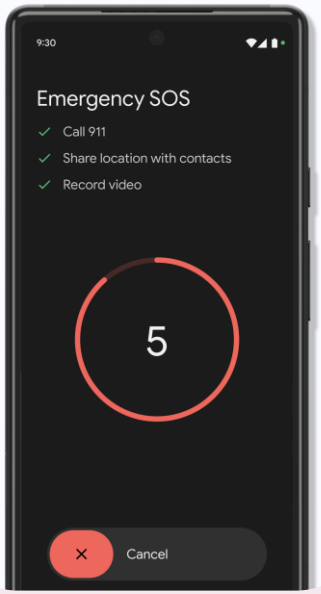


[1]

Call, share, and record automatically



[1]

[3]

Tap once to get an incoming call to leave

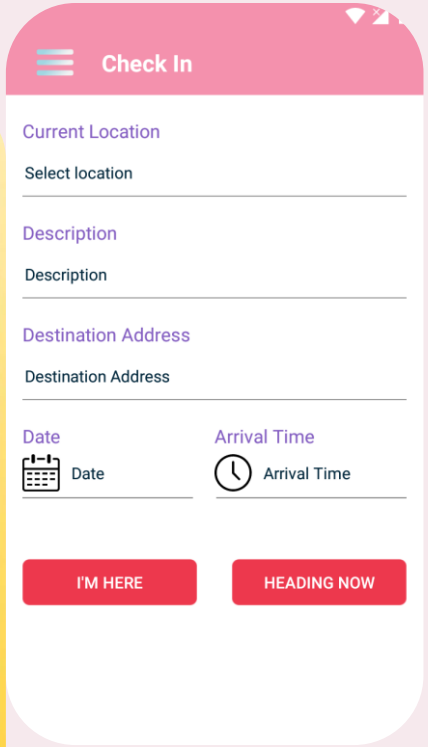
Your excuse to exit before things escalate is a pre-recorded call that sounds real.

HEAR AN EXAMPLE CALL

[4]

Share route updates at custom-set checkpoints

[2]



[1] bSafe- Security and Safety Solutions — getbsafe.com. https://www. getbsafe.com/
[2] uAlertPersonal Safety- Apps on Google Play — play.google.com. https://play.google.com/store/apps/details?id=com.theualert&hl= en&gl=US
[3] Flare | Home — getflare.com. https://getflare.com/
[4] TransitMate — apps.apple.com. https://apps.apple.com/dk/app/ transitmate/id1622298888

So many technologies, but are they effective ?

Tourist Perceived Safety at Destinations- TPSD [1]

Work Safety Scale (WSS) [2]

School Climate Survey and the Neighborhood Inventory for Environmental Typology (NIfETy) [3]

Multidimensional Model of Perceived Personal Safety (PS)[4]

Personal safety ?

Transportation ?

Technology ?

[1] Chaowu Xie, Jiangchi Zhang, and Alastair M Morrison. “Developing a scale to measure tourist perceived safety”. In: Journal of Travel Research 60.6 (2021), pp. 1232–1251
[2] BobEHayesetal.“Measuring perceptions of workplace safety: Development and validation of the work safety scale”. In: Journal of Safety Research 29.3 (1998), pp. 145–161
[3] AJ Milam, CDM Furr-Holden, and PJ Leaf. “Perceived school and neighborhood safety, neighborhood violence and academic achievement in urban school children”. In: The Urban Review 42 (2010), pp. 458–467
[4] Stylianos Syropoulos et al. “How safe are we? Introducing the multidimensional model of perceived personal safety”. In: Personality and Individual Differences 224 (2024), p. 112640

None of these scales can measure these technologies' effectiveness

“What is a reliable scale to measure perceived personal safety fostered through technology during door-to-door transportation?”

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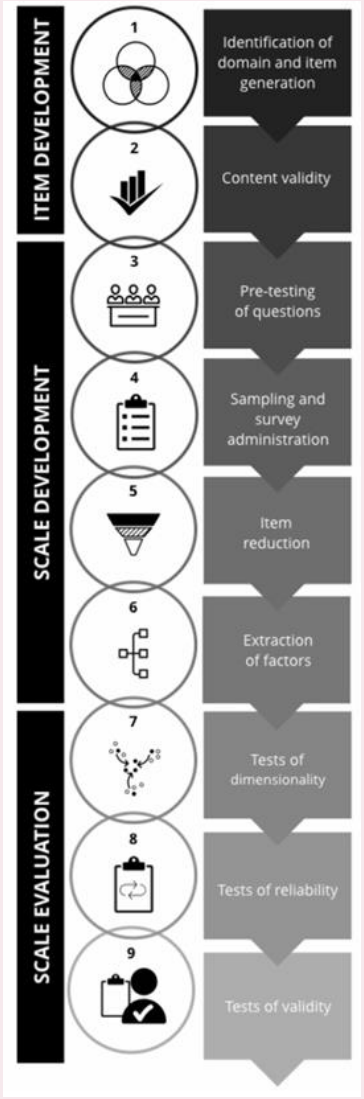
How did we answer the RQ?



Three phases and nine steps of scale development and validation [5]

[5] Godfred O Boateng et al. “Best practices for developing and validating scales for health, social, and behavioral research: a primer”. In: Frontiers in public health 6 (2018), p. 149

Item development

Scale development

Scale Evaluation

Focus Groups

Initial Item Generation

Result: 77 items

Expert Review

Result: 65 items

EFA

Survey

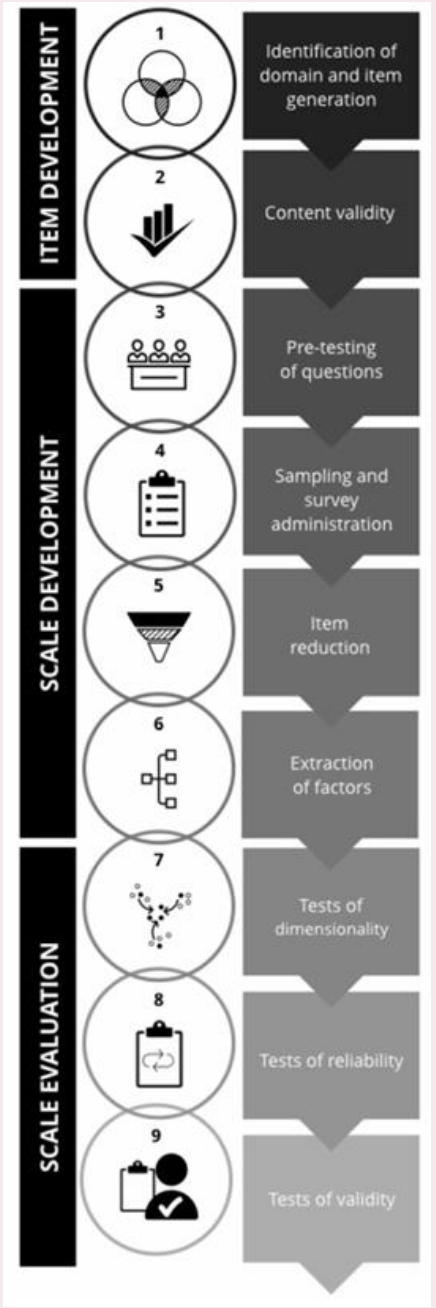
13 - Item scale

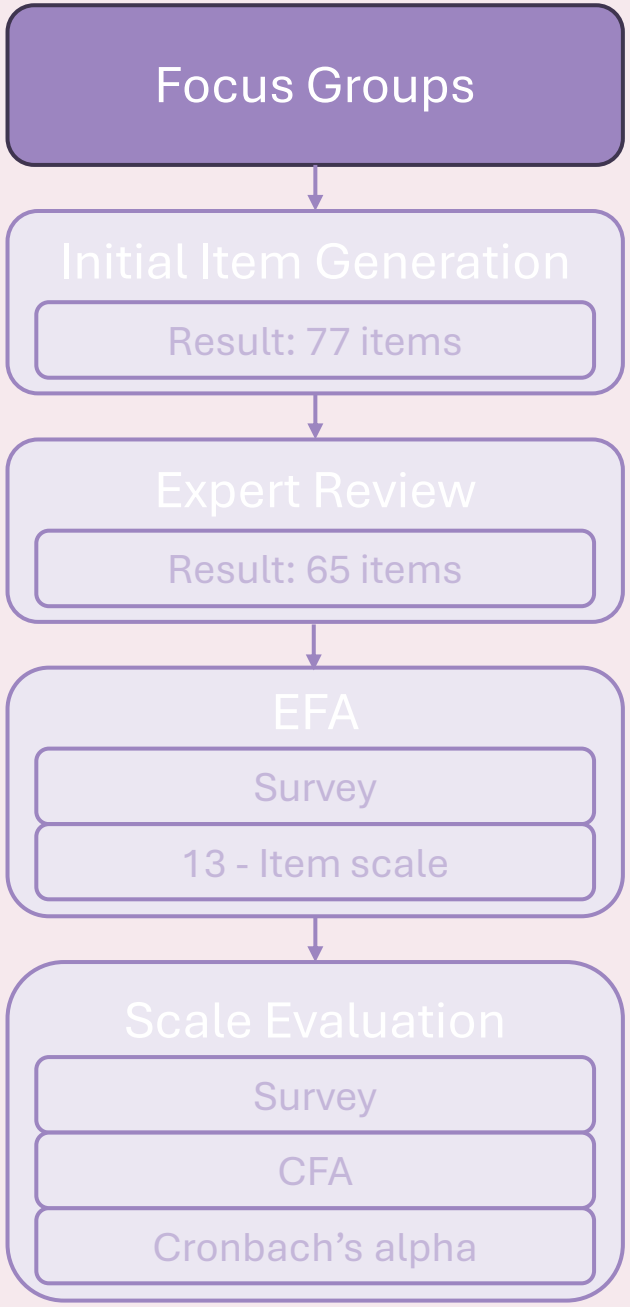
Scale Evaluation

Survey

CFA

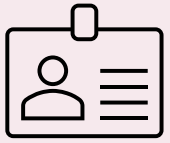
Cronbach's alpha



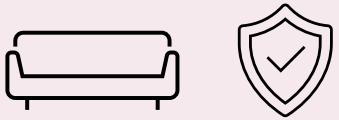


What are the factors that affect PPS during DTDT?

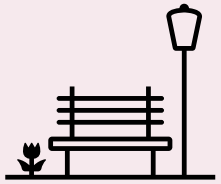
Focus Groups



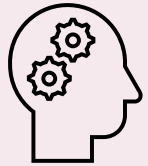
Demographics & Identity



Social Comfort & Trust

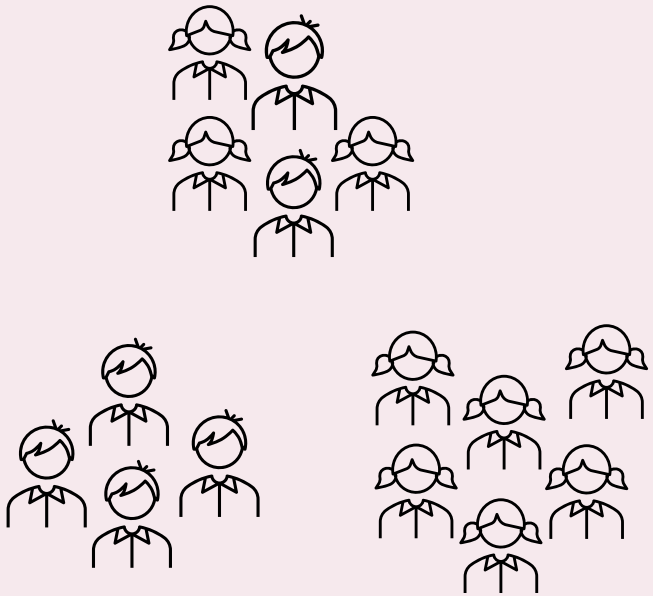


Immediate Environment

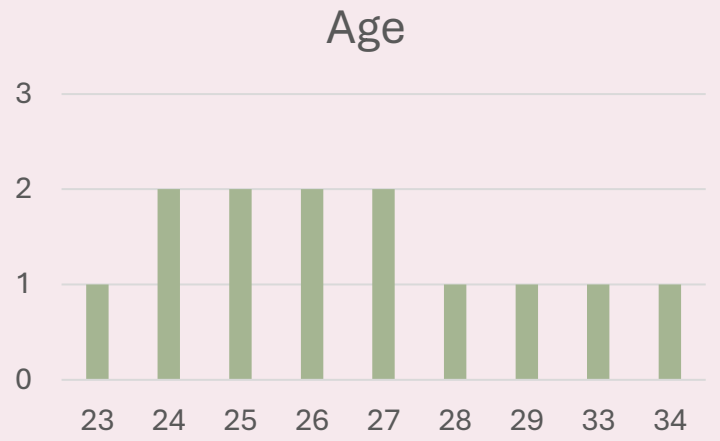


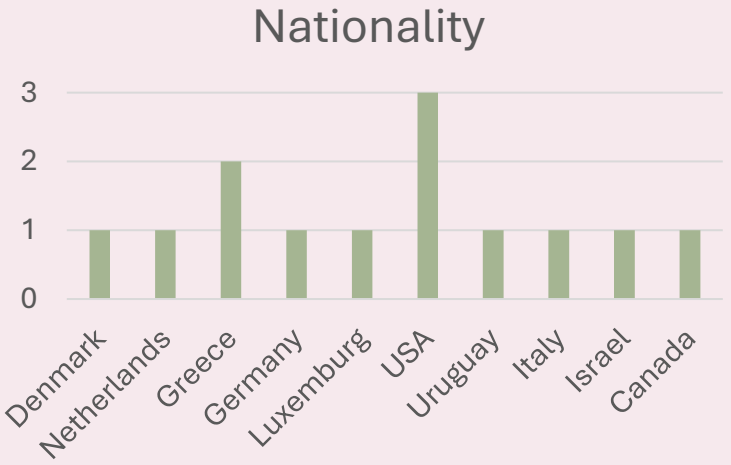
(Previous Experiences)

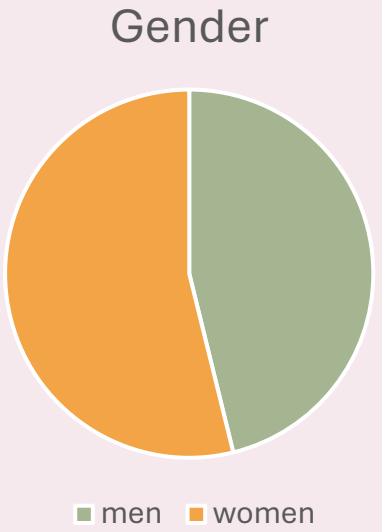
Focus Groups



13 participants
3 groups







Focus Groups

2X

Scenario

Feelings of personal safety

Reasons

What if...?

Focus Groups

"It depends on what the city is known for"

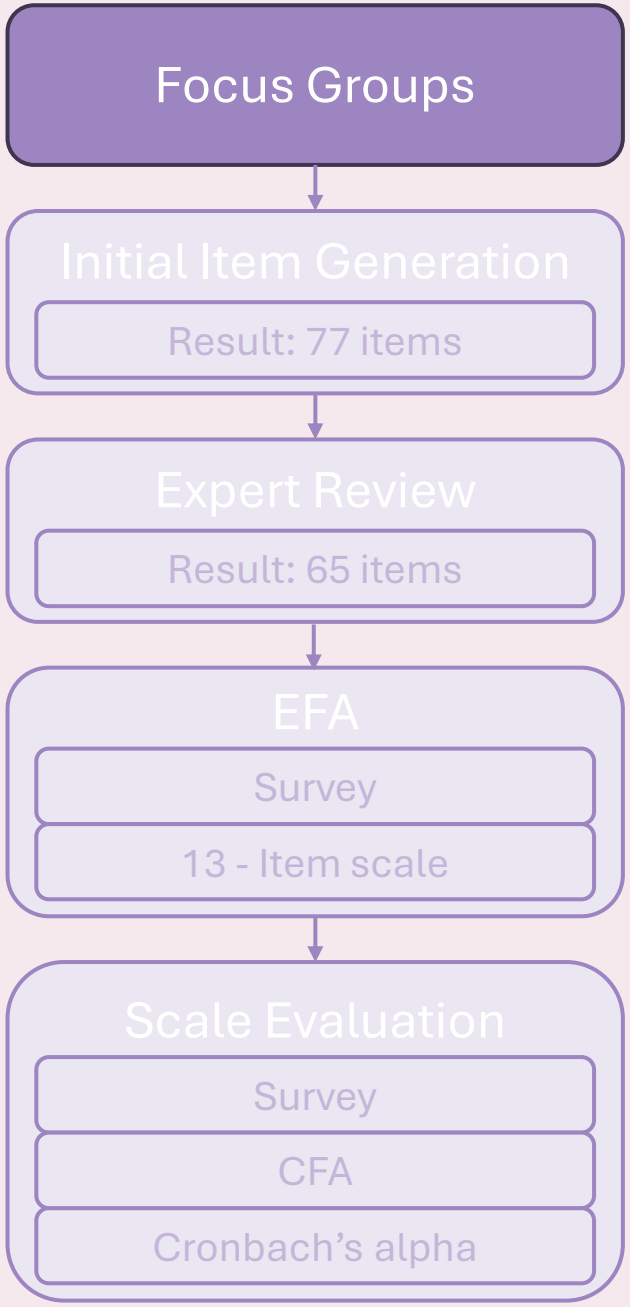
"The character is with a bunch of strangers and doesn't know their motives"

"They would be less scared because they're physically bigger"

"It's nice to travel with friends to be able to keep track of each other"

"If you are part of a minority people might have a prejudice against you and the possibility of confrontation is high!"

"Being macho asserted so that he intimidates people who might want to harm him"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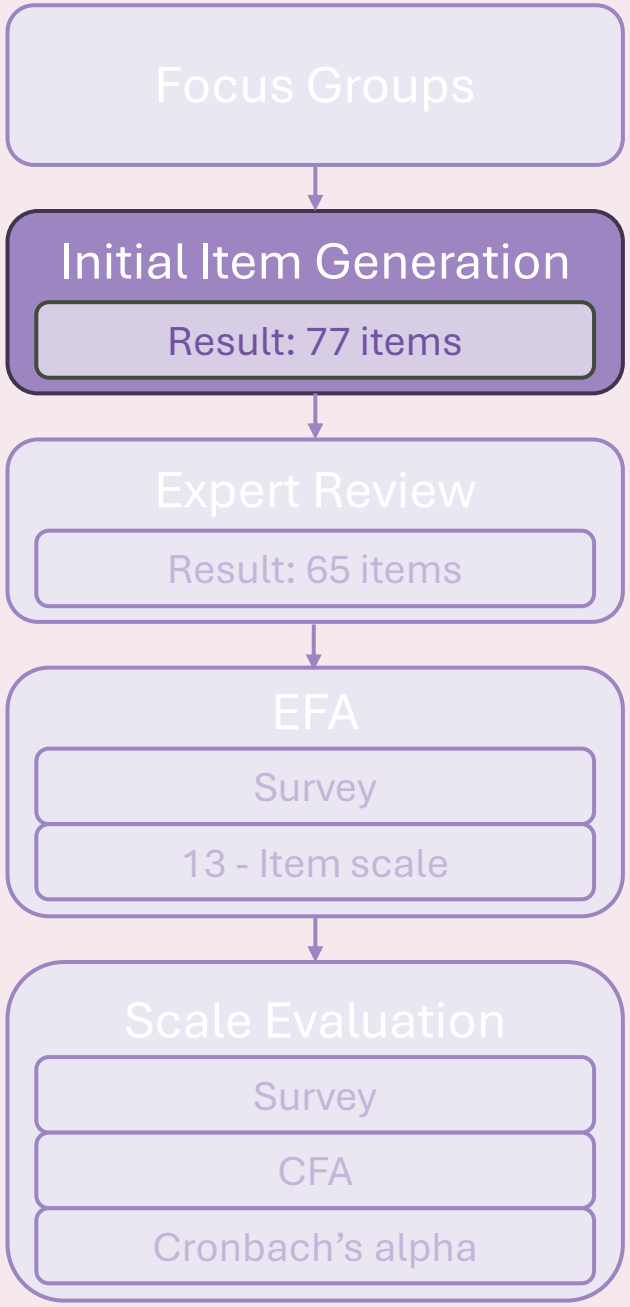
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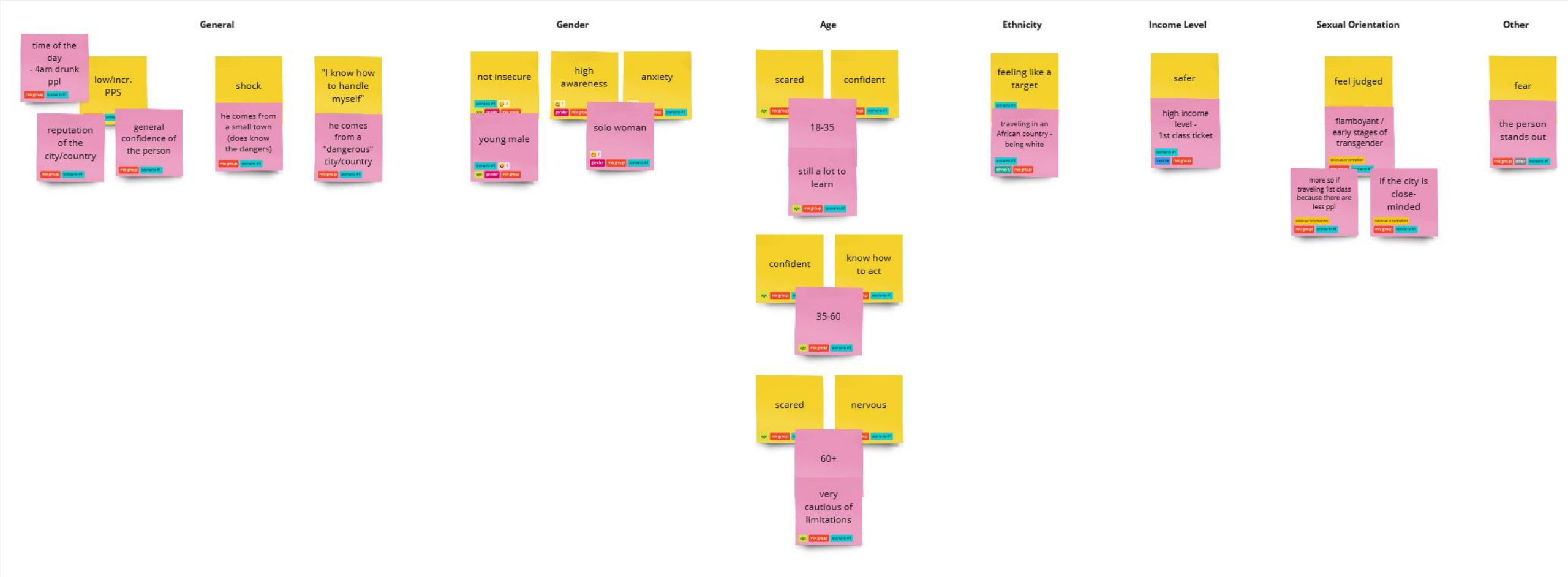
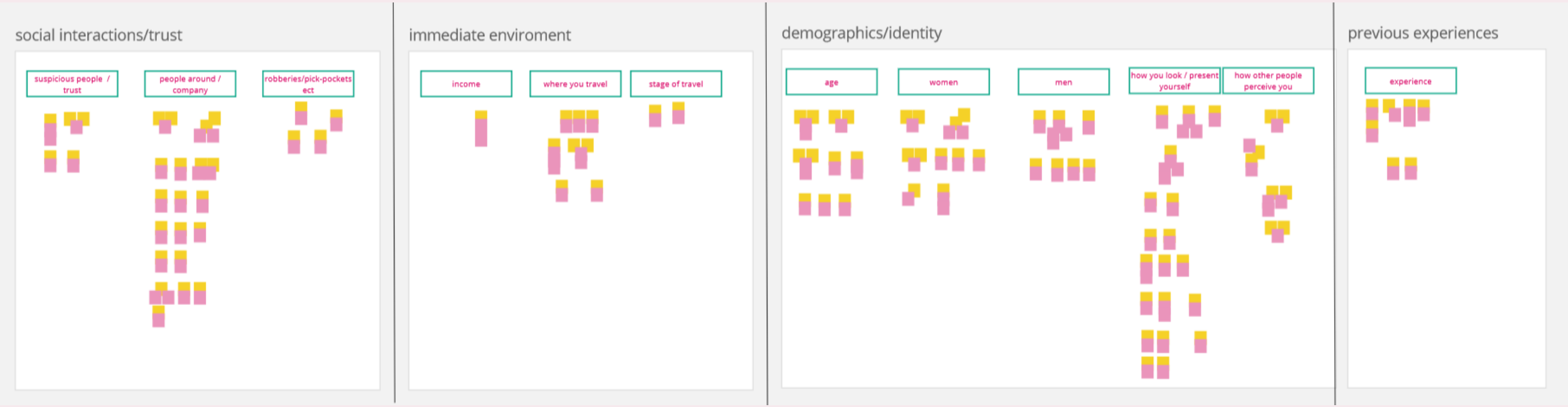


Post-it from a focus group notes in Miro

Initial Item Generation

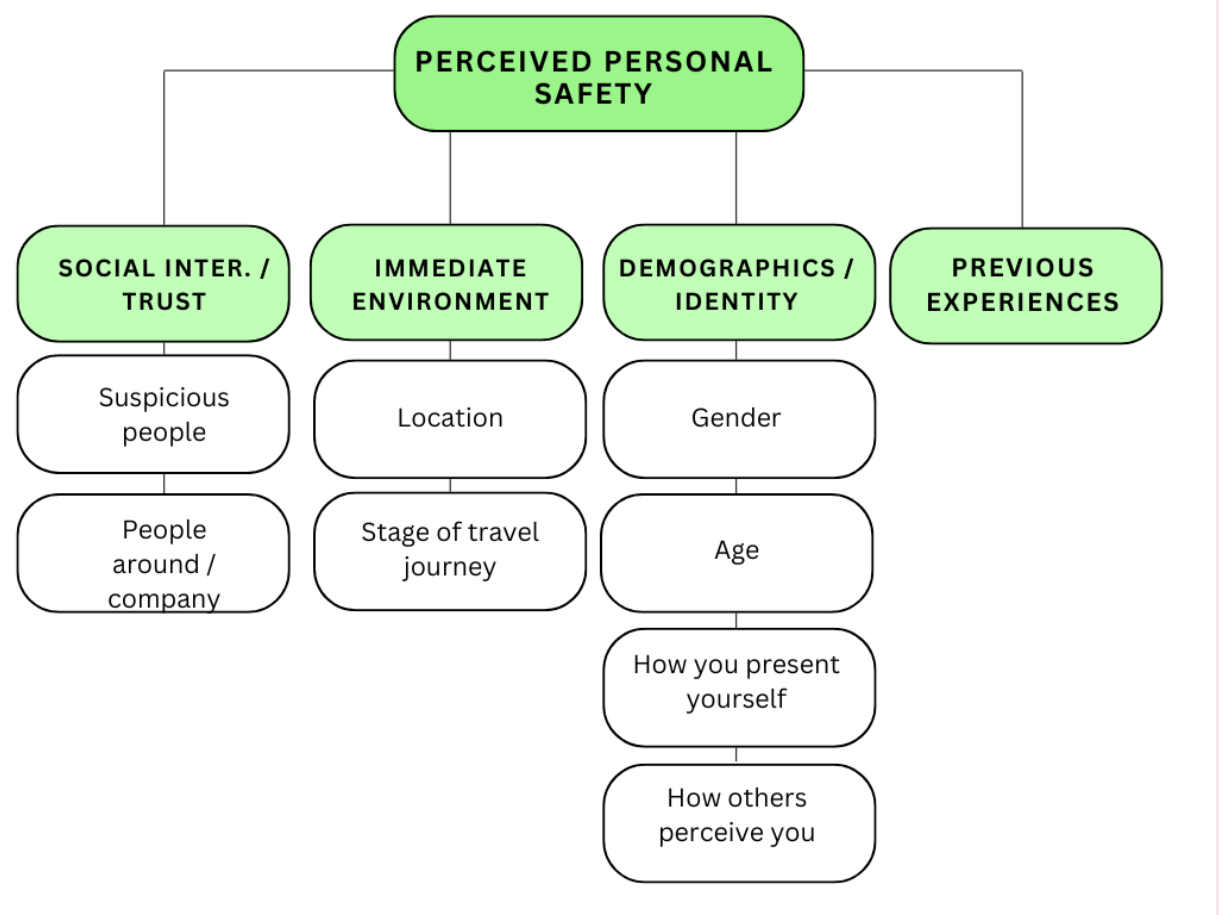
Result: 77 items



Post-it notes organized in themes in Miro

Initial Item Generation

Result: 77 items



Final codes

Initial Item Generation

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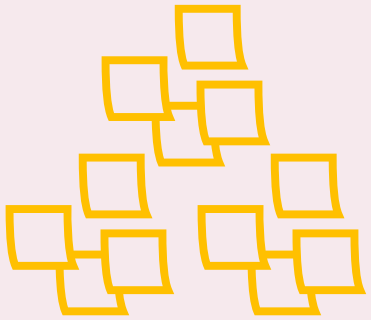
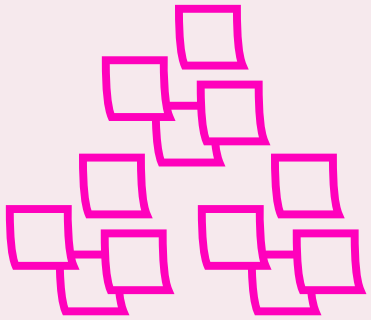
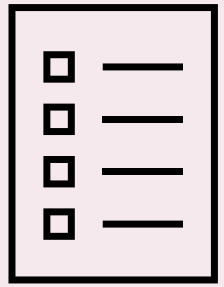


Feelings of personal safety



Reasons



77 items

Initial Item Generation

Result: 77 items

Using this technology helps me feel less anxious when walking alone

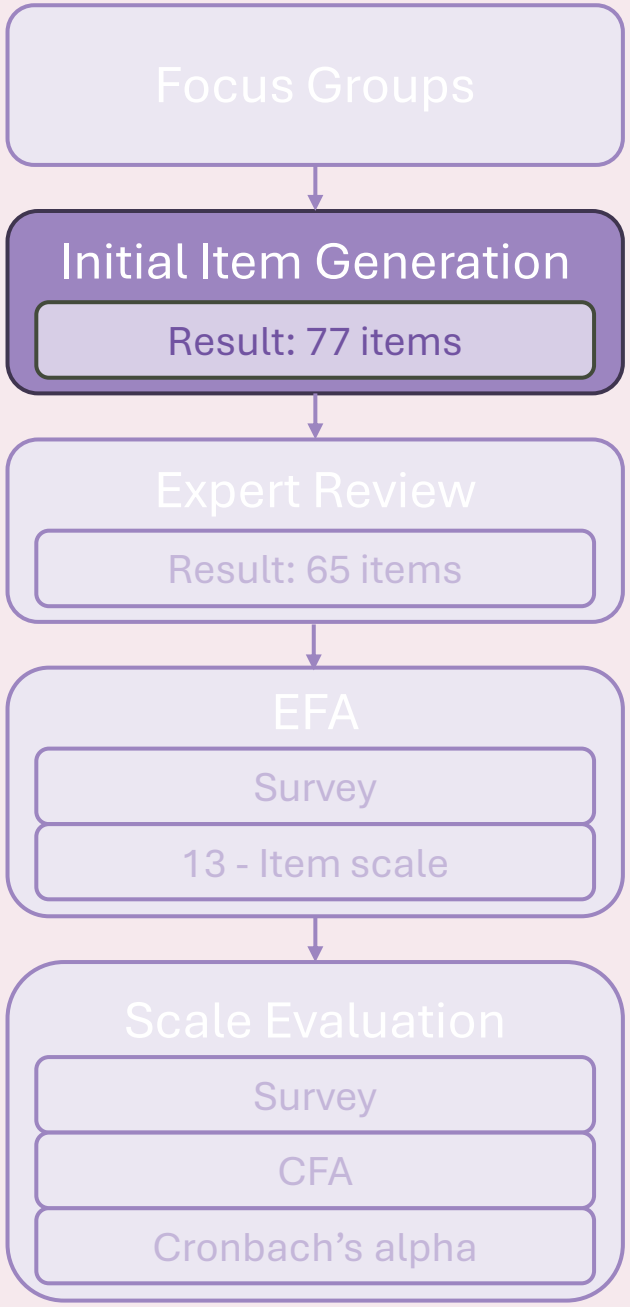
Using this technology helps me feel more prepared when transitioning from public transportation to walking

Using this technology helps me balance my perception of risk of gender-based violence, without feeling overwhelmed by concerns while traveling

Using this technology helps me feel more comfortable around strange people

Using this technology helps me reduce my fear of hate crimes when I express my individuality while I travel

Using this technology helps me reduce my discomfort in diverse social settings where my ethnic or racial identity might be more noticeable while traveling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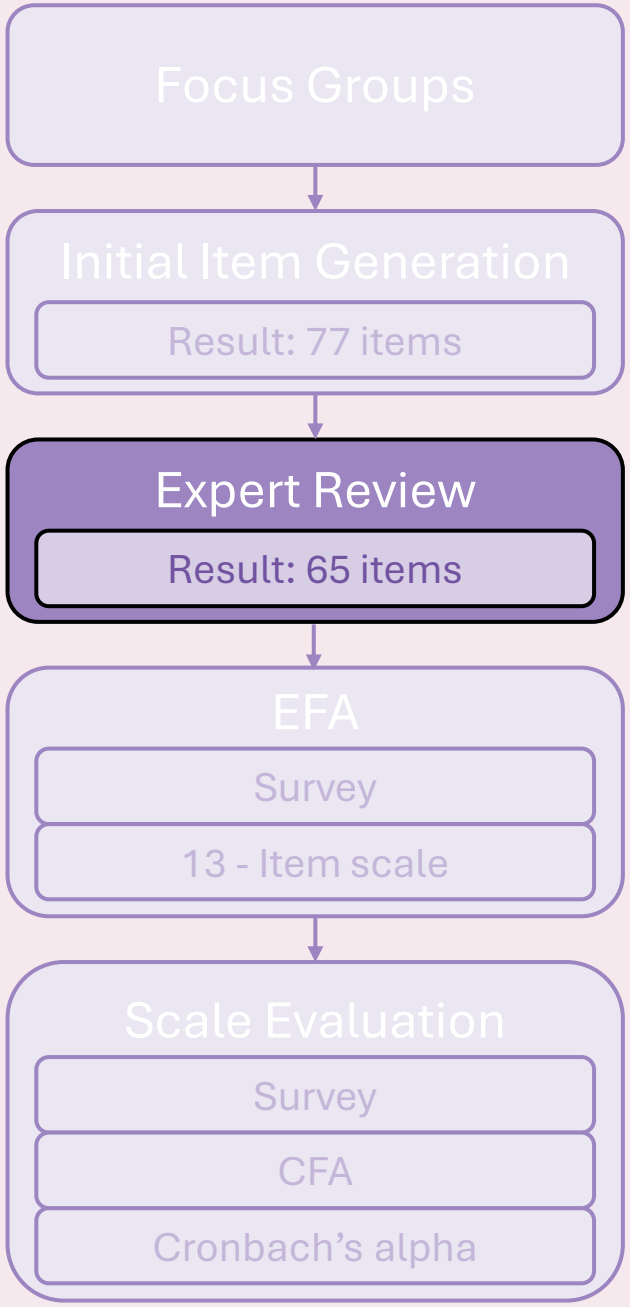
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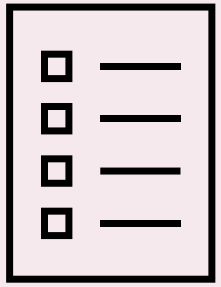

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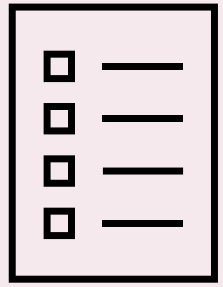
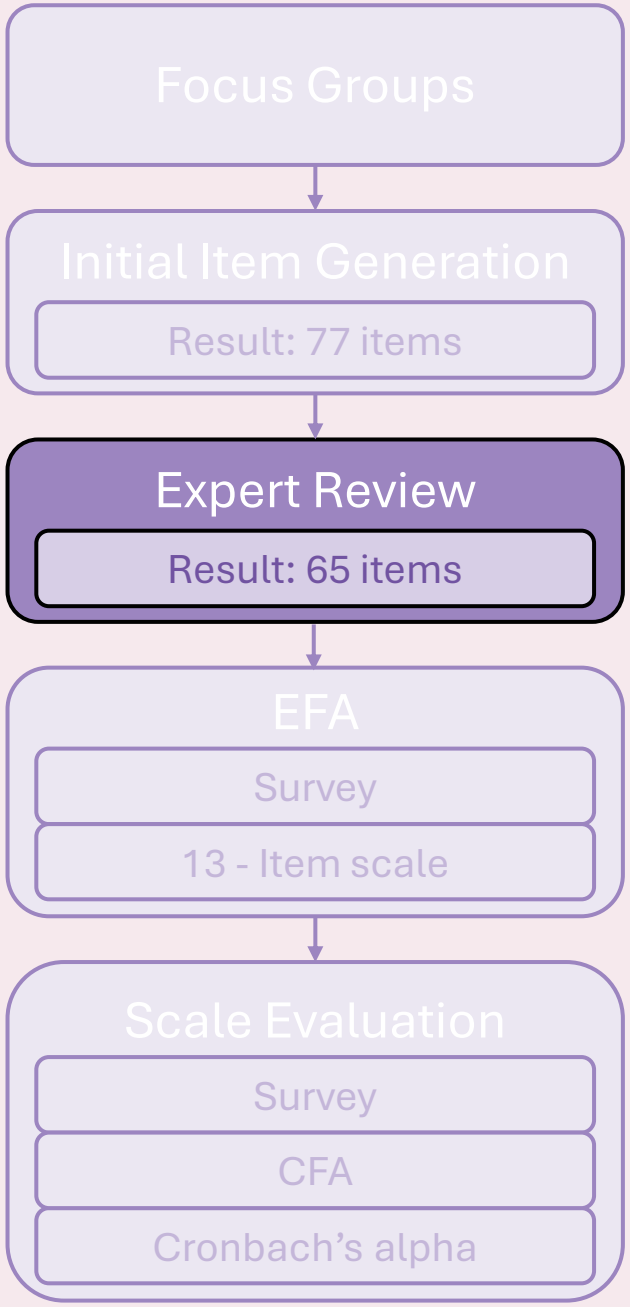


65 items

content validity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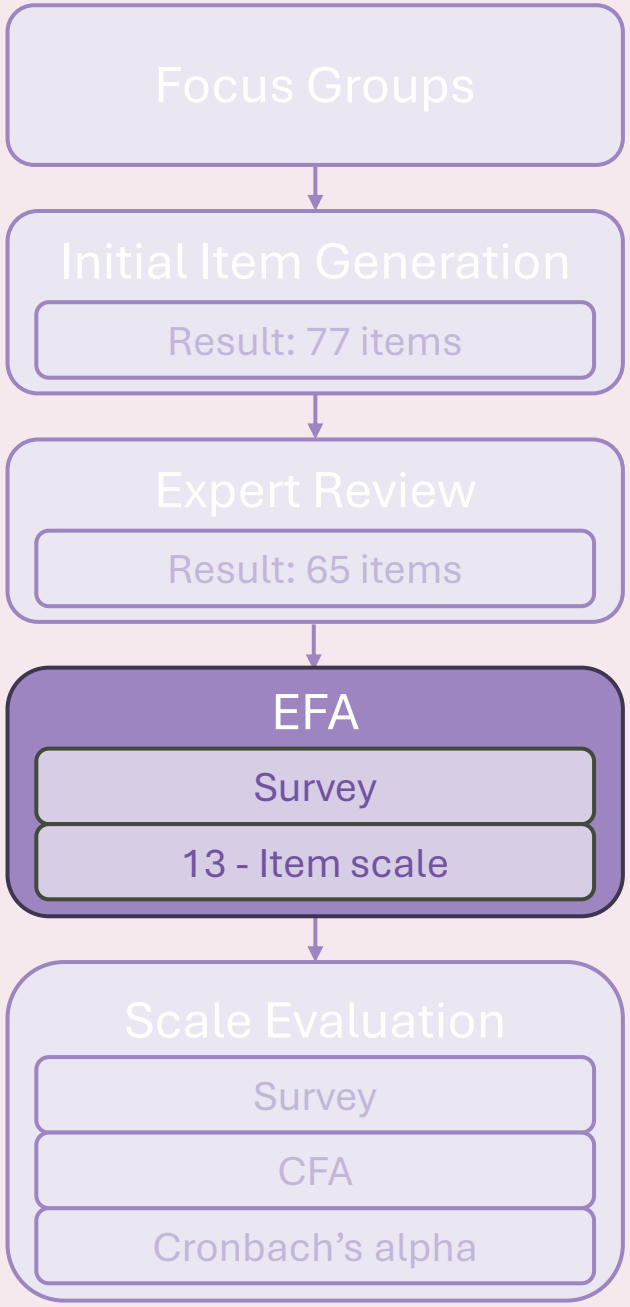
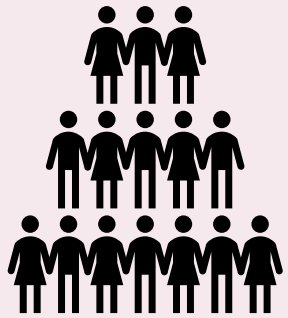


Only items that effectively measure how technology affects PPS during DTDT

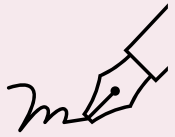
EFA

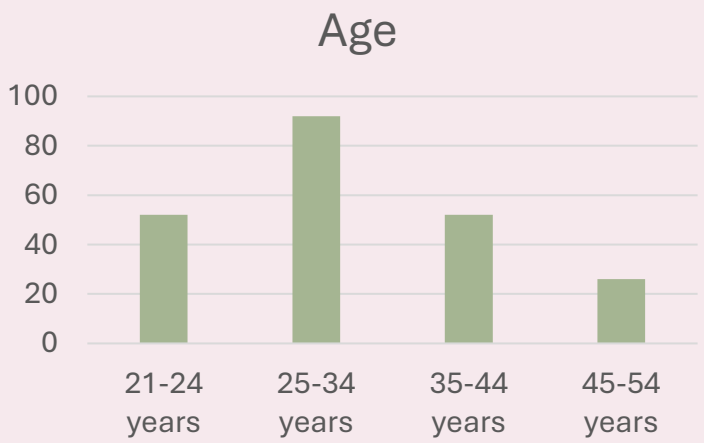
Survey

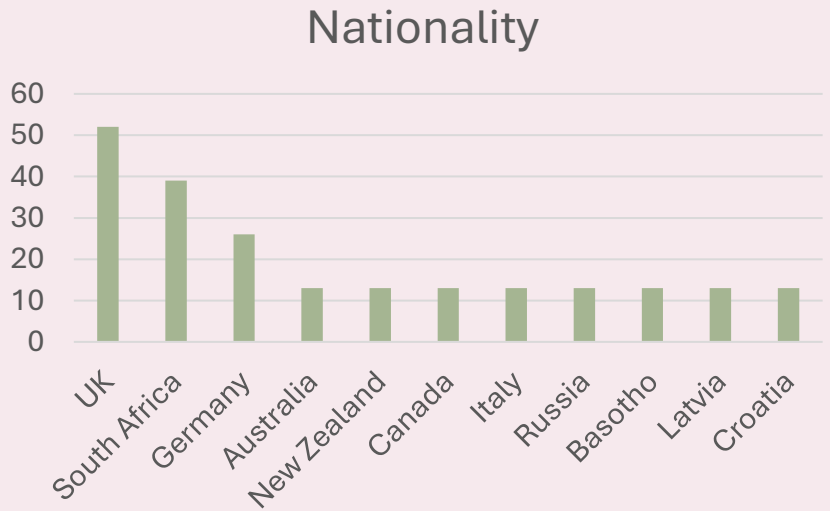


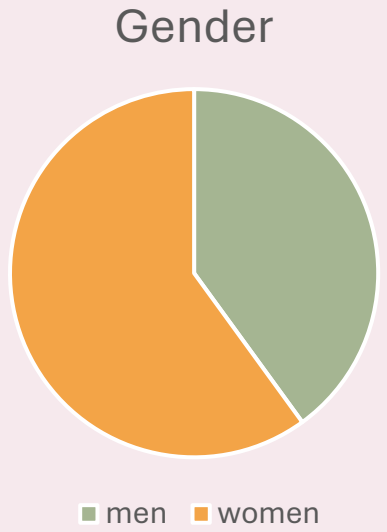
223 participants

Prolific









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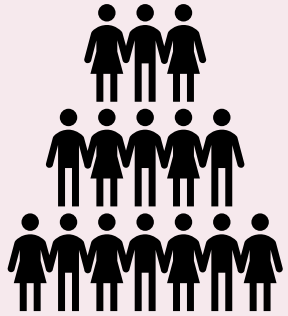

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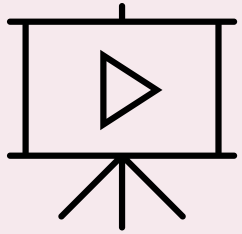
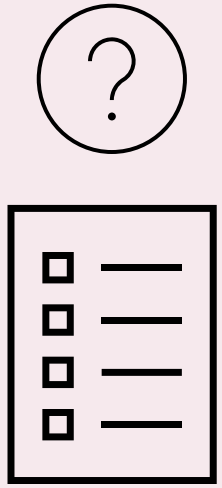
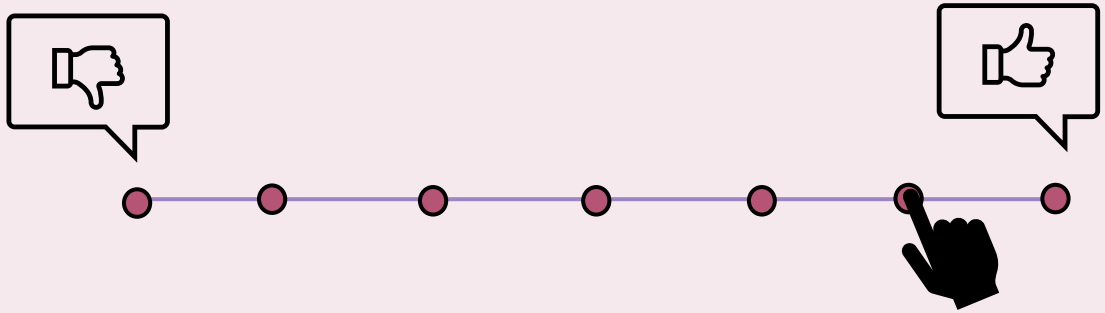


App feature showcase



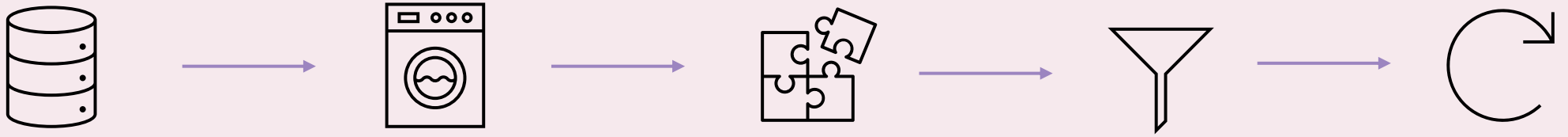
65 items



7-point Likert

EFA

Survey



Data

Clean data

Kaiser-Meyer-Olkin

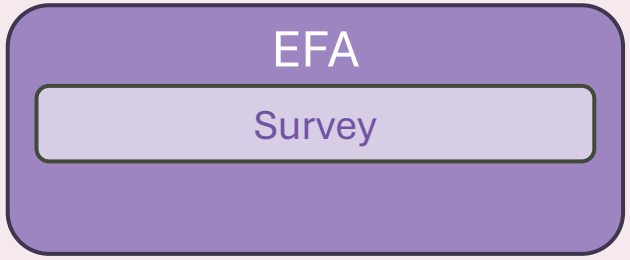
Bartlett’s test of Sphericity

Kaiser’s Criterion

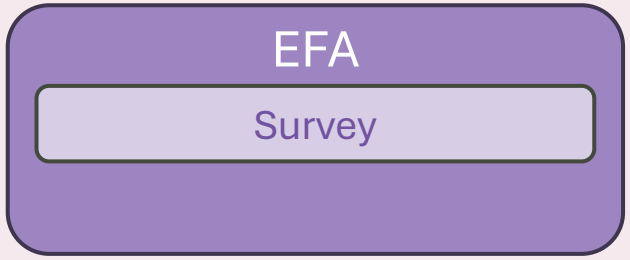
Scree Test

6 or 4 factors

Oblimin



18	immedi. env._3	0.118676	0.326164	-0.0347	0.172556	0.290232	0.222362
19	immedi. env._4	0.117414	0.311359	0.09003	-0.02892	0.416469	0.134613
20	immedi. env._5	-0.00917	0.184897	-0.1824	0.106717	0.64322	0.307034
21	immedi. env._6	0.052495	-0.00753	0.199544	0.240218	0.507357	0.086467
22	immedi. env._7	-0.00104	0.219879	0.091268	0.126593	0.60693	-0.04579
23	immedi. env._8	0.116758	-0.06619	0.177573	0.249766	0.587459	0.01494
24	immedi. env._9	0.44205	0.101188	0.119903	0.021059	0.497991	-0.1652
25	immedi. env._10	0.444649	0.297294	0.050716	0.026949	0.405345	-0.26555
26	prev. exp._1	0.07713	0.411144	0.276889	-0.1807	0.096807	0.336845
27	prev. exp._2	0.076969	0.514641	0.025322	0.034638	0.167013	0.297577



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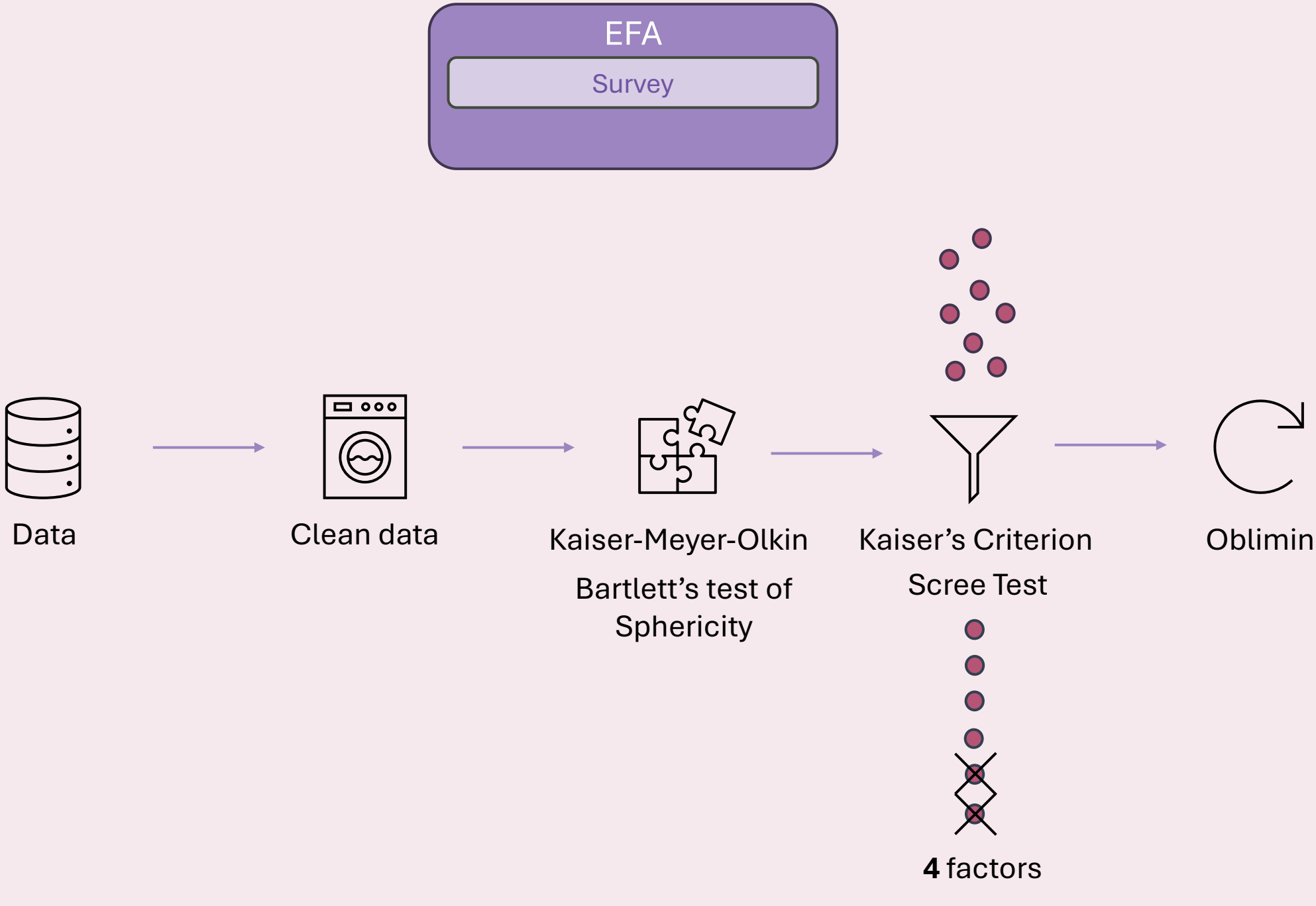
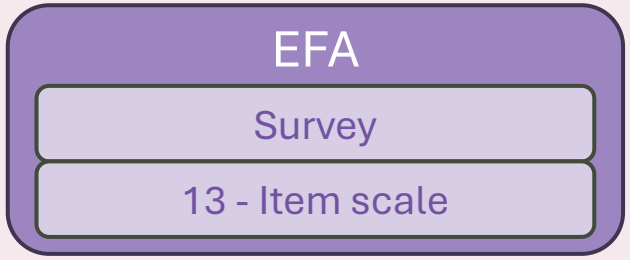
< 0.4

cross-loadings


EFA
Survey
Data
Clean data
Kaiser-Meyer-Olkin
Bartlett's test of Sphericity
Kaiser's Criterion
Scree Test
4 factors
Oblimin

Loadings > 0.75



Identity

1. Using this technology helps me ease my concerns about standing out due to my appearance or presentation in areas with different religious or cultural norms
2. Using this technology helps me reduce my discomfort in diverse social settings where my ethnic or racial identity might be more noticeable while traveling
3. Using this technology helps me reduce my fear of hate crime when I express my individuality while traveling
4. Using this technology helps me feel less worried about prejudice based on how I express myself
5. Using this technology helps me maintain my confidence even in areas where my ethnicity is not well-represented

Traveling Alone

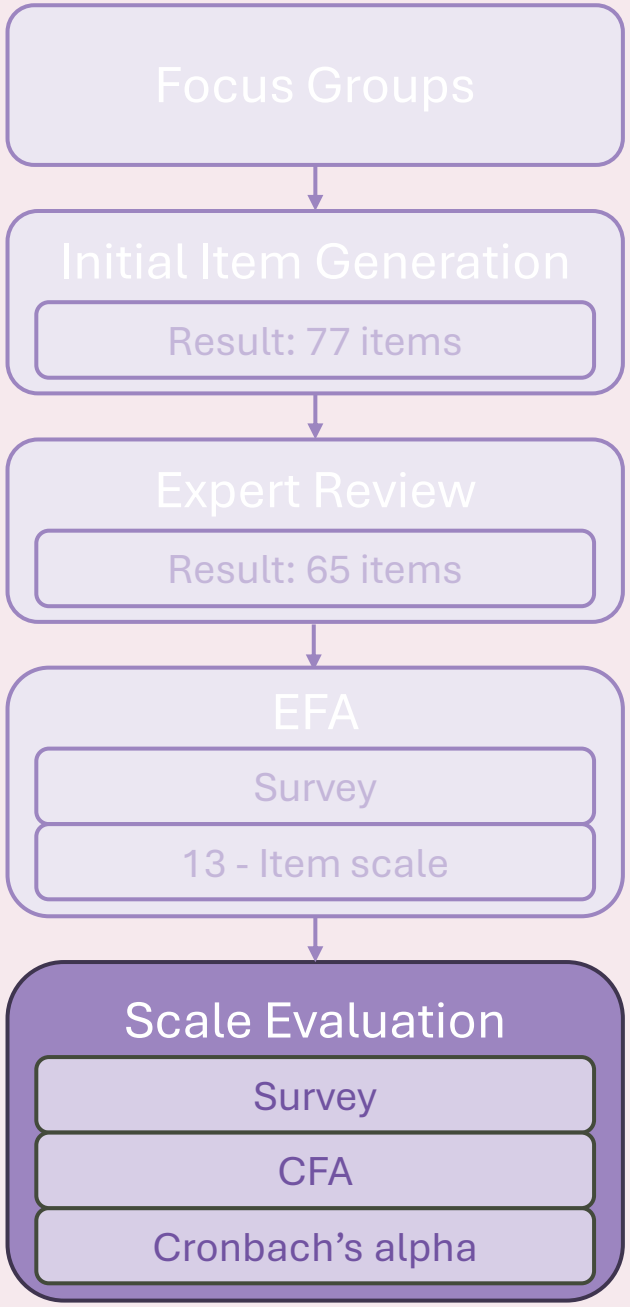
6. Using this technology helps me feel less scared when traveling alone
7. Using this technology helps me feel less anxious when walking alone
8. Using this technology makes me less anxious when walking through a station alone

High-Risk Context

9. Using this technology helps me feel more confident while maintaining an appropriate level of caution when walking alone in a dangerous area
10. Using this technology helps me feel less scared while maintaining an appropriate level of caution when walking alone in a bad neighborhood
11. Using this technology helps me feel less nervous while staying vigilant when using public transportation or walking in an area with a bad reputation

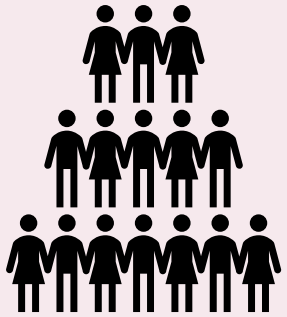
Interactions with Strangers

12. Using this technology helps me feel more comfortable when unwanted interactions with strangers occur
13. Using this technology helps me feel more confident when unwanted interactions with strangers occur

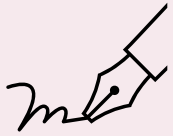

Focus Groups
Initial Item Generation
Result: 77 items
Expert Review
Result: 65 items
EFA
Survey
13 - Item scale
Scale Evaluation
Survey
CFA
Cronbach’s alpha

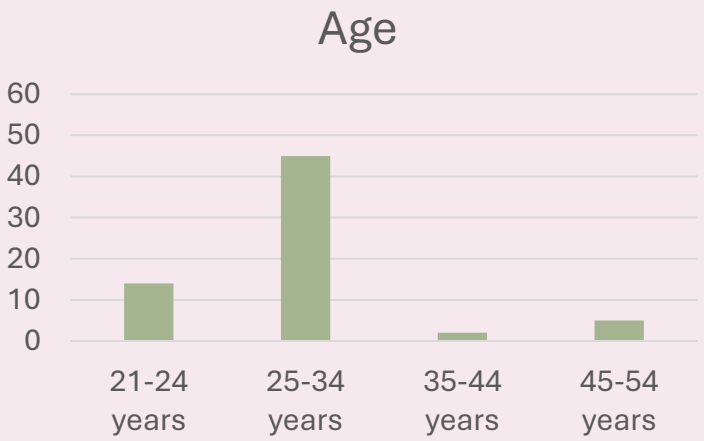
Scale Evaluation

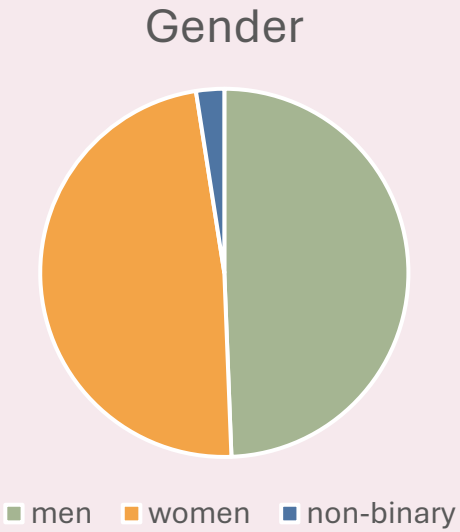
Survey



71 participants

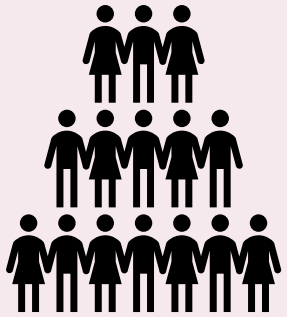




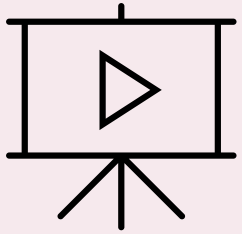


Scale Evaluation

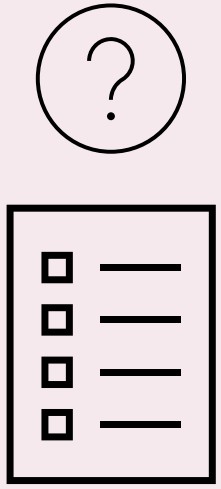
Survey



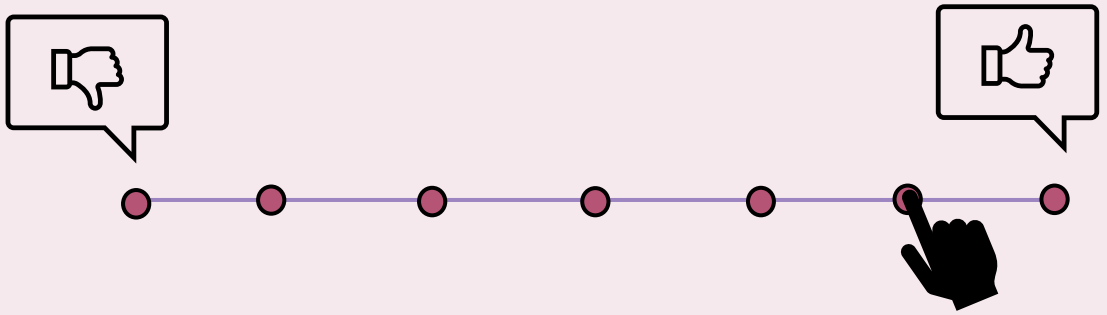
71 participants



App feature showcase

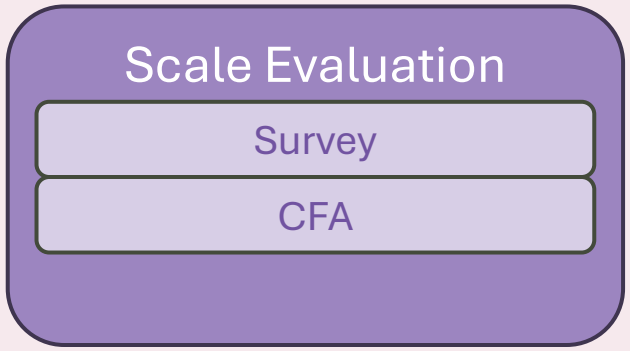


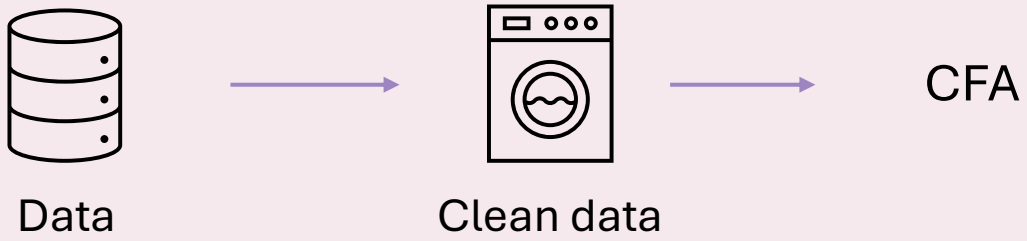
13 items



7-point Likert

dimensionality

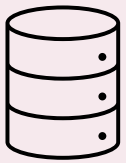




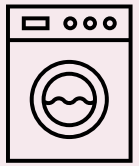
dimensionality

Scale Evaluation

- Survey
- CFA



Data



Clean data

CFA

#	Identity	Traveling Alone	High-Risk Environment	Interactions with Strangers
1	0.75	0	0	0
2	0.78	0	0	0
3	0.72	0	0	0
4	0.67	0	0	0
5	0.75	0	0	0
6	0	0.72	0	0
7	0	0.82	0	0
8	0	0.77	0	0
9	0	0	0.77	0
10	0	0	0.72	0
11	0	0	0.65	0
12	0	0	0	0.76
13	0	0	0	0.75

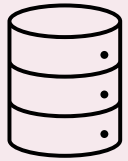
dimensionality

Scale Evaluation

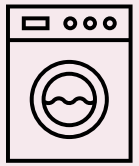
Survey

CFA

#	Identity	Traveling Alone	High-Risk Environment	Interactions with Strangers
1	0.75	0	0	0
2	0.78	0	0	0
3	0.72	0	0	0
4	0.67	0	0	0
5	0.75	0	0	0
6	0	0.72	0	0
7	0	0.82	0	0
8	0	0.77	0	0
9	0	0	0.77	0
10	0	0	0.72	0
11	0	0	0.65	0
12	0	0	0	0.76
13	0	0	0	0.75



Data



Clean data

CFA

CFI : 0.97361

TLI : 0.965112

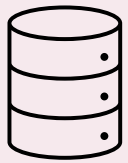
RMSEA : 0.073684

Scale Evaluation

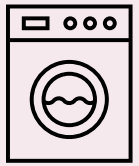
- Survey
- CFA
- Cronbach's alpha

reliability

#	Identity	Traveling Alone	High-Risk Environment	Interactions with Strangers
1	0.75	0	0	0
2	0.78	0	0	0
3	0.72	0	0	0
4	0.67	0	0	0
5	0.75	0	0	0
6	0	0.72	0	0
7	0	0.82	0	0
8	0	0.77	0	0
9	0	0	0.77	0
10	0	0	0.72	0
11	0	0	0.65	0
12	0	0	0	0.76
13	0	0	0	0.75



Data



Clean data

CFA

CFI : 0.97361

TLI : 0.965112

RMSEA : 0.073684

Cronbach's alpha

Factor	Alpha value	Confidence interval
Identity	0.93	[0.900, 0.953]
Traveling Alone	0.90	[0.849, 0.934]
High-Risk Context	0.93	[0.903, 0.957]
Interactions with Strangers	0.88	[0.815, 0.928]

Implications

- Evaluation of personal safety apps
- Help identify strengths and weaknesses of features
- Promot public transport, more eco-friendly transport

Limitations

- Video-assisted showcase of the app
- Prolific: self-selected sample
- Global applicability: may miss regional variation

Future Work

- Bigger sample for evaluating the PPSS
- Construct and discriminant validity through known groups and t-tests
- Develop and test an enhanced version of the bSafe app based on PPSS feedback

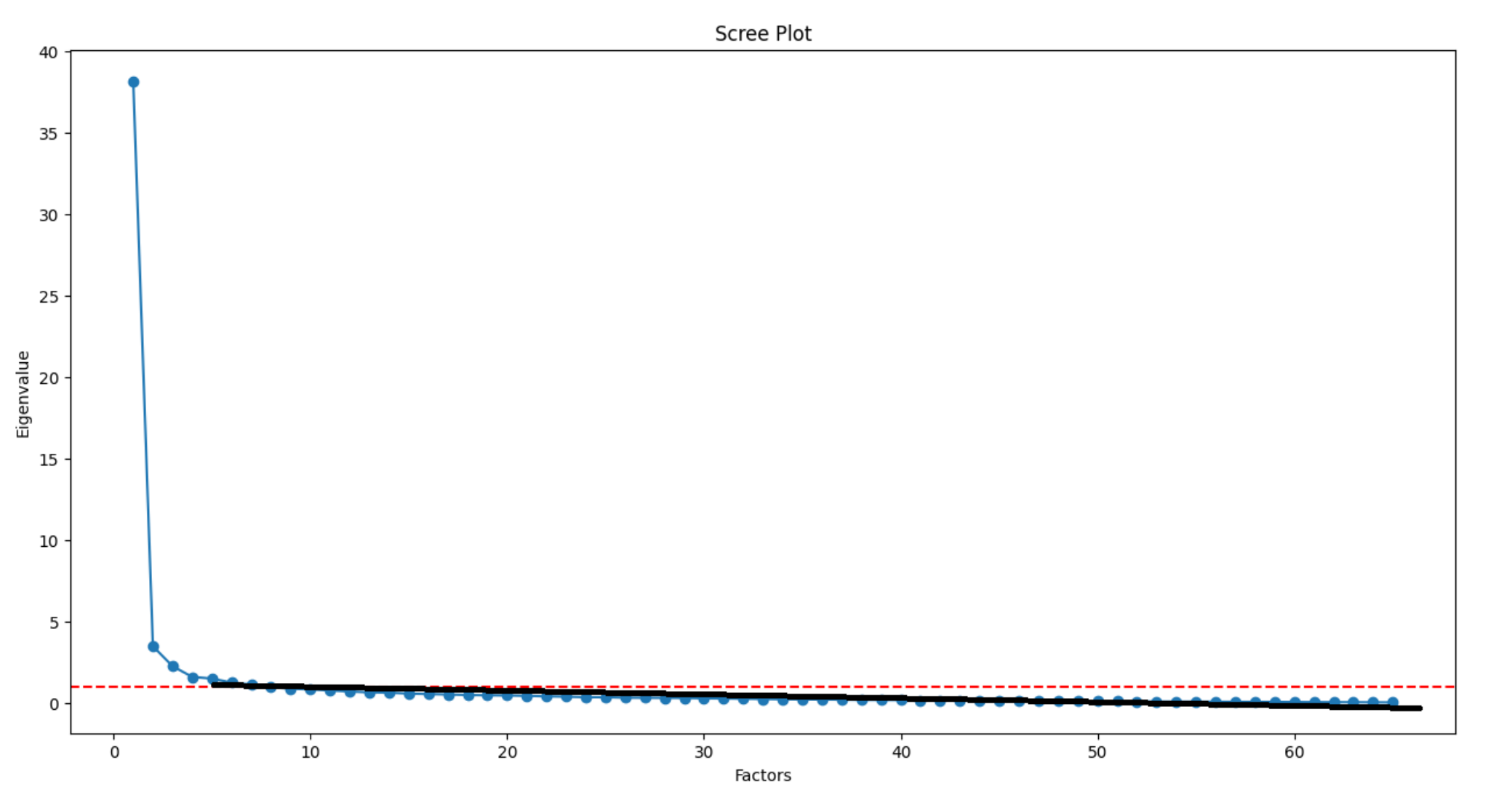
Thank you for your attention :)

Questions?

Scenario #1

It's rush hour and 25-year-old Mike has to go to work. It's his first day at his new job in a brand-new city. To get to the office, Mike checked the travel planner which indicated a public transport travel time of 40 minutes in total. He leaves the house and walks 5 minutes to the train station. Arriving at the station, he walks to the platform and waits 3 minutes for the train to arrive. When the train arrives, Mike gets on the train and rides it for 20 minutes. After arriving at the station, he gets off and walks to the nearest metro station. After boarding the metro, he spends 10 minutes on it. When Mike arrives at the station, he takes a short walk towards his office on the other side of the road.

Scenario #2
Mia has just had a night out with her best friends for her 18th birthday, and they all get on the last metro to go home. They board the metro together, but since they all live in different areas of the city they have to each get off at a different station. Arriving at Mia's destination, she says goodbye to her friends and exits the metro. Then she walks through the station and gets in the direction of her place, which is a 7-minute walking distance.


Scree Plot
Eigenvalue
Factors
40
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60