A photograph of a woman with long dark hair, wearing a dark coat, looking down at her smartphone. She is standing in a crowded street with other people walking by. The scene is somewhat blurred, suggesting movement and a busy environment.

Let them know your next STEP

REPORT

Exploring Interaction 2022/2023
Laura Franco 5672600

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Balance

Research & Exploration

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Concept & Evaluation

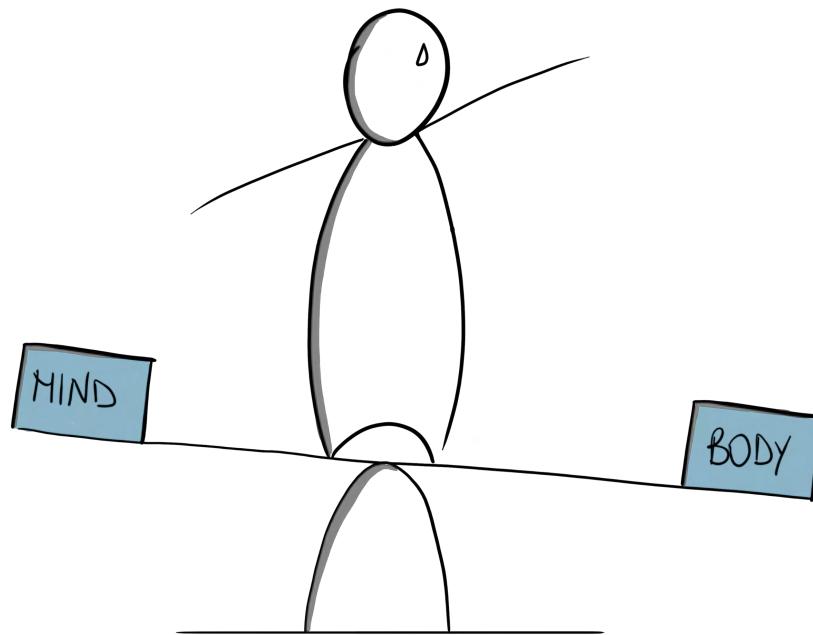
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Appendix

Report total amount of words 3013

Balance

Reasoning about the main topic



The Philosophy explored the **dualism between mind and body**. The Cartesian split theory shows us that the **mind can be considered the software** that runs on the **body, which is the hardware** (The mind explains behavior while the body is the output device). **Mind and body should be perfectly balanced to consent us to move and act optimally in the environment** but sometimes this is not the case.

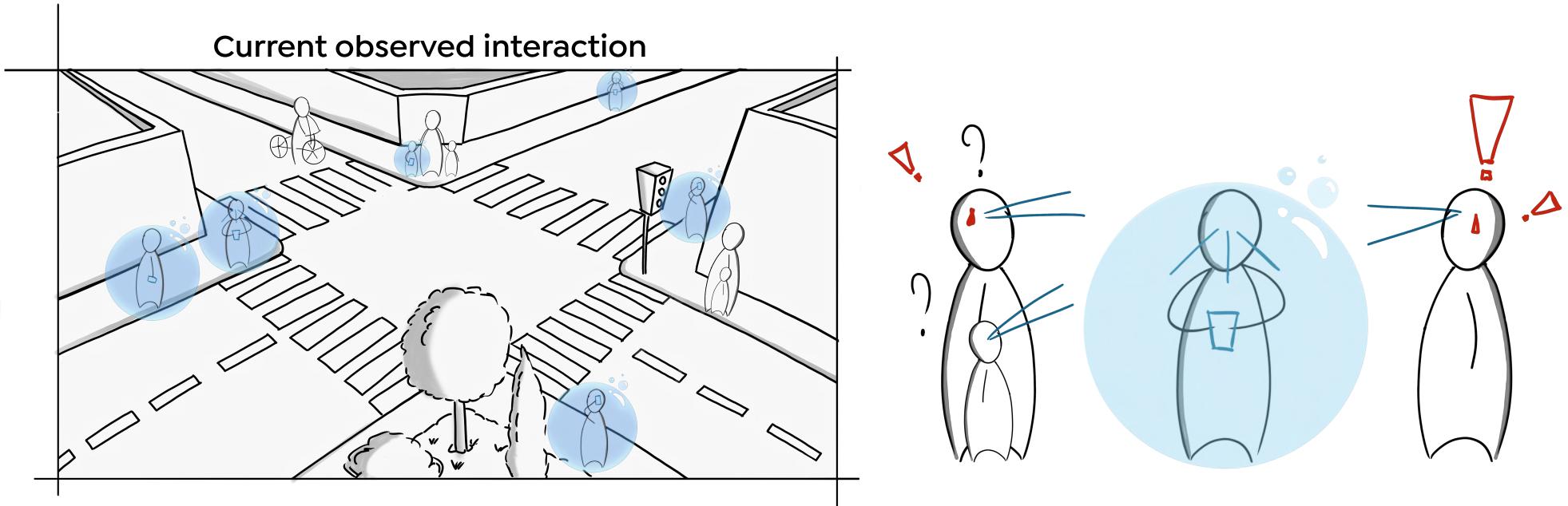
Nowadays with the **use of** technological devices, in particular, **smartphones** we tend to live in two different dimensions, **our minds, and thought are not aligned with our actions**. We receive dozens and dozens of messages, calls, e-mails, pictures, and much more. We are constantly and instantly connected with people around us or even around the world. But **often we lose connection with the environment** and with what is happening around us.

Research & Exploration

During Cycle 1 I started to explore the selected current interaction related to the theme of “Balance”. I define the context, involved people, and what effect I want to achieve for my users. With these elements, the Design Goal has been formulated. In this chapter, the reader will go through a short recap on the Design Goal, Interaction Vision, research activity and Design Direction (more details can be founded in the Appendix)

Introduction

Research & Exploration



Most of the **people in the city center tend to use their phones when they move around**. Some of them use it actively for calls, texting, socials, and directions; others hold it in their hand, just in case they will need it because they feel awkward or under social pressure. **This device creates an immersive bubble that muffles people's awareness about the surrounding environment**. An excessive **detachment from the world around them can create potentially dangerous situations both for the phone's users and for the people around them**. Because of the phone, **our body language gets misinterpreted, and our minds and thought are not aligned with our actions**.

Design goal

Research & Exploration

My design goal is to allow **city**
Context

walkers, that need to **use their phone while moving around**,
Who is involved Interaction

to make their next steps **predictable and visible for the others**
Effect

Interaction vision

Research & Exploration



Protective
Trustful
Supportive
Safe

Research activity

Research & Exploration



1

Casual observation

To gain an overview of the selected context with all the possible



2

Desk research

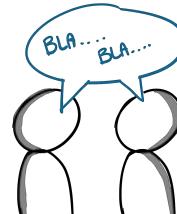
To get inspired by other people's research/papers. To check what is already known about this topic and make connections between different fields



3

Survey

To gain insight into people's experience, need, and thought



4

Interview

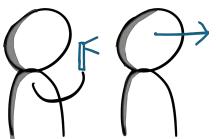
To gain some extra insight into the experience and feelings of the users in a more open and flexible way than the questionnaire



See appendix p. 53–85 for details about methods, procedure and sample size

Research activity

Research & Exploration



5

Roleplay

To compare people's typical behavior while walking with the phone and without it in a crowded environment to highlight pain points and possible intervention



6

Ethnography

To take into account the smartphone point of view



7

Sensitising activity

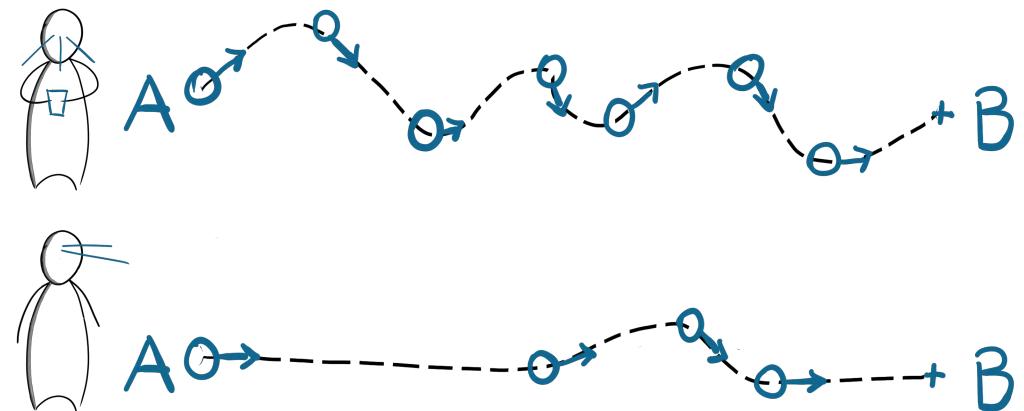
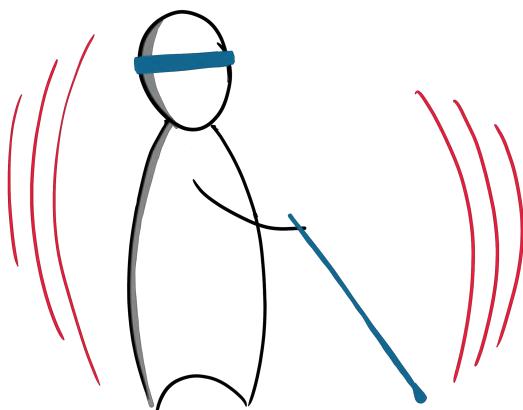
To gain some extra insight into user's needs through the generative and making technique



See appendix p. 53-85 for details about methods, procedure and sample size

Main insights

Research & Exploration

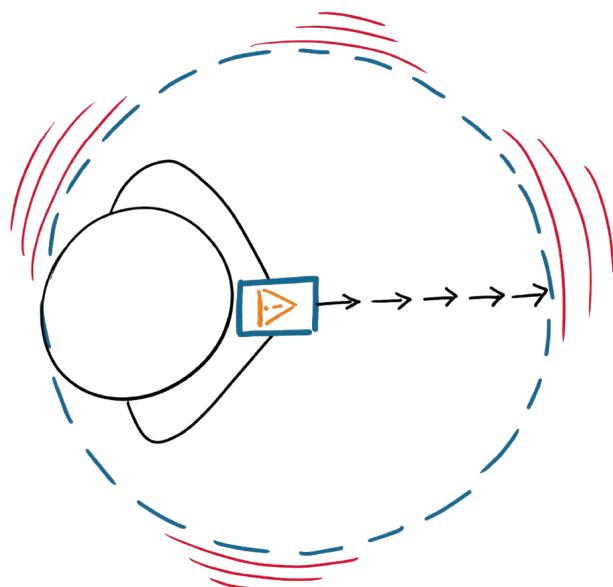


Activity	Insight
1 2	There are similarities in the experience of blind people & people that use their phone

Activity	Insight
5	<ol style="list-style-type: none">1. People using the phone tend to follow and trust the guide of the person in front of them2. When using the phone, the path plotted is inconsistent and unpredictable

Main insights

Research & Exploration

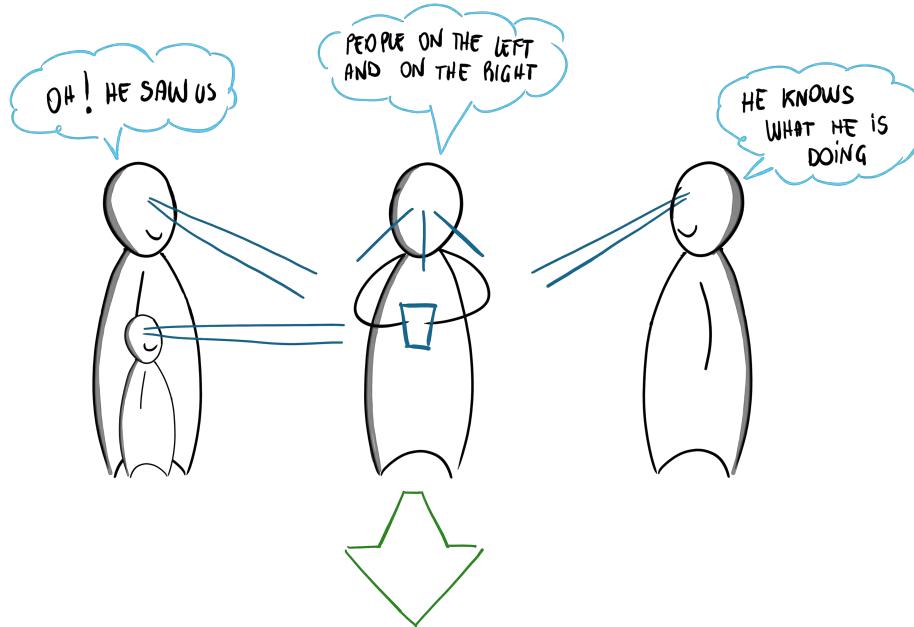


Activity	Insight
1 3 4	The periferal view gives information about the surrounding environment
3 4 5 7	The awareness of the world around depends on the commitment required by the task on the phone
6	The position of the phone is always aligned with the tip toes even when moving in a zigzag manner
3 4 5	When using the phone many aspects and details of the context are missed

Desired interaction

Research & Exploration

People should be able to walk even when using their phone, for unpostponable reasons, without creating a chaotic situation for the others. Their path should be straight and predictable thanks to a clear communication through their body language.



Design direction

Research & Exploration

My design direction is to create a multisensory device that allows implicit communication on multiple levels between phone users and others

See appendix from p. 53-88 for all the phase and details about the Cycle1

Prototype & Direction

In this phase the aim was to further research and explore the current interaction by using various low-fi prototypes with the scope of developing the design direction previously defined at the end of Cycle 1. Some adjustments have been done to the previous DG and IV. During this chapter an overview of the different interactive prototyping phases is presented with their relative strength and weaknesses. To conclude, one concept is selected as the most valuable for further detailing in the Cycle 3.

Design goal

Prototype & Direction

My design goal is to **fulfill pedestrians'**
Who is involved

need for autonomy and safety
Effect

when they **use their phone while walking**
Interaction

in a crowded environment
Context

Interaction vision

Prototype & Direction

It should feel like dancing the tarantella*

Predictable
Engaging
Create consciousness
Communicative
Playful



*Tarantella: A quick, spirited Italian folk dance that involves much spinning and often the playing of tambourines. In Tarantella people dance in big groups, the couples dance by changing partner often and the partners don't usually have a physical contact but they use their body language to engage and show their next movements

Qualities and properties

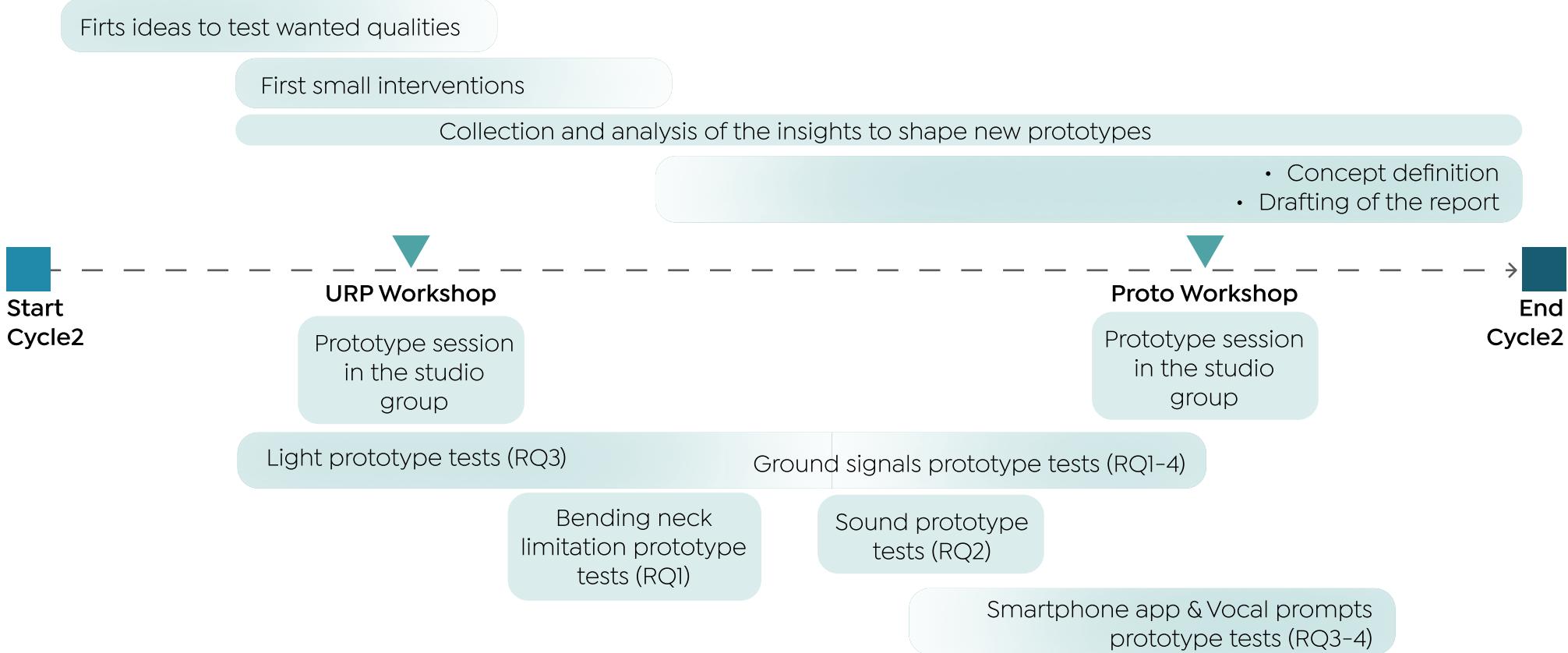
Prototype & Direction

In the next pages, my first interventions with small low-fi prototype sessions are shown. The prototypes have the goal to test which features should be included in the final concept in order to be perceived as effective by the user by meeting the qualities of the defined interaction vision

	Interaction vision qualities	Concept expected properties
Predictable	Every dancer's step can be predicted in advance by the others thanks to the skills and the practice	The design help pedestrian to predict others next step
Engaging	Every dancer has to do their part to not break the rhythmicity. Only if everyone has the same motivation and goal the choreography can be at the same time an organized and chaotic flow.	The design is engaging for both the users and the stakeholders of the interaction
Create consciousness	Dancers must be aware at the same time of their movements, other dancers steps and location and the rhythm. The situation is never constant but they have to adapt second after second	The design help the phone users to be aware of the surrounding and the other pedestrian to know that the phone users are aware of them
Communicative	The implicit communication is the key of the tarantella. Dancer coordinate with each other often without having to make physical contact but only through body language and eye contact	The design help the crowd to coordinate in a dynamic but organized flow by facilitating the implicit communication
Playful	Tarantella is a playful dance, not serious and very joyful that doesn't aim to connect only two people but an entire group	The design should be perceived as a game and not as alarm device

Prototype plan

Prototype & Direction



RQ1: What catches the attention of pedestrians that use the phone? What catches the attention of pedestrians that don't use their phone?

RQ2: How people can communicate implicitly without eye contact?

RQ3: How pedestrians with phones can show others that they are aware of the surrounding?

RQ4: How can we make pedestrians with the phone more aware of their actions in a playful and not restrictive way?

Prototype1

Prototype & Direction

Lights

Many variations have been made, to find out if this kind of intervention is able to catch the attention of the pedestrian with/ without the phone or neither of them.



Main insights

- Lights are NOT very helpful for pedestrian with the phone because people's gaze is already focused on the smartphone
- Light can help pedestrian that are not using their phone



See appendix p. 89 for details about methods, procedure and sample size

Prototype2

Prototype & Direction

Sounds

By prototyping different soundtracks, my interest was to understand how sound influences people's awareness related to human motion. Specifically what kind of sounds can be recognized as a human source

1. White noise sound



2. Person's step sound



3. Heartbeats sound



Main insights

- Sounds, as the heartbeats, can be related to human vital parameters. It makes people look around and check the environment.
- The sound tracks 1 and 2 made the participant confused



See appendix p. 90 for details about methods, procedure and sample size

Prototype3

Prototype & Direction

Ground signals

For this prototyping phase, I made a distinction between signals drawn on the ground and elements that created temporary physical obstacles on the user path.



Main insights

- Variations on the ground catch people's attention for a moment but then they will act again as they were doing previously
- When participants stepped on the balloons they checked the floor but not the environment around
- Drawn signals are not very noticeable



See appendix p. 91 for details about methods, procedure and sample size

Prototype4

Prototype & Direction

Bending neck limitation

The aim was to understand how much the “wrong” posture of the neck in the current situation is responsible for the lack of awareness of the surrounding. A travel pillow has been used to force the participants into a more straight posture to prevent the bending neck



Main insights

- Unnatural positions make participants more aware of the surrounding, they also have more control on their movements

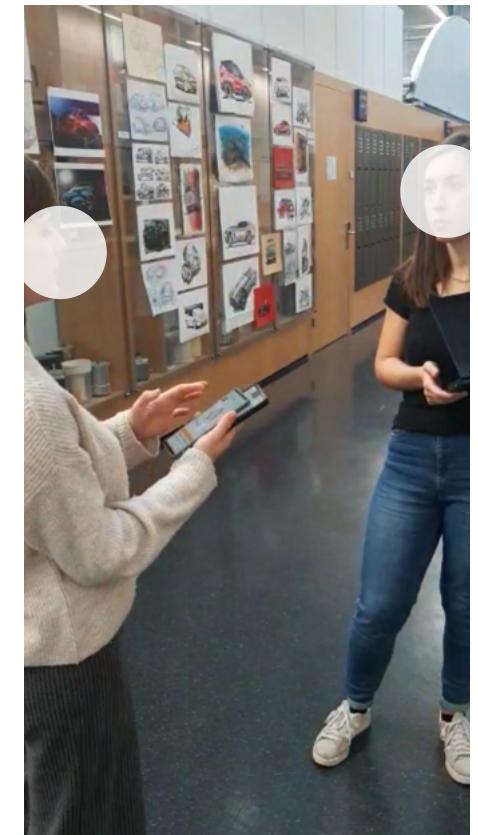
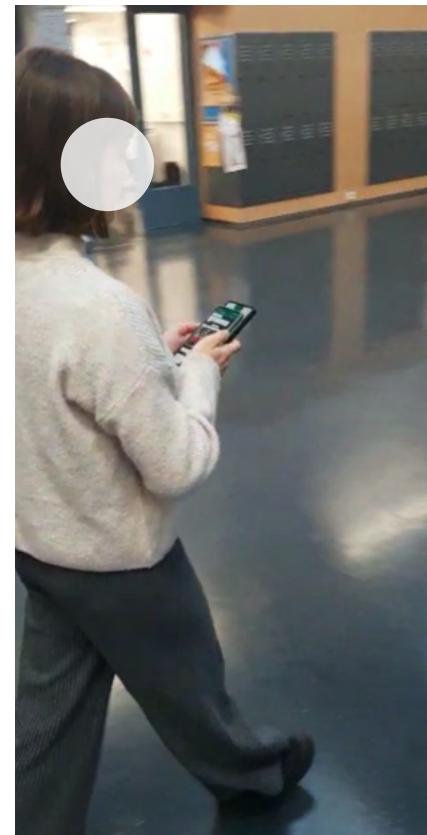
See appendix p. 92 for details about methods, procedure and sample size

Prototype5

Prototype & Direction

Smartphone app & Vocal prompts

By prototyping the app on the phone and the vocal prompts, the aim was to test whether the users would have felt more conscious about the environment. The prototypes used live vocal/visual feedback to alert them whether they were walking straight or they were zigzagging.



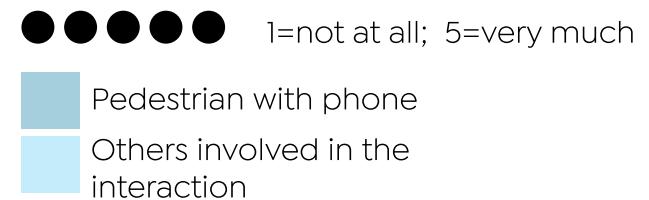
Main insights

- Instruction through visuals on an app makes people rely on the phone and they don't look around anymore
- The visuals on the app weren't really clear to the participants

See appendix p. 93 for details about methods, procedure and sample size

Evaluation & Conclusion

Prototype & Direction



	Predictable	Engaging	Create consciousness	Communicative	Playful
Lights	●●	●●	●	●	●●
	●●●●●	●●●●●	●●●	●●●●	●●●
Sounds	●●	●●●	●●●●●	●●	●●●●
	●	●	●	●	●
Ground signals	●	●●	●●●	●	●●●●
	●	●●	●	●	●●●●
Bending neck limitation	●●●●●	●	●●●●●	●●●●	●●●●
	●●●●●	●	●●●●●	●●●●	●●●●
Smartphone app & Vocal prompts	●●●	●●●●●	●●●	●●	●●●●
	●	●	●	●	●

Unexpected findings/conclusion

- If pedestrians are asked to use their phone while completing another task at the same time or to walk in unusual positions, they will be more focused on the surrounding as well
- The design shouldn't make them even more dependent and reliable on the phone
- Pedestrians that are not using their phone normally feel very annoyed by seeing other pedestrians using their phone because they perceive them as not respectful
- Pedestrians with the phone sometimes are more aware of the surrounding than they look

Concept

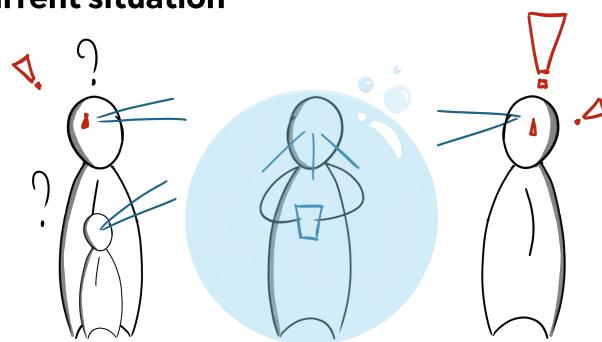
Prototype & Direction

The concept consists of an appliance that can be attached to every smartphone's cover.

Through this design, users can implement the ability to perform different actions with different fingers at the same time.

The challenge of this “game” is related to the fact that the users will have to perform actions with fingers that reflect their gait and body’s movement in the space. People around them will be able to see the gadget on the cover and they will know that the user is caring about being aware of the surrounding

Current situation

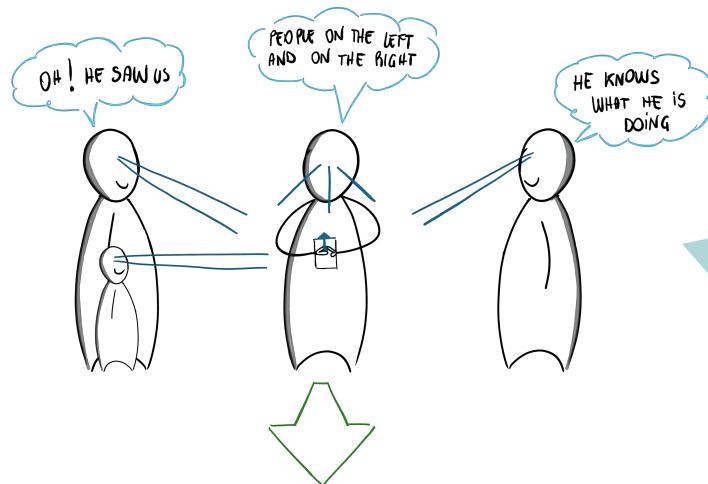


Concept design



Pedestrian will move the pointer to the left, right or center depending if he/she is turning left, right or walking straight

Desired situation



The pointer is controlled with the index fingers of both hands

Concept quality & properties

Prototype & Direction

Qualities

Predictable

Properties

The design should help pedestrian to predict others next step

Engaging

Properties

Interaction, Appearance

Create consciousness

The design is engaging for both the users and the stakeholders of the interaction

Interaction, Appearance, Technology

Communicative

Design helps:

- Phone users to be aware of their surroundings
 - Other pedestrians know that they are taken into consideration by those who use mobile phones

Interaction, Experience

The design help the crowd to coordinate in a dynamic but organized flow by facilitating the implicit communication

Interaction, Experience, Aesthetic expression

Playful

The design should be perceived as a game and not as alarm device

Interaction, Experience, Aesthetic expression, Technology

Concept aspects

Prototype & Direction

Interaction

The mere presence of the device on the phone cover makes it clear that the person using the mobile phone is aware of the fact that there are people around and knows that can manage their presence.

For the people around, the presence of the device on others' phone is a clear sign of awareness. Pedestrians without the phone will feel taken into consideration and respected.

Experience

The direct users should feel:

- triggered and engaged
- motivated to use it because able to keep track of their skills progress

People around should feel:

- That phone users are willing to be respectful towards them and will not underestimate their presence around



Appearance

The design is small: adaptable to any phone cases and accessible by the user's index fingers of both hands

Aesthetic expression

Pop and flashy in the style but with minimalistic shapes

Technology

mechanism that allow a simple but engaging interaction

Materials

The product is made by plastic materials because it need to be durable and not fragile

Concept & Evaluation

In this final phase the details of the concept have been defined. Most of this cycle has been spent to evaluate the desired interaction and consider the feasibility of the final concept, this have been possible through the assessment of many experimental prototype. The detailing and the specification of the final prototype follows the interaction vision's qualities. At the end of the cycle 3 I conducted a final evaluation with potential users and implemented findings and recommendations for future works.

Design goal

Concept & Evaluation

I want to design a device that allows for **implicit communication**, about
Effect

their movement, **between pedestrians, while using their phones**, in a

Who is involved

Interaction

crowded environment

Context

Interaction vision

Concept & Evaluation

It should feel like dancing the tarantella*

Predictable
Engaging
Create consciousness
Communicative
Playful



*Tarantella: A quick, spirited Italian folk dance that involves much spinning and often the playing of tambourines. In Tarantella people dance in big groups, the couples dance by changing partner often and the partners don't usually have a physical contact but they use their body language to engage and show their next movements

Prototype 1 & 2

Concept & Evaluation

With these prototypes the aim was to test some of the aspects and properties the final concept might have had.

What I wanted to test was:

- what kind of grip and shape are able to engage the most with the users.
- which interaction works in term of mechanisms (ex. squeezing, rotation, clicking, pressing, moving, sliding,...).
- what is the preferable texture in an ergonomic perspective.
- what body action should be required by the users (fingers/palms)
- which characteristics catches other pedestrian attention (visual/sound)
- which interaction between the direct user and the device works best (passive or active)



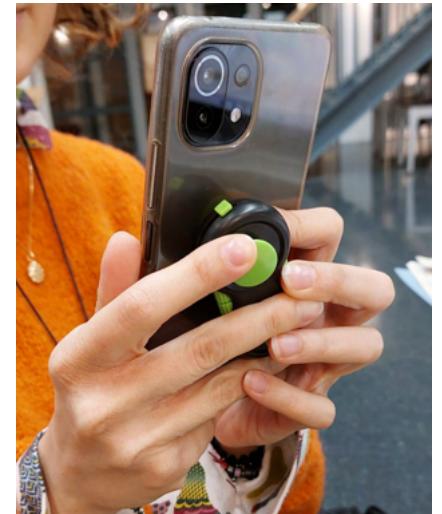
1. Overview of the prototype with which the mechanism of squeezing with the hand's palm has been tested



2. First prototype with anthropometric reference and user handle



3. Overview of the prototype with which the mechanism of triggering with the fingers has been tested



4. Second prototype with anthropometric reference and user handle

Prototype 3

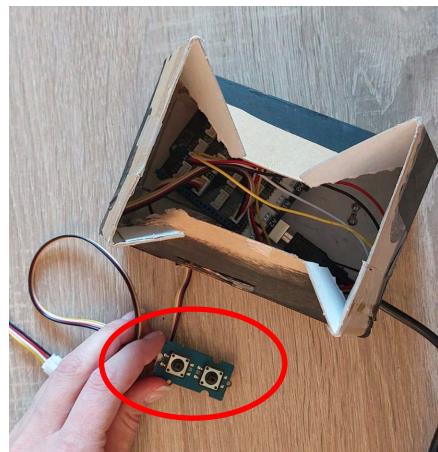
Concept & Evaluation

Gait supporting device with vibrational live feedback

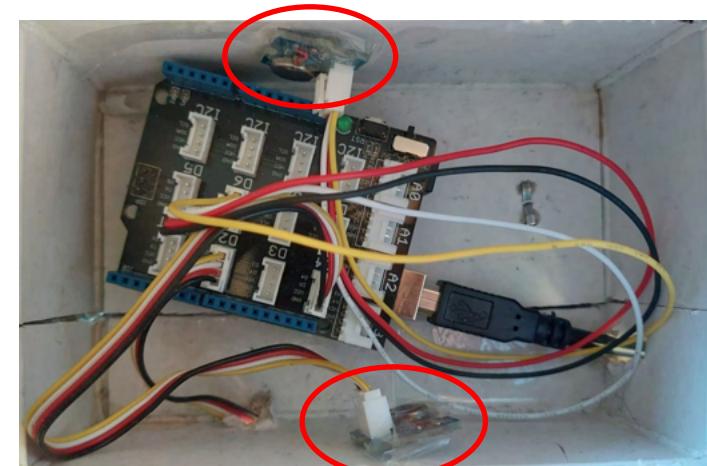
This low-fi prototype has been attached to the phone's cover of the participants. The users have been asked to walk around while using the phone. Through the controller the vibrational sensors, one on the left and one on the right, were activated by the conductor of the test (me) to send some sort of information to the phone user. In the next page the results of the evaluation are visualized. The functions of the device for the E1 & E2 have not been explained while the participants of E3 & E4 where aware of what the device was trying to communicate to them.



1. Overview of the prototype



2. Button controller for the vibration of the left and right motor



3. Inside of the prototype with the two vibration motor

Insight

- The participants weren't paying any attention to the environment around because too focused on trying to understand what the vibrations were communicating to them
- The vibration can be easily misinterpreted as a phone notification (texts, calls,...)

See appendix p. 106 for details

Evaluation prototype 3

Concept & Evaluation



	Predictable	Engaging	Create consciousness	Communicative	Playful
E1					
E2					

E1 & E2 with four different participants, by maintaining the same role for the whole session (1 phone user, 1 pedestrian) no switching role

	Predictable	Engaging	Create consciousness	Communicative	Playful
E3					
E4					

E3 & E4 with the same two participants but two separate session of testing by switching roles in between

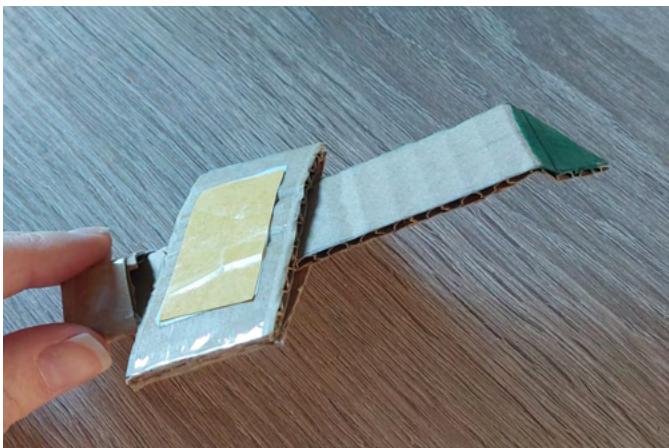
See appendix p. 95 for evaluation plan and from p. 106 for results

Prototype 4

Concept & Evaluation

Manually controlled direction indicator device

This low-fi prototype has been attached to the phone's cover of the participant. The user has been asked to walk around while using the phone and at the same time to move the pointer left or right if he/she had the intention to move in one of these directions or had the feeling of being doing it. The other pedestrian didn't have any direct interaction with the prototype.



1. Overview of the prototype



2. Indicator for other pedestrian



3. Mechanism for the movement of the indicator

Insight

- The mechanism, compared to the Prototype 3, was more engaging for both the user and the stakeholders
- More visibility of the device is needed
- The direct user feels that he is communicating with others even though doesn't have a live feedback

See appendix p. 111 for details

Evaluation prototype 4

Concept & Evaluation

 Phone user  Other pedestrian

	Predictable	Engaging	Create consciousness	Communicative	Playful
E1	 	 	 	 	 
E2	 	 	 	 	 

E1 & E2 with four different participants, by maintaining the same role for the whole session (1 phone user, 1 pedestrian) no switching role

	Predictable	Engaging	Create consciousness	Communicative	Playful
E3	 	 	 	 	 
E4	 	 	 	 	 

E3 & E4 with the same two participants but two separate session of testing by switching roles in between

See appendix p. 95 for evaluation plan and from p. 111 for results

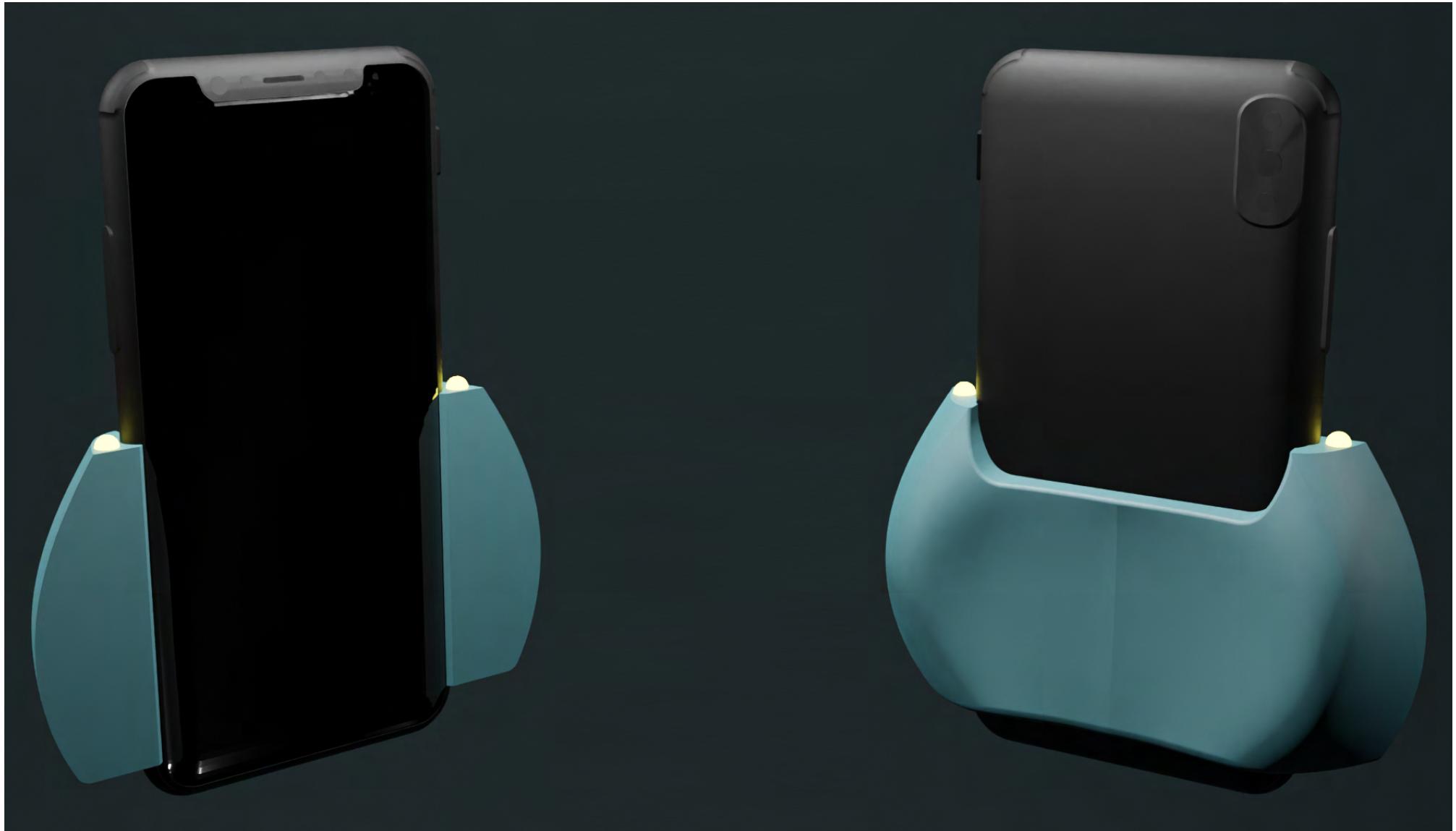
Prototypes insights

Concept & Evaluation

- 1 The functionality of the device should be pretty intuitive for both the direct user and for the stakeholders of the interaction
- 2 The presence of an active interaction with the mechanism of the device by the user has a positive impact on:
 - creating consciousness on the phone user about the surrounding environment
 - the engagement of the stakeholders
- 3 The visibility of the device it is essential for a successful interaction
- 4 The activation of the mechanism of the device with the fingers might be not the optimal interaction while the palm of both hands is often not used
- 5 In the E3 and E4 of both the third and forth prototype it is noticeable a relevant improvement in terms of rating from the participants. This is due to the fact that those two evaluation has been done by making the participants play first the role of the phone user and then the role of the stakeholder. They were then more aware and conscious of the functionality of the prototypes

Final concept

Concept & Evaluation



Concept aspects

Concept & Evaluation

Interaction

- For the phone user, the interaction with the device should be intuitive and easy to handle while using the phone at the same time (it should be perceived as engaging and playful)
- For the people around, they are not meant to interact actively and directly with the device but the presence of the device on others' phone should be perceived as a sign of awareness and respect towards them. (it should be communicative and predictable)

Experience

- The direct users should feel engaged in the interaction with the device because the playfulness of it and the increasing feeling of consciousness
- People around should feel that the phone user is communicating with them. They should feel like they can predict where the phone users are going to walk

Appearance

The design is small: adaptable to any phone case and accessible by the user's palm of both hands to make it engaging. The people around should be engaged by the device thanks to the use of the lights that can catch their attention

Aesthetic expression

Pop and flashy in the style to express the playfulness of the device but with minimalistic shapes to be communicative

Technology

The mechanism used is simple in order to allow an intuitive and engaging interaction by creating a playful challenge which remind to game mechanism. By squeezing the right or left side the correspondent light will turn on and off.

Materials

The product is made of plastic materials because it needs to be durable and not fragile since will be under stress for long periods. It is made of soft materials for a more ergonomic interaction and also to be squeezable to trigger the mechanism



Final prototype

Concept & Evaluation



Mechanism

The prototype allows the user to squeeze it and trigger the mechanism that turn on and off the left and right lights



The interaction reflects, with some technical limitations but very faithfully, the expected functioning of the final concept



See appendix p. 116-123 for details about methods, procedure and steps

Final concept - Prototype

Concept & Evaluation

The prototype, as such, has limitations but overall I can be satisfied with the result achieved. There are some aspect that didn't worked in the optimal way and if I would work more on this project some aspects could be improved in a even more detailed prototype. The main function and the interactive live responds to the user actions made the tests with the users not only possible but also able to achieve valuable results.



Prototype's similarity with the final concept

- On/off pressing activation mechanism for the indicator lights
- Soft texture
- Ergonomic shape

Prototype limitations

- Adaptability of the device to any smartphone cover
- Increased sensitivity of the light switching mechanism
- Aesthetics of the materials used

Final Evaluations plan

Concept & Evaluation

The Evaluation Plan for final concept it is structured in two sections that will be outlined in the next page. The plan for them is slightly different in terms of selected participant and task requested.

Design goal	Interaction qualities	Design elements
Target group <ul style="list-style-type: none">Pedestrian with the phoneRandom pedestrian	Predictable Engaging Create consciousness Communicative Playful	Fidget mechanism Lights feedback Visible colors Challenge
Intended effect Implicit communication between pedestrians		
Context Crowded environment		

What I want to use to evaluate my Interaction?

The final prototypes that allow me to collect evidences that help to test the assessment criteria

- HIGH-FI final prototype, the technology used and the functionality is very close to the final concept
- Short term & task specific
- In the actual context

Final Evaluations plan

Concept & Evaluation

Evaluation 1

Participants

- 1 Pedestrian with the phone
- Crowd of pedestrian both with and without phone

Materials

Phone in use + Prototype

Requested task

The participant will be asked to walk from point A to point B in a selected area of the market while using the phone and the Prototype

Context

Crowded environment, in the actual context

Expected duration

5 minutes test + 15 minutes evaluation and interview

Test assessment

- In-situ observations
- Interviews
- Rating from participants

N. of session

2 session - 2 participants

Evaluation 2

Participants

- 1 Pedestrian with the phone
- 1 Pedestrian without the phone

Materials

Phone in use + Prototype

Requested task

The participants will be asked to walk in the context while one of them use the prototype and the other one act as the pedestrian without the phone. Then the role will be switched

Context

Crowded environment, in the actual context

Expected duration

5 minutes test + 25 minutes evaluation and interview

Test assessment

- In-situ observations
- Interviews
- Rating from participants

N. of session

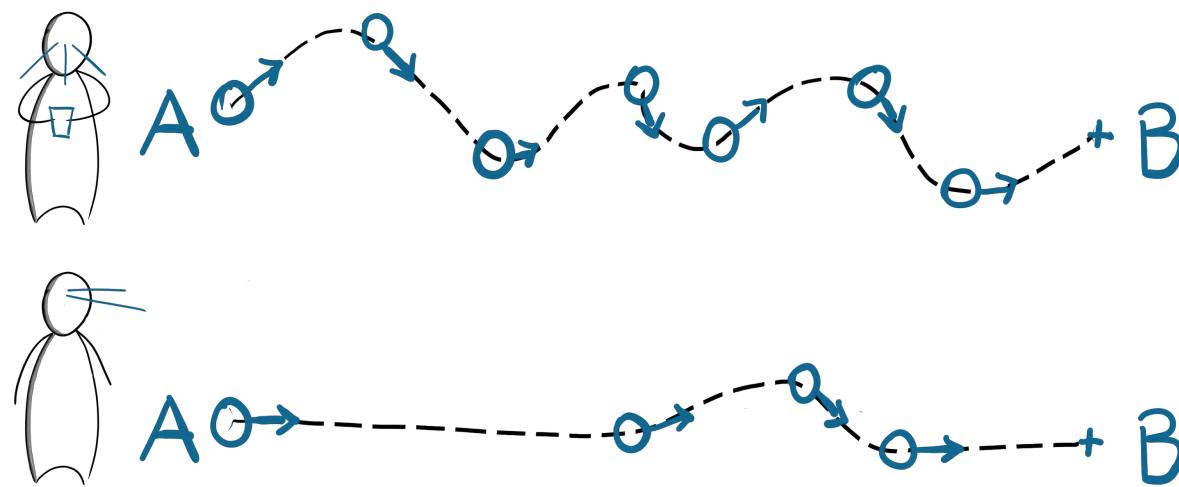
4 session - 8 participants

See appendix p. 101 for details about plan, test procedure

Evaluation 1

Concept & Evaluation

At the very beginning of this project one of the test I conducted was asking people to walk from a point A to a point B in the city center during the market first without using the phone and then a second time while using it. For more detail see pag. n 9-10 in the first chapter and pag. 69-72 in the appendix. An important insight from that was the fact that phone users tend to have an inconsistent gait. In this phase I was curious to check if the prototype was having the expected effect of people gait by improving their pace. For this reason I asked the same two participant to walk from the same point A to the point B in the same external conditions (the market), this time while using the prototype. In the following pages the visualization of the gait is showed.



Insight

- The prototype made the participants more conscious of their movements and as a consequence they plotted a more consistent and steady gait
- The phone user had the feeling of being more aware of the environment and not completely focused on the phone
- Other pedestrians notices it but it should be even more outstanding

See appendix p. 124 for user pictures

Evaluation 1 - Visualization

Concept & Evaluation



COSTANZA



The image show the plot of the participant gait from point A to point B while using the phone



The image show the plot of the participant gait from point A to point B while using the phone with the prototype

Evaluation 1 - Visualization

Concept & Evaluation



YUN



The image show the plot of the participant gait from point A to point B while using the phone



The image show the plot of the participant gait from point A to point B while using the phone with the prototype

Evaluation 1 - Results

Concept & Evaluation

The participants have been asked to evaluate the interaction by rating the prototype on a scale from 0 (not at all) to 5 (very much). In this case, only the Phone user has been asked to evaluate the prototype. On the other side, some questions to random people picked from the crowd involved in the interaction have been asked in order to test if they have noticed the device and if they would guess what the users were doing.

● Phone user

	Predictable	Engaging	Create consciousness	Communicative	Playful
E1	● ● ● ○ ○	● ● ● ● ○	● ● ● ● ○	● ● ● ● ○	● ● ● ● ●
E2	● ● ● ○ ○	● ● ● ● ○	● ● ● ● ○	● ● ● ○ ○	● ● ● ○ ○

Insight

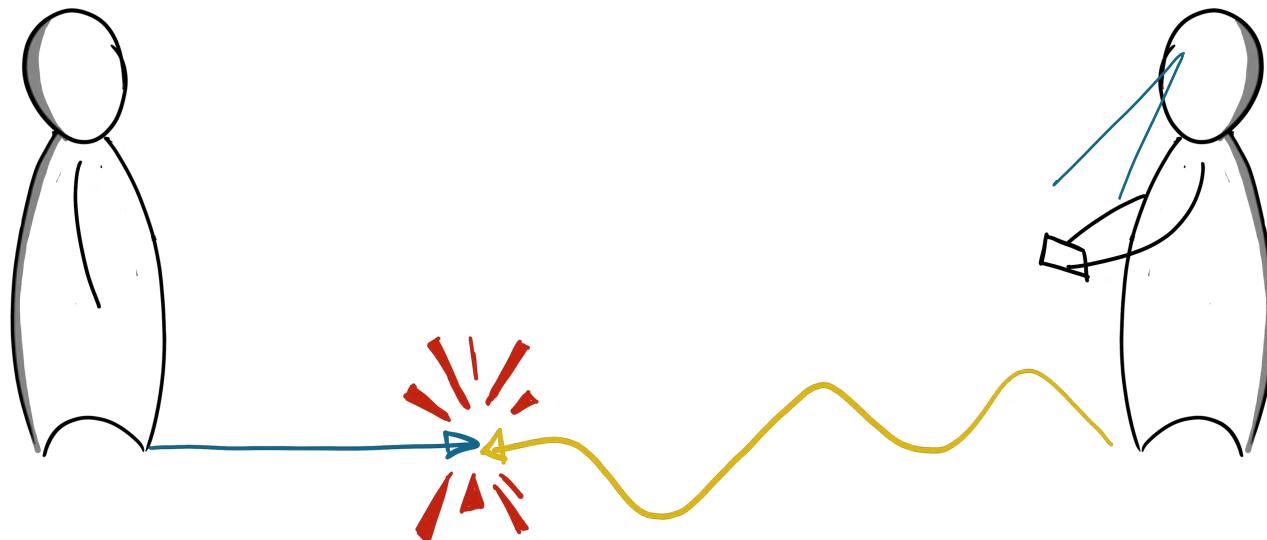
- The phone user had the feeling of being more aware and not completely focused on the phone
- The pedestrian around didn't get straight away what the function of the device was, but after some instant of observation the functionality was easy to understand
- The other pedestrians thought that it was a game
- To have a better comparison to the data from the research activity from the cycle1 I tested the same two participants, the side effect of this could be a bias in the participant behaviour and a not objective result
- The device is visible but not standing out too much and can be unnoticed if the pedestrian is not careful

Evaluation 2

Concept & Evaluation

Inconsistency and unpredictability of the gait

In this Evaluation2 I wanted to test the concept based on the perception and the evaluation from both sides (the direct user of the device and the other stakeholders of the interaction). The participants have been asked to walk around while using the phone and at the same time interrelate with the device. Interviews, observation and rating from the participant have been done at the end of each test to evaluate the interaction vision properties of the concept.



Insight

- The awareness about the device increase after switching roles in the test session
- The device should be more outstanding to be even more visible and engaging for the other pedestrians

See appendix p. 125-127 for user pictures

Evaluation 2 results

Concept & Evaluation

Phone user

Other pedestrian

	Predictable	Engaging	Create consciousness	Communicative	Playful
E1	● ● ○ ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ○ ○ ○ ○ ○ ○ ○ ○
E2	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○
E3	● ● ○ ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○
E4	● ● ○ ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ ○ ○ ○ ○

Community aspect

Concept & Evaluation

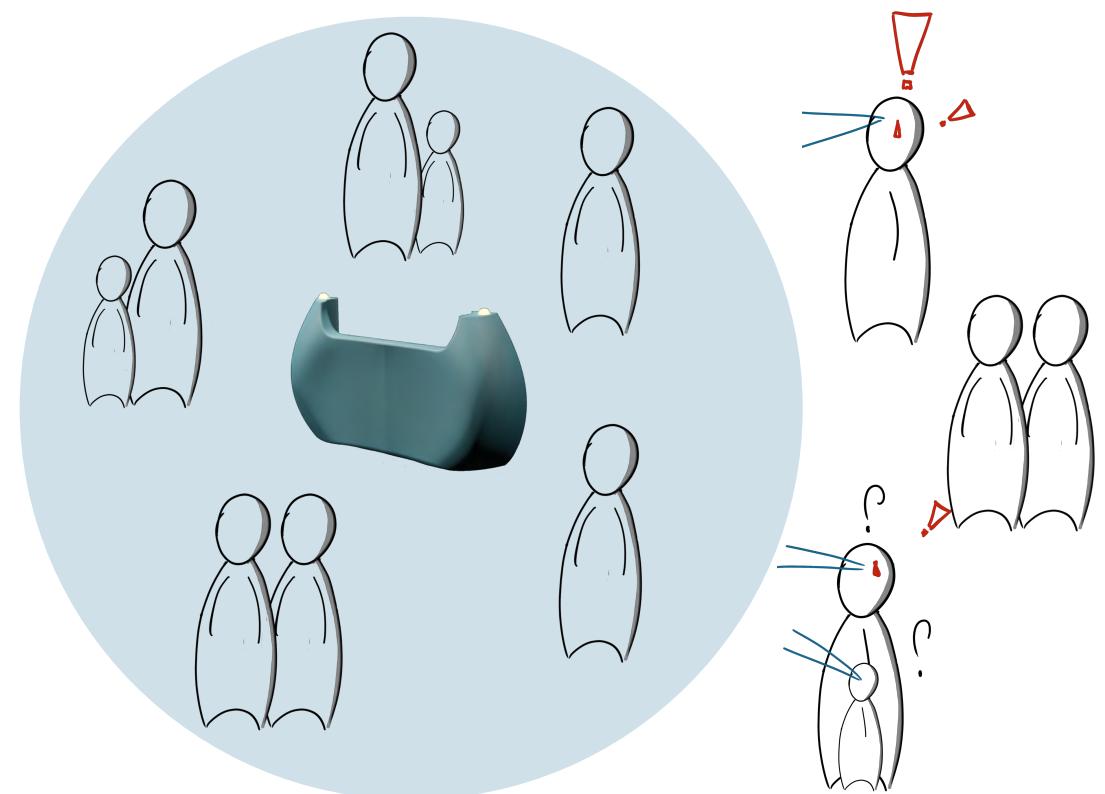
During the research activity and the interviews I iterated I realized how being part of a certain group make the difference in the evaluation of the product.

"If I would know that this product exist on the market than I would get the meaning and the function of it straight away"

This is one of the most mentioned sentences during the different evaluations sessions. It is then clear that to reach a successful interaction not only the direct user need to know that functionality of the product but also the stakeholders need to have some knowledge.

It is important to be aware that some aspects need to be taken into consideration

- 1 Common and shared values within a community
- 2 Group of people with the same needs
- 3 Need to raise awareness on the topic
- 4 Need to contextualize the product



Findings & Conclusions

Concept & Evaluation

The prototype helped to rebalance the current interaction in which in most cases the phone users are really focused on the screen and lose control and awareness of the surrounding environment while at the same time, the other pedestrians (without the phone) feel frustrated due to the inability of catching other intentions.

The concept can be judged successful considering the evaluations' results and the experiences shared by the participants. In view of this, the qualities of the interaction vision are fulfilled by the design properties with a satisfactory result.

Final insights

- 1 The **active Interaction required to the users, by the device**, make them **more aware** of what is going on around them and **less focused on the phone**
- 2 The user have the **perception of being communicative towards the other pedestrian** even without having a live feedback from the other pedestrian involved in the interaction
- 3 The **shape** reminds of a video game controller, this **makes it perceived as playful and engaging**
- 4 The device makes the **participants more conscious of their movements** and the consequence was a **more straight gait and a more consistent and steady pace**
- 5 The product has the **expected effect when it is known by the community with shared values and needs**. In this sense the **product contextualization is fundamental**.

Recommendations for future work

Concept & Evaluation

After the evaluations of my concept thanks to the use of the prototype I found that my concept, to a certain degree did make it a better and more controlled experience for both the users. There are still some aspects that have to be explored or researched more in order to have an even more balanced experience in terms of perception for the phone user and for the other stakeholders. If I had the chance to continue on working on this project, I would look into the following:

- 1 More research is needed to **increase the visibility of the device for the other pedestrians** involved in the interaction
- 2 More study has to be done to **engineer the product to make it adaptable to any smartphone**, this would allow a smooth interaction with the **reduction of the operating error to a minimum**
- 3 As mentioned before the **community aspect is fundamental to have a successful interaction**, more work is needed in order to **raise awareness** and make this device well known to most people to reach a high effect on the social level
- 4 **The material and the texture** used in the prototype made the interaction **very engaging** for this reason the final product should keep the same feeling
- 5 Given the interesting results of **Evaluation 1** it would be appropriate to **further investigate in that direction** trying to **avoid bias as much as possible** but maintaining a **set up of the test session that allows a comparison** between the data obtained

Appendix

Design goal process

Cycle 0

My design goal is to **allow city walkers** distracted by their phone to **be able to cross each other path** in a **more effective way**

Cycle 1

My design goal is to allow **city walkers**, that need to **use their phone while moving around**, to make their next steps **predictable and visible for the others**

Cycle 2

My design goal is to **fulfill pedestrians' need for autonomy and safety** when they use their phone **while walking in a crowded environment**

Research activity

Appendix

Casual observation

Why

To gain an overview of the selected context with all the possible situations and to map the flow of the current interaction

How

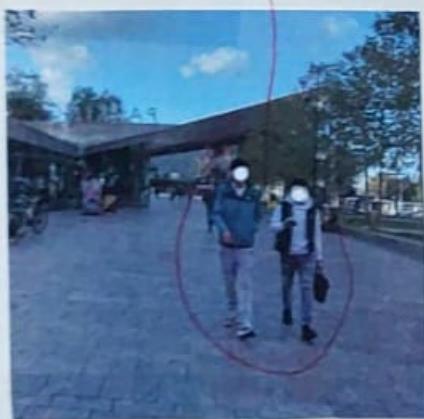
I walked around in the city center and i started to take random picture to pedestrians and I observed what they where there most typical behaviors and how people interacted with each other

What:

The pedestrian weren't following any instruction this because i wanted to be as unnoticed as possible to catch their real behaviors without any bias. In the following pages are collected pictures and observations

mother with the stroller and the rest of the family

One guy is looking at the phone, the other one is holding it



She stopped on the side

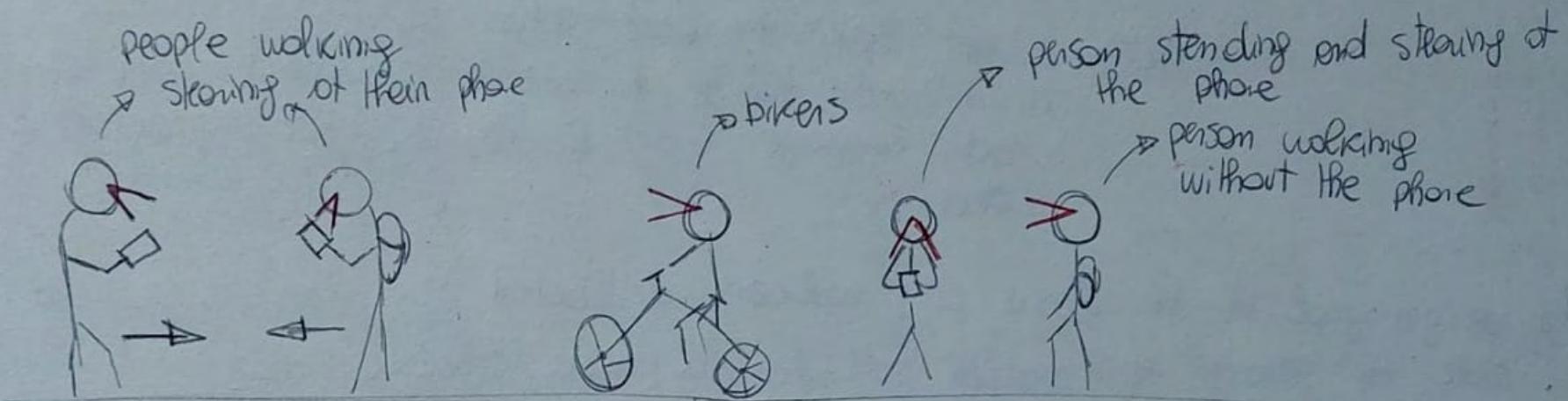


very focused on the phone *

all the three people were using the phone while walking



WHAT HAPPEN IN THE STREET ? CHAOS !



- I observed for a while people walking/biking /... around for the city
- Most of the people walk and at the same time they steam at their phone
- another part is constantly holding his phone* in the hand this means that soon or later they are going to use it
- Bikers don't usually use their phone, I saw only one or two daily that

Research activity

Appendix

Desk research

Why

To get inspired by other people's research/papers. To check what is already known about this topic and make connections between different fields

How

The source I used the most were Google, Google Scholar, Youtube

What:

I read many papers, watched videos about different topics more or less related to my context to build connections. in the following page you can find the most useful links

Active and passive echolocation

<https://www.jneurosci.org/content/37/6/1614>

<https://youtu.be/08smCjKWNL0>

Inattentional blindness

<https://www.safetytalkideas.com/safetytalks/distracted-while-walking/>

<https://nobaproject.com/modules/failures-of-awareness-the-case-of-inattentional-blindness>

Biomotion sound

https://pcwww.liv.ac.uk/sophiew/biomotion/bidet_caulet2005_auditorybiomotion_STSp_Neuroimage.pdf

Smombies app

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0197050>

Research activity

Appendix

Survey

Why

To gain insight into people's experience, need, and thought

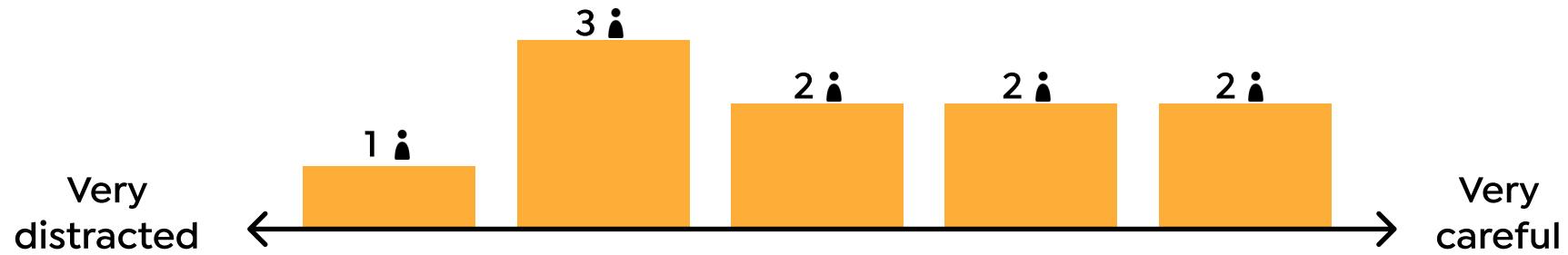
How

I submitted the online survey to 10 participants of different ages, gender and background

What:

The participants were asked to rate themselves as a pedestrian, express their thought, and their reason to use/not using their phones. In the following pages, all the questions and answers are reported

How would you define yourself as a pedestrian?



Could you briefly explain your previous answer?

Distracted by their thought

- Always good to keep an eye on what's going on around you. Still sometimes I loose myself in my thoughts.
- I am generally focused on my way but I tend to be distracted if I'm lost in thought
- I am not careful time to time while walking, being distracted by day dreaming, checking smartphone, etc.
- Sometimes I fell or don't see stuff around me while thinking
- I often walk against things and am fully up in my thoughts

Others distractions

- I listen to funny podcasts or call
- I am normally focused on what I am doing, to not crush against the cars and other people, but it happens that I am distracted by the phone or when I am in a group of friends

Very careful

I have mild anxiety problem. I'm careful for everything

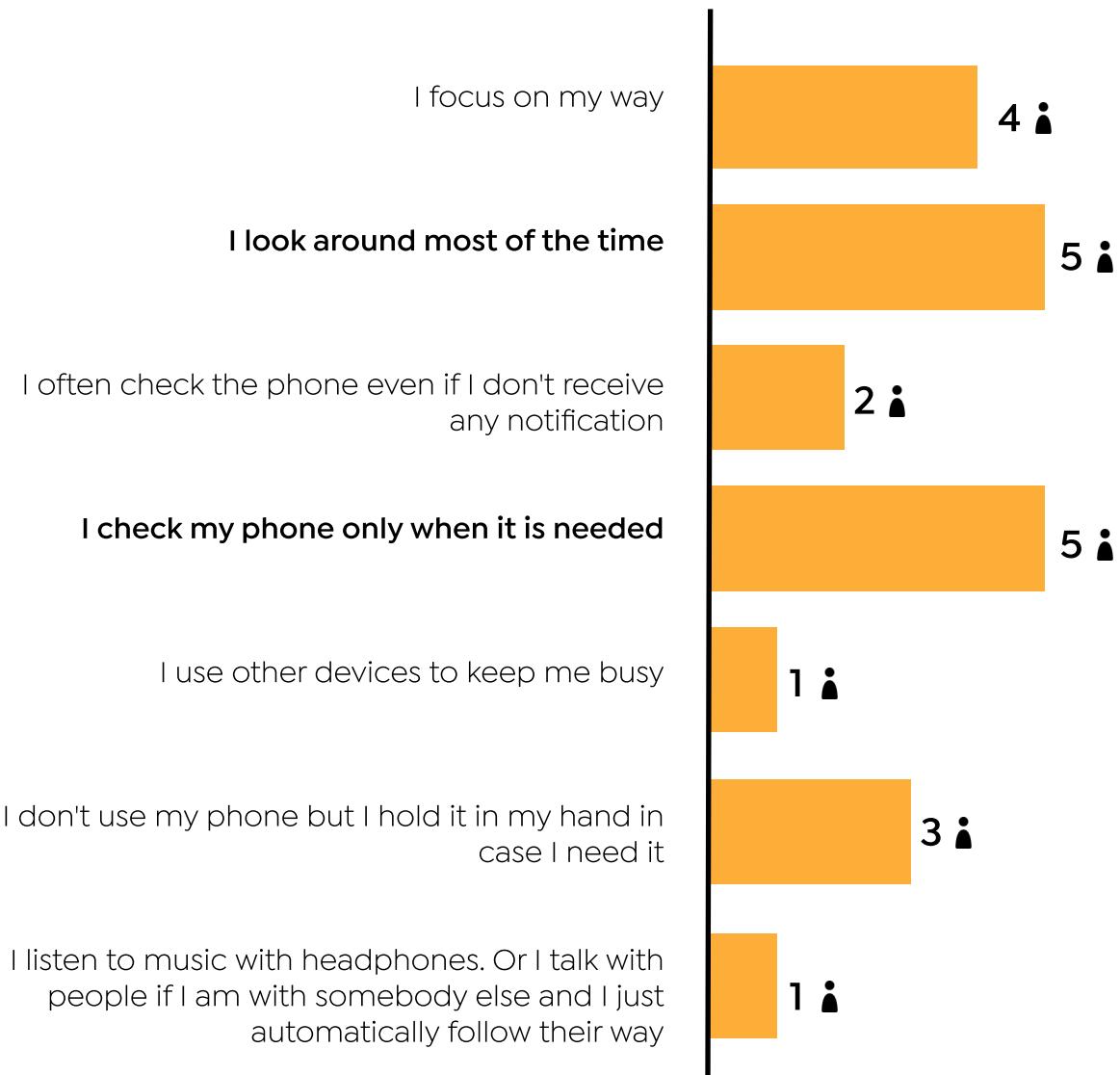
Others

i don't have a bike in the Netherlands

No reason specified

I never notice anything. When people ask me "have you seen that guy/woman/scene/ whatever" I never do. Literally they can kill a child in front of me and I would not notice anything

What do you normally do when you walk in the city?



Could you please explain why you act in the way you selected in the previous answer?

Notifications/Directions

I like listening to music while walking, I feel like I'm in a movie with a soundtrack. I follow my fellow's pathway because I have no sense of orientation and I just trust them. **I check my phone to read notifies** when I already know where I have to go, or I write people when I have to meet them. **I check it to look at Google maps** when I don't know the way

I dont have a good sense of direction so I must be very careful and **check on my phone for directions**

When I go to city centre it's usually for pleasure. I look at my phone **only to answer texts and look at directions.**

I often **check the messages I get while walking and even reply on them.** Also when I have to check the **route to the destination, I check it continuously.**

Pleasure/distraction moment

Since i am walking routs i know well or **i walk as relaxation**

unconscious action

I focus on my way because I need to reach the place I want to reach, but I am also **checking my phone even if sometimes I do not receive any notification,** because is a sort of **compulsive thing.** Sometimes I think about something else and I check it only when it is needed.

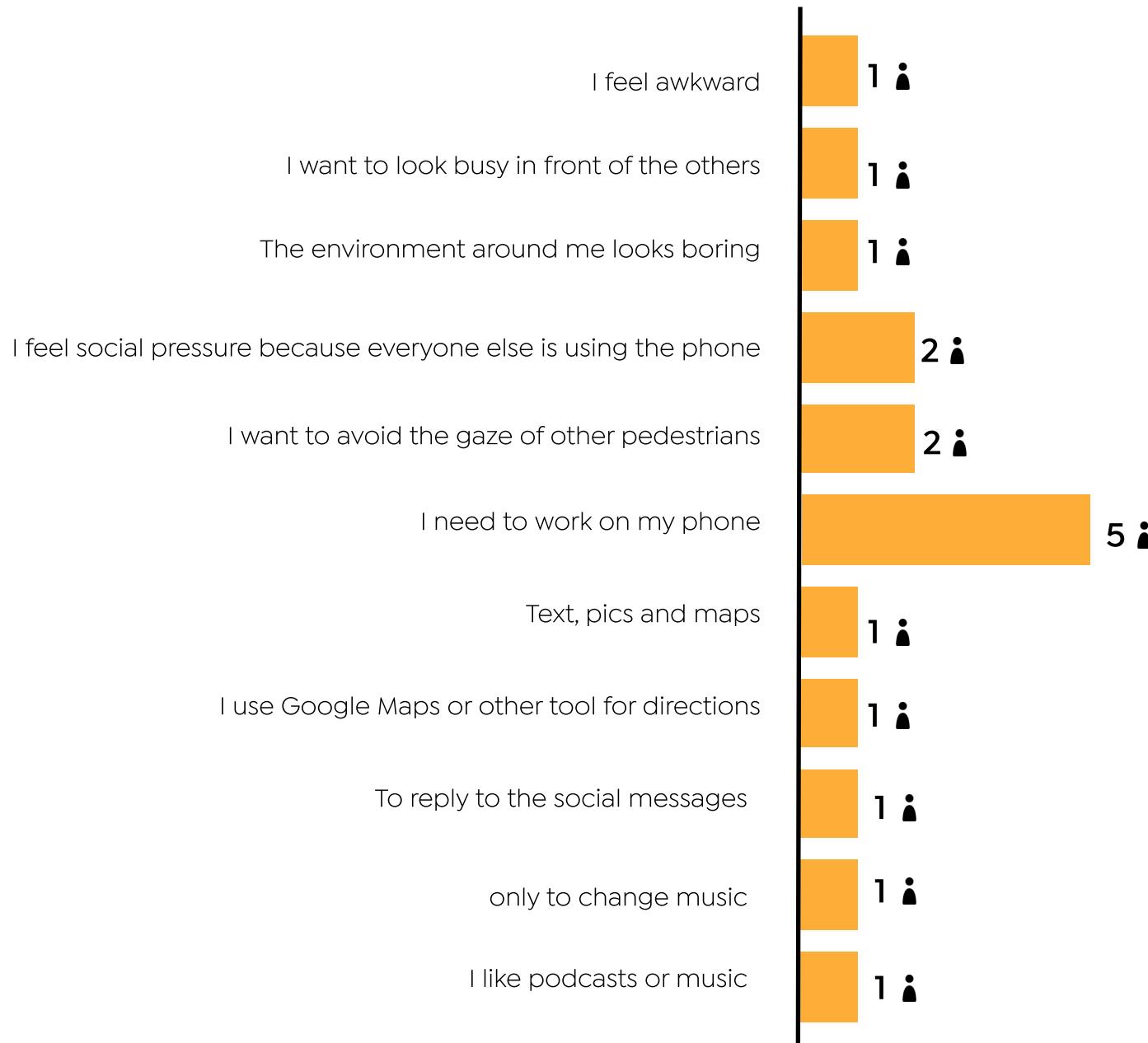
Careful about the environment

Because I like to have **music** and **just look around me to see if there is something interesting**

I feel silly to scroll on the phone when there nothing going on. And **I need to care for my surroundings** for cars, cyclers, and I want **to check if I look good when I walk pass windows**

Its nice **to watch other people**

What are the reasons that make you use your phone while walking? (You can select more than one)



Could you briefly explain your previous answer?

Awkwardness/social pressure/to look busy

While I am walking **I do not feel awkward**, while **when I am sit especially with people I am not comfortable with or in the tube or with other people I feel awkward and I want to look busy in front of others and sometimes I feel social pressure because the people around me use their phone.**

Sometimes **if I pass by a group of people** and I don't know what to do **I just look at the phone to avoid pressure**

I would **check on my phone if I'm standing still with someone facing me nearby**. I avoid eye contact cuz I don't want to attract attention

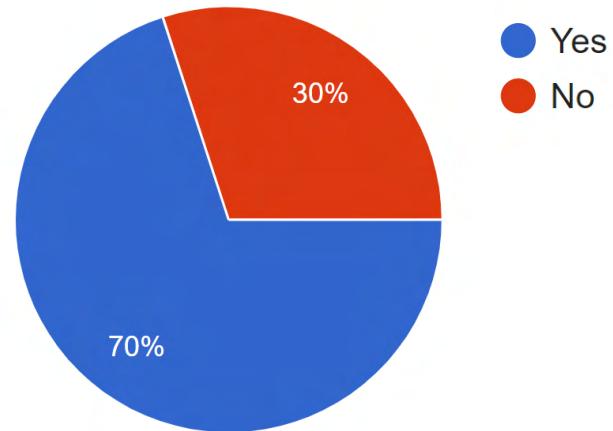
Directions

I Need app for directions because otherwise I get Lost

fulfill the need to be available

No matter if the **messages** is about work or just social stuff, **I prefer to reply it at the moment.**

Have you ever felt in danger while walking around and using your phone at the same time?



YES, I felt in danger

Almost get collided by a bicycle

Sometimes I was really close to clash with other people because I was using the phone, one time I fall because I did not see a step in the street

Because in the meanwhile I can't concentrate on my way or what is surrounding me. Maybe I step on something, I bump into someone, I get invested

Especially here in the Netherlands with bikes or cars

Bikes

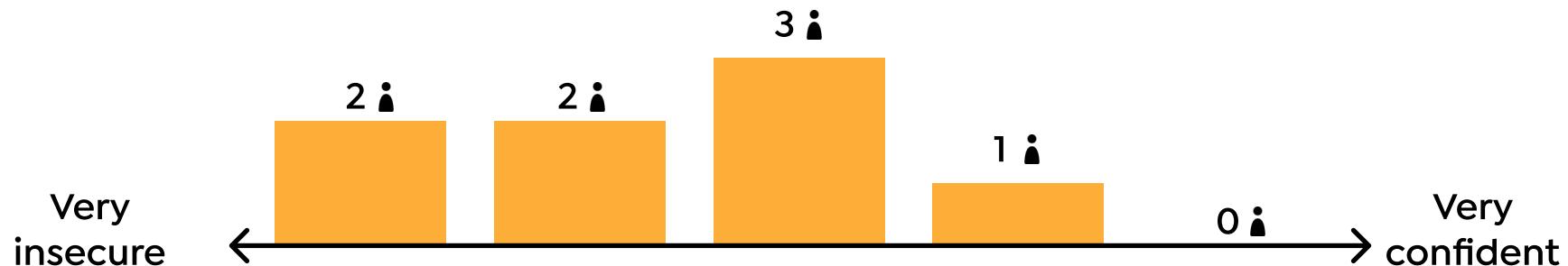
People are irritated and you cant see in front of you

NO, never felt in danger

No, i always prioritice my safety over my phone

Because First of all I pay attention to what happens around me

How do you feel while walking and using your phone at the same time?



I do not look at it, stop to use it (change music) or look at it at safe situations.

I dont like to do it

when I use it I am a middle way between feeling insecure and very confident, because I pay attention to the cars and big vehicles and I know that if I crash on other people would not put at risk my life

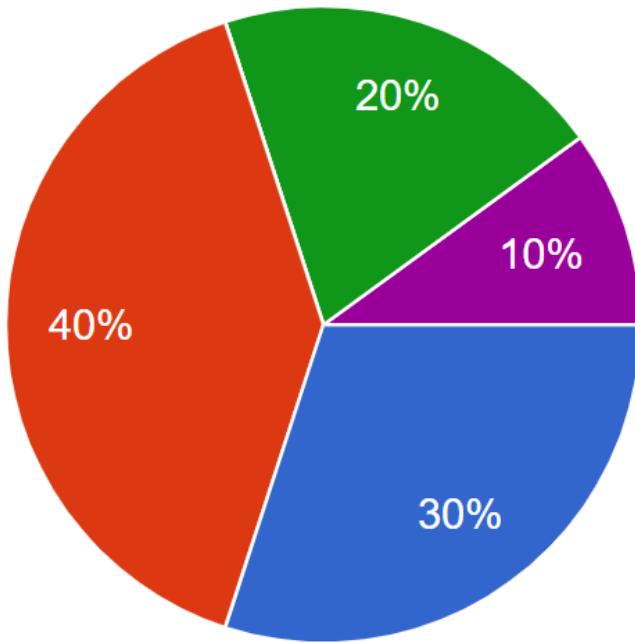
Sometimes I can just concentrate in both actions, especially when I just have to read. If I have to write it gets more complicated

I think I have a good balance of those

Sometimes i Need to put too much concentration looking at the phone so I feel in danger

Insecure, but if it is on the sidewalk for the pedestrian, it feels not that dangerous

How do you experience walking towards someone that is using the phone in the street?



- I feel very confident, I can always understand where the other is going to walk
- Often I have to focus on the other body language to understand how to move
- I feel more comfortable to stop and observe the other person action before stepping forward
- I don't feel comfortable at all when the others are using the phone while walking
- mostly not focussing so can bump into them

Other thought and experience

Sometimes I hate when people walk while using the phone because they obviously don't know where to go. It happened quite often that some of them were bumping into me and I get angry

Generally I have to change direction to avoid pumbing in the person that ls using the phone

I feel like more unsafe situations in the hague are with pedestrian groups or tourist that do not realize they are not alone in the street (example suddenly stepping on the street or walking with 5 people side by side so bicycles or other pedestrians cant pass) also, there are walking tours with earphones (on the phone) in the hague making this even more dangerous

Research activity

Appendix

Interview

Why

To gain some extra insight into the experience and feelings of the users in a more open and flexible way than the questionnaire

How

I Interview one person, it was an online meeting for logistical reasons. It started with direct question and answers but then it become more as a conversation and that is the point where i got more insights

What:

The participant was asked to answer and argument some questions that you can find in the next page

Interview



Marianna
25 years old

- Do you use your phone while walking?

Yes, very very often

- Why do you use it?

To check mails, messages, notification in general

- What makes you start the interaction with your phone?

Sometimes because everyone around me is using it, or to escape from a situation or avoid awkwardness.

- Do you keep it in an available spot or do you keep it in a bag and you take it out only when it is needed?

I either hold it in my hand or I keep it in a pocket that I can easily access to

- Have you ever felt in danger because of using the phone?

Yes, often I bumped into people because I was using my phone and sometimes I really don't know where to walk if the person that is coming towards me is using the phone

- Are you aware of the surrounding environment while you are using the phone?

If I take a picture of course yes, otherwise no

- How do you get aware that other people are getting too close to you?

When I get too close to others, when I look at the phone and I focus on it my peripheral vision can check an area around the phone and if I see someone stepping into it then I have to focus my attention on the street again

- Is there something you want to share about your experience?

I think that in a group when there is someone that is using the phone also the others start to use it automatically, it is an element of distraction in group conversations

Research activity

Appendix

Roleplay

Why

To compare people's typical behavior while walking with their phone and without it in a crowded environment to highlight pain points and possible intervention. This is one of the activity that gave me the most useful and interesting insights

How

I asked at first to one participant to walk in a crowded environment while using the phone. I decided to test during the market in the city center. While filming this person I noticed that the gait was not at all straight. I then asked the same person to walk in the same stretch of road without using the phone and it was already very much more straight.

I repeated the same test with two more people and I noticed a pattern in the comportment and in the plotted gait.

During the test I was filming the participant from behind because I noticed that when I was walking in front of them the participants were following me and they weren't acting naturally

What:

At the end of the test the participant was asked to answer and argue some questions. On the next pages you can find the plotted gait of each participant.

Walking experience from point A to point B while using the phone

YUN

"Sometimes everyone around me is walking with someone else, I feel lonely and awkward so i look at my phone"



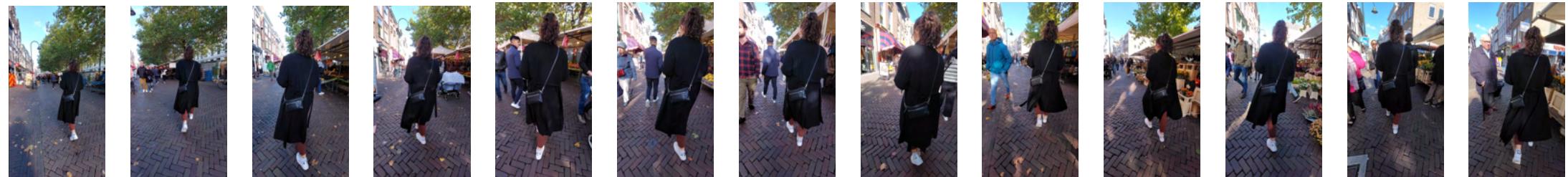
Walking experience from point A to point B without using the phone



Walking experience from point A to point B while using the phone

COSTANZA

"My awarness about the environment really depends on the task I am pursuing on the Phone. If it requires full concentration and it is very demanding I can not have control of the surrounding"



Walking experience from point A to point B without using the phone



Walking experience from point A to point B while using the phone

EDOARDO

"I noticed so much more about the surrounding environment when I didn't use the phone, there was so much going one and it was nice to observe it"



Walking experience from point A to point B without using the phone



Research activity

Appendix

Ethnography

Why

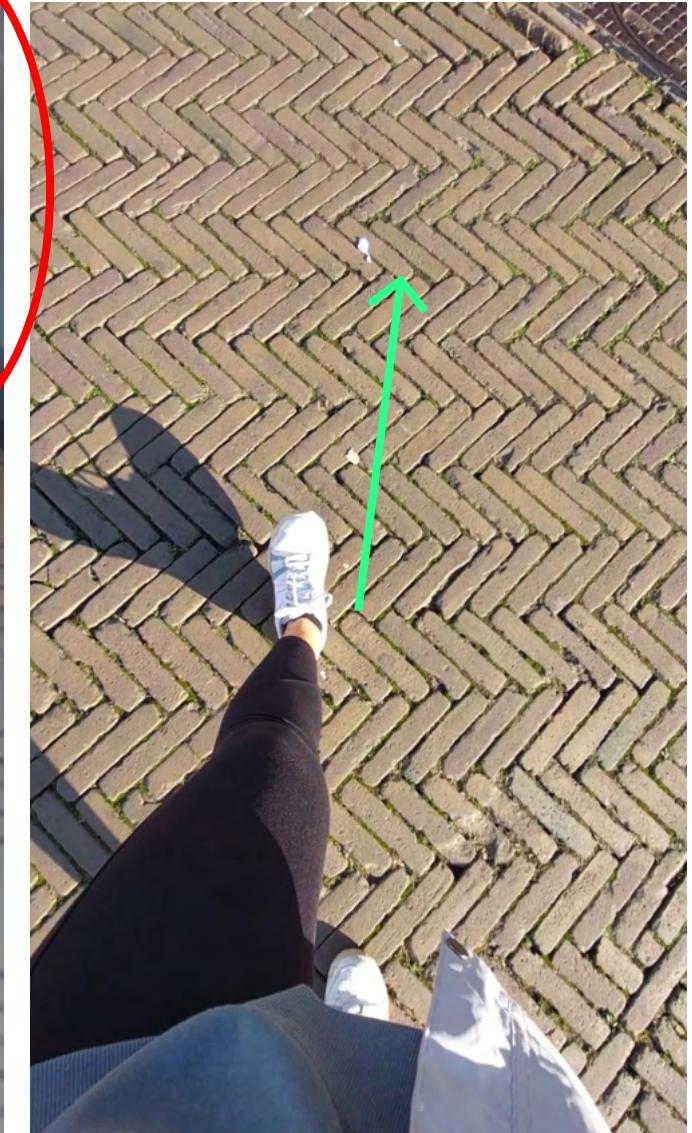
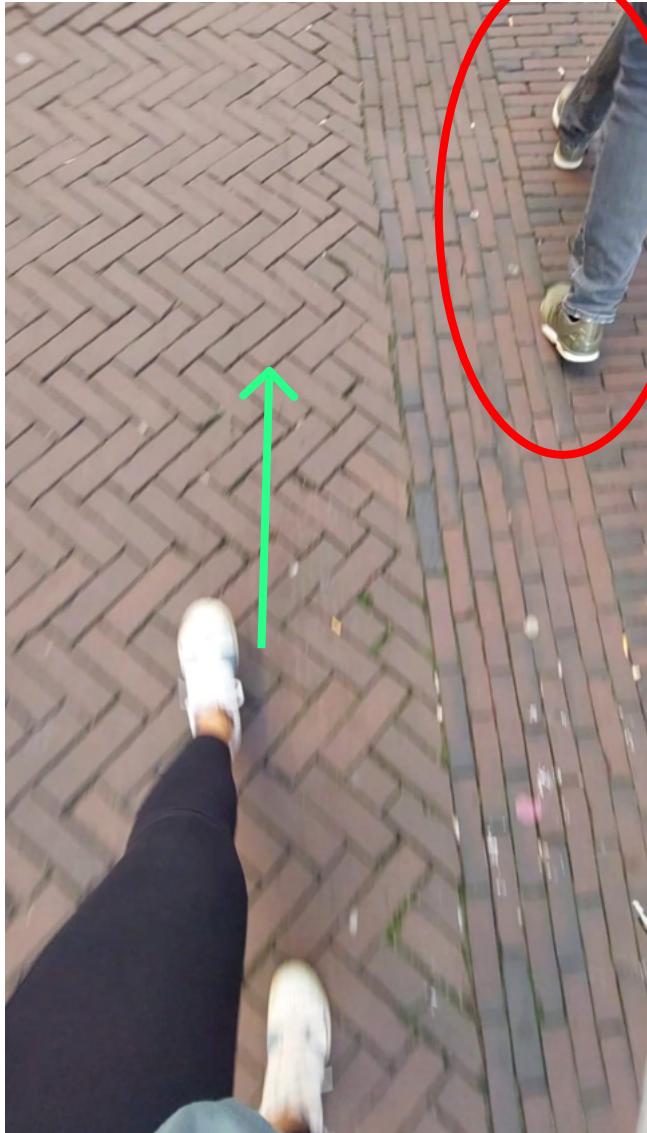
Since the current research focused on the interaction between humans and phones I also wanted to consider the smartphone point of view and see if something interesting would come up from that.

How

I started to film with my phone's camera while I was using it as I would normally do wandering around in the city center. I did it for around 20 minutes

What:

In the end I started to observe what my phone recorded and I noticed that even when I was zigzagging, the tip toes of my feet were always aligned with the phone



Research activity

Appendix

Sensitising activity

Why

To gain some extra insight into user's needs through the generative and making technique. I asked the participant to take part in 2 sensitizing activities and at the end of them I provided them with some tools for a collage we all talked together and discuss them

How

I submitted three tasks to three participants. They had to complete the firsts two individually and the third one collectively during a collage and brainstorming session

What:

The participants were asked to take two walks in the city center or in a crowded place. The first one while using the phone as they would normally do and the second one without bringing the phone with them. After each session they had to answer to some whort questions. After the two activities we had a collective activity in which they where asked to compose a collage. On one side they had to show they relationship with the phone, on the other side they had to show their relationship without the phone. In the following pages all the materials and results are showed.

The role of the smartphone in the interaction between humans when they are walking

First of all, I would like to thank you for your time and for your participation to this research activity, I truly appreciate.

Now, let me introduce the topic:

I am a master student in Design for Interaction at TU Delft. I am conducting a research project about the interaction between people walking around the city center. My aim is to gain insight about how people feel and act while they are walking. During observations I have noticed that most of the people, in some way, use their phone either they just hold it in their hands, or they actively interact with it. I would like to investigate the role played by the phone, to understand what kind of need it fulfill in this context.

The plan:

The activity is divided in 3 steps. The firsts 2 steps are individual (you are asked to do these two activities in preparation for the third one) while the third one will be a collective moment when you will share and discuss with the other participants your experience.

1º Activity → 15 minutes

Individual activity to do in preparation for the third one

2º Activity → 15 minutes

Individual activity to do in preparation for the third one

3º Activity → 45 minutes

Collective activity and discussion

The information you share by taking part to this research will be totally private and the collected data will be used only for the project purpose. I am curious to learn more about your experience and remember there are no right or wrong answers!! Thanks

Do you give me your consent to use the informations you share for my research project?

Yes

No

Name and surname

Sign here

Date

Activity 1

In this first part I am going to ask you to do an outdoor activity

I would like you to take a walk, you can for example go to the city center, the campus,... feel free to follow your instinct and maybe explore new part of the city.

It doesn't have to be an intensive trekking; 10 minutes will be enough but if you feel like you want to take more time you are more than welcome to do it. At the end of it you will be asked to answer to some questions.

There are some rules that I am asking you to follow, they will be relevant for me to make sure the data are not compromised, and the results of the different participant are aligned.

Rules:

- **Bring your phone with you** and use it as you would normally do
- Choose to walk in a **context where there are people around** (Supermarket, Market, campus, ect.)
- Choose an **environment with physical objects around** (Buildings, stands, people, ect.)
- **it should not be an empty and unobstructed environment** (not an empty square)

When the exercise is over, I would like you to answer to some questions, try to answer them right after so that your experience is still fresh in your memory (you can use text, images, drawing,...)

- For how long did you walk?
- Where did you walk?
- Where did you keep your smartphone during the exercise?
- Have you used your smartphone? And what did you use it for?

- Did you check your phone as an unconscious action or you did it because you knew exactly what you wanted to achieve with it?
- Did you feel like using your smartphone was something that you couldn't postpone?
- Were you distracted or you felt in full control of the environment around you while you were using your phone?
- Are there any moments you felt in danger because you were using your phone?

Activity 2

In this second part the assignment is very similar to the first one, I am going to ask you again to do the activity you did before but now the rules are different.

I would like you to take a walk, again, you should walk in the same place you did for the first exercise.

Again this time doesn't have to be an intensive trekking; 10 minutes will be enough but if you feel like you want to take more time you are more than welcome to do it. At the end of it you will be asked to answer to some questions.

There are some rules that I am asking you to follow, they will be relevant for me to make sure the data are not compromised, and the results of the different participant are aligned.

Rules:

- **Leave your phone at home**, if for some reason this is not possible, please put it in your bag and don't use it for the entire duration of the exercise
- Choose to walk in a **context (same place as before) where there are people around** (Supermarket, Market, campus, ect.)
- Choose an **environment with physical objects around** (Buildings, stands, people, ect.)
- it **should not be an empty and unobstructed environment** (not an empty square)

When the exercise is over, I would like you to answer to some questions, try to answer them right after so that your experience is still fresh in your memory (you can use text, images, drawing,...)

- For how long did you walk?

- If you have to compare the second activity with the first one what did it change?

- Did you feel the need to use your phone? if yes in which moment? Why?
- Was the need something that you could postpone to a second moment or an impellent need
- Are there any moment you felt in danger because you couldn't use your phone?
- About the environment around you, did you notice something that you haven't noticed during the first activity?

Activity 1

- For how long did you walk?

Costanza: 10 minutes more or less

Yun: 20 minutes

Valentina: 10/15 minutes

- Where did you walk?

Costanza: Market and the streets around it

Yun: from my home to the campus

Valentina: around the campus, on path along the IDE building and the mechanical engineering ones, and then I came back to IDE

- Where did you keep your smartphone during the exercise?

Costanza: In my right hand and sometimes I hold it with two hands (while texting)

Yun: pocket and hand

Valentina: For the first half (going ahead) on my hand to listen and record some audios, on the other half I put it on my pocket

- Have you used your smartphone? And what did you use it for?

Costanza: Yes, I checked the messages, opened Instagram and use it to change the music I was listening to.

Yun: Yes, checked time and hold it

Valentina: Yes, I used it to listen to some WhatsApp audios and to reply to them by recording another audio. Then I put it away on my pocket, and I took it twice to look at the time and to see if I had some notifications / someone wrote me.

- Did you check your phone as an unconscious action or you did it because you knew exactly what you wanted to achieve with it?

Costanza: It was mostly unconscious. The time I took it out I didn't have a clue of what I wanted to do with it but then I sent a message and I started to check constantly if the guy responded to me.

Yun: I did it unconsciously

Valentina: I knew what I wanted to achieve.

- Did you feel like using your smartphone was something that you couldn't postpone?

Costanza: So so, for some actions yes, like Instagram or socials in general. For others like texting back or change songs I think no

Yun: No, I could have postponed it

Valentina: I could postpone it, but I felt this was the right time and moment to listen these audios because I was not taken by another activity

- Were you distracted or you felt in full control of the environment around you while you were using your phone?

Costanza: I felt pretty conscious when I was in the square or in the sidewalk but I needed to look more around when I was crossing the street or I was nearby a bike lane or car lane.

Yun: I was distracted

Valentina: I felt in control of the environment as I was walking on a right path and I knew that I should have come back, but I surely was paying more attention on the audios than on the environment.

- Are there any moments you felt in danger because you were using your phone?

Costanza: Yes, while crossing the street

Yun: Yes, while crossing the road

Valentina: No, because I wasn't looking at it (so my sight was free to see any possible dangers, like bikes coming). I was just listening and recording while I was seeing where I was going to

Activity 2

- For how long did you walk?

Costanza: 30 minutes

Yun: 10 minutes

Valentina: 10/15 minutes

- If you have to compare the second activity with the first one what did it change?

Costanza: I looked more around me, saw more details but I also had the opportunity to think more about my day/what I have to do and so on

Yun: My mindset, I am worried about if anyone wants to reach me so i walked quickly

Valentina: I looked around me way more than before, and I felt like I was looking for something new and interesting that I have never noticed before

- Did you feel the need to use your phone? if yes in which moment? Why?

Costanza: Yes, because while I was thinking about my day and what to do I needed to write down or see if I had already something programmed. Also, I noticed more little details and since I like taking pictures I felt the need to have the phone to take them.

Yun: Yes when I left for 5 minutes because I was afraid of something urgent

Valentina: Just at the beginning, while I went out of the building, as a spontaneous gesture.

- Was the need something that you could postpone to a second moment or an impellent need

Costanza: The need of programming/planning my day could be postponed (it was just a reminder) The photo, tho, could be not

Yun: Yes i shouldn't have worried much about it

Valentina: I could surely postpone it

- Are there any moment you felt in danger because you couldn't use your phone?

Costanza: No, not at all

Yun: No

Valentina: No

- About the environment around you, did you notice something that you haven't noticed during the first activity?

Costanza: Yes, more little details. Especially dogs and behaviour of people in general

Yun: Yes

Valentina: Yes, I looked at both sides of the road, and I focused on things that I don't usually look at (like ducks, things on the canals, some details outside and inside the buildings that I could see from out of the window).

Pictures set for the collage

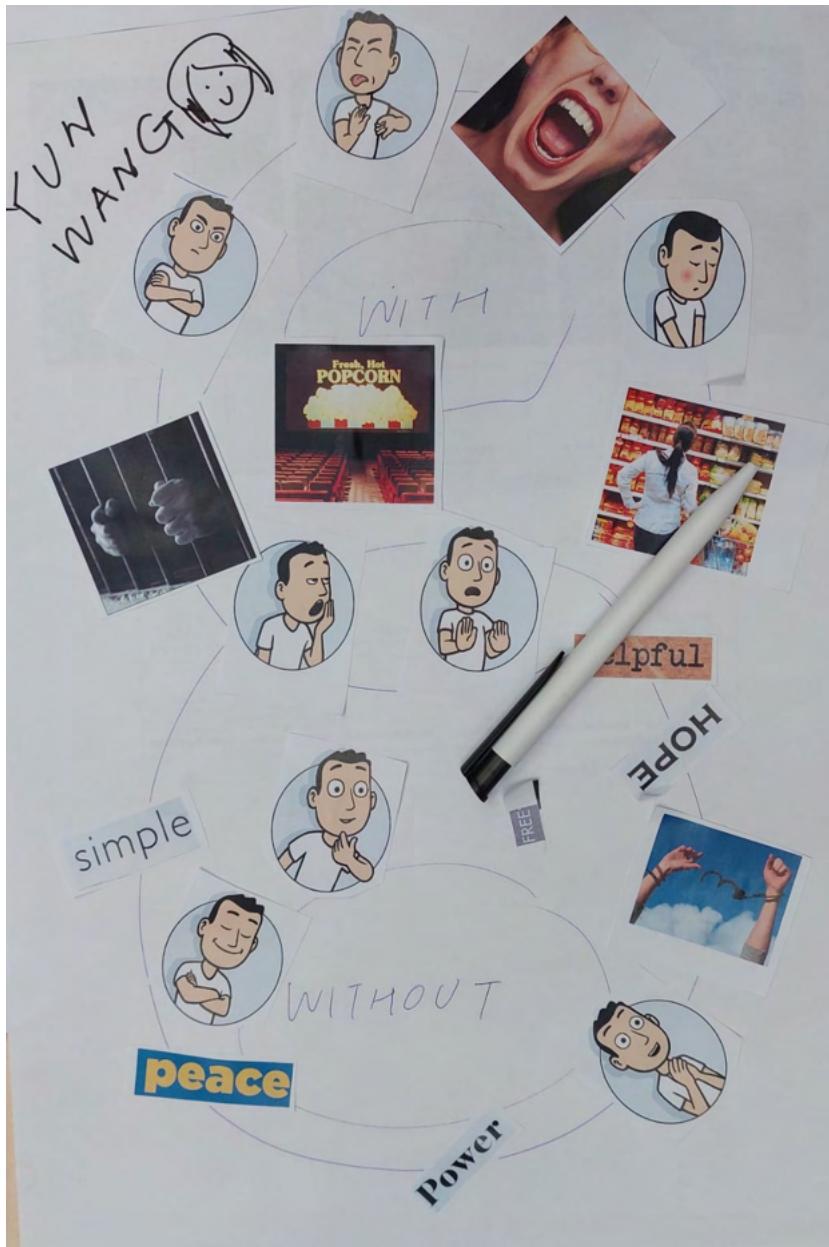


Words set for the collage



Bliss, fabulous, Awesome, happy, honey, Lovely, astounding, Glorious, Gallant, stunning, adorable, Marvelous, Graceful, amazing, cheery, Precious, dreamy, Passion, romance, happiness, magic, soul, Kindness, Wonderful, inspiring, Desire, charming, helpful, beauty, angel, flawsome, creativity, divinely, PEACEFUL, brilliant, Luck, PERFECT, HOPE, IMAGINE, Faith, LOVE, delight, enchanting, wise, SMILE, exquisite, Superb, neat, WONDERFUL, serene, GRACE, HEART, romantic, liberty, sunny, sweet, inspiration, BELIEVE.

Yun collage



Costanza collage



Overall Insight

Appendix

Insight from Observations (How people act)

1. Even if they don't use the phone actively they will **hold it in their hand** or in a very reachable place
2. When the participants are asked to walk in a busy environment while using their phone, **the gait is very inconsistent and unpredictable.** They are zigzagging between the obstacles (people and objects) or they are randomly stopping to walk and start again.
3. When people use the phone while walking they experience the **Cartesian split**, the mind is the software that runs on the body is the hardware (The mind explains behaviour while the body is the output device)
4. The more demanding the action is, the more unexpected the walk will be. **The ability** of the people **to combine the mind and body activity depends on the commitment** that the activity required (writing a mail, reasoning on something complex)
5. **Peripherical vision** is what makes people switch from the phone interaction to the environment interaction
6. The **body language gets misinterpreted** because of the use of the phones

Insight from Desk research and Literature (What we already know)

1. Research of Hisashi Murakami University of Tokyo about **the chaos created by people walking in the crowd with the phone**
2. The **white cane for blind people**
 - it makes people walk faster and consequently with better posture
 - it stimulates the curiosity of the blind
 - it shows to others around the next step of the blind person
3. **Komboloi** as an example of **antistress device**

Overall Insight

Appendix

Insight from interviews and questionnaires (How people think and how they say they act)

80%
Distracted

By their thoughts or the phone

20%
Careful

- They check their phone
 - To read notifications
 - To look for directions in google maps
 - For no particular reasons: social pressure, awkwardness, boredom
("I want to look busy" "A sort of compulsive thing" "When everyone around is using the phone" "When i feel awkward")
 - Music

70%
Danger situation

30%
prioritize safety

90%
Insecure when they walk using their phone

10%
Confident

70%
They don't feel very comfortable on walking towards someone that is using the phone

30%
It is not hard to tell where the other is going to walk

Overall Insight

Appendix

Insight from Observations and Acting activity (What people do in a controlled situation)

1. Even if they don't use the phone actively they will **hold it in their hand** or in a very reachable place
2. When the participant are asked to walk in a busy environment while using their phone, the gait is very inconsistent and unpredictable. They are zigzagging between the obstacles (people and objects) or they are randomly stopping to walk and start again.
3. The more demanding the action is, the more unexpected the walk will be. **The ability** of the people **to combine the mind and body activity** (Cartesian split) **depends on the commitment** that the activity required (writing a mail, reasoning on something complex)
4. **Peripherical vision** is what make people switch from the phone interaction to the environment interaction

Insight of ethnography research from the phone point of view (What is the phone experience)

1. The position of the **phone** it is always **aligned with our tip toes** even if we are zigzagging

Insight from sensitizing booklet and collective activity (What are people needs)

With phone

1. With the phone they were **worried to cross the street**
2. They **checked it mostly for irrelevant stuff** but also for **music and audio messages and photos**

Without phone

1. More **details were noticed** without using the phone
2. Without the phone there was the **constant feeling of missing notification or important call**

Prototype1

Appendix

Lights

Many variations have been made, to find out if this kind of intervention is able to catch the attention of the pedestrian with/ without the phone or neither of them.

Material

1 white spot light
1 red spot light
1 led string light

Research methods

Roleplay & Interview

Sample size

I° session with a large group of 7 participant
II° session with a small group of 2 participants

Procedure

Different kinds of light have been placed on different spots of the participant's bodies and on their smartphone devices in both the situation when they were the pedestrian with the phone and pedestrians without the phone.

Main insights

- Lights are NOT very helpful for pedestrian with the phone because people's gaze is already focused on the smartphone
- Light can help pedestrian that are not using their phone



Prototype2

Appendix

Sounds

By prototyping different soundtracks, my interest was to understand how sound influences people's awareness related to human motion. Specifically what kind of sounds can be recognized as a human source

Material

1 white noise track
1 person's step track
1 heartbeats track

Research methods

Roleplay & Interview

Sample size

Four sessions with one participant at the time (4 participant in total)

Procedure

The participants were asked to use their phones while walking in the street, while one soundtrack at a time was played.

Main insights

- Sounds, as the heartbeats, that can be related to human vital parameters and for this reason make people look around and check the environment.
- The sound tracks 1 and 2 made the participant confused

1. White noise sound



2. Person's step sound



3. Heartbeats sound



Prototype3

Appendix

Ground signals

For this prototyping phase, I made a distinction between signals drawn on the ground and elements that created temporary physical obstacles on the user path.



Material

4 sets of paper signals
2 balloons half filled with water

Research methods

Roleplay & Interview

Sample size

Three sessions with one participant at the time (3 participant in total)

Procedure

Participants have been asked to walk while using their phone first by placing around the paper signals and then the balloons

Main insights

- Variations on the ground catch people's attention for a moment but then they will act again as they were doing previously
- When participants stepped on the balloons they checked the floor but not the environment around



Prototype4

Appendix

Bending neck limitation

The aim was to understand how much the “wrong” posture of the neck in the current situation is responsible for the lack of awareness of the surrounding.

Material

1 travel pillow



Research methods

Roleplay & Interview

Sample size

Two sessions with one participant at the time (2 participant in total)

Procedure

With this prototype, I wanted to limit the possibility of the participants bending their necks in the classical position taken by the pedestrian that walks while using their phone.

Main insights

- Uncomfortable and unnatural positions make participants more aware of the surrounding, they also have more control on their movements



Prototype5

Appendix

Smartphone app & Vocal prompts

By prototyping the app on the phone and the vocal prompts, the aim was to test whether the users would have felt more conscious about the environment. The prototypes used live vocal/visual feedback to alert them whether they were walking straight or they were zigzagging.

Material

1 Mockup application with live visual feedback
1 phone call with a live vocal directions

Research methods

Roleplay & Interview

Sample size

4 sessions with one participant at the time (4 participant in total)

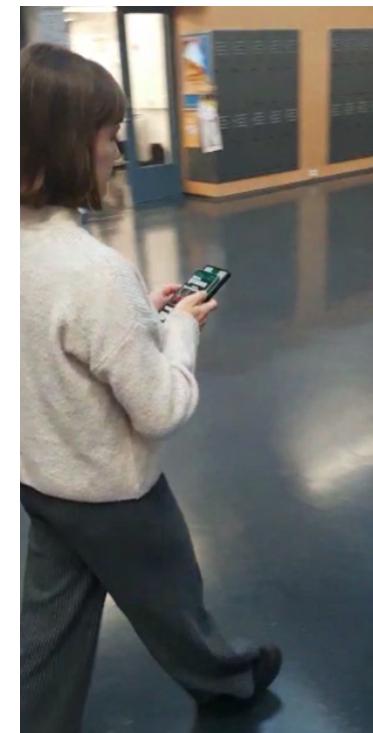
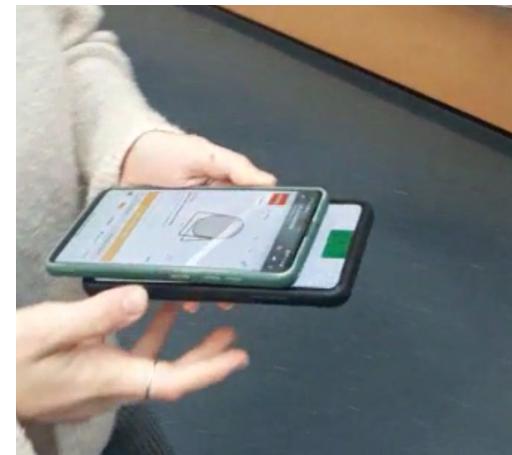
Procedure

In one session the participants were asked to walk around while using their phone, at the same time they were holding another phone under their own one. The second phone was showing them if they were going straight/left/right.

The second session had the same goal but the mean changed, instead of receiving visual feedback through the app the participant were directioned by me through vocal directions thanks to a phone call.

Main insights

- Instruction through visuals on an app makes people rely on the phone and they don't look around anymore



Paper technology

WalkSafe -->

Wang et al. [6] proposed WalkSafe, a smartphone app for enhancing the safety of people crossing roads while talking on their phones. WalkSafe uses the rear camera of the smartphone to detect approaching vehicles via machine learning algorithms implemented on the phone.

LookUp-->

Jain et al. [7] recently proposed a pedestrian safety app called LookUp, which uses shoe-mounted inertial sensors to profile ground gradients and step patterns in order to detect sidewalk-street transitions (i.e., stepping over a curb or walking down sidewalk ramps). They reported that the detection rates of LookUp were over 90%, with 0.7% false positives. However, WalkSafe appears to improve smartphone users' safety only while they walk and talk, and LookUp requires shoe-mounted inertial sensors.

SpareEye-->

Foerster et al. [8] proposed SpareEye, an Android app that warns pedestrian users concerning activities that require continuous focus on the screen (e.g., texting, watching videos, and gaming). SpareEye only requires the built-in camera of the smartphone. However, SpareEye relies on variations in image sizes obtained by a monocular camera, and hence cannot accurately measure the sizes of obstacles and the distances between users and obstacles.

Smombie Guardian -->

Smombie Guardian accurately computes the sizes of obstacles and the distances to them in a novel manner, by tracking the ratio of the user's displacement to the variation in image size (see Implementation)

VEST -->

Eagleman's so-called VEST, whose name comes from the futuristic-sounding "variable extrasensory transducer", is a sleeveless top equipped with vibrating nodes that buzz information on to the wearer's back, essentially giving the wearer a new source of information.
<https://www.dailymail.co.uk/sciencetech/article-51929c3b42dc7971329d1e336b23dc07>

Evaluation plan

Design Goal

I want to design a device that allows for **implicit communication**, about their movement, **between pedestrians, while using their phones, in a crowded environment**

What I want to use to evaluate my Interaction?

Prototypes that allow to collect evidence that helps to test the assessment criteria

- LO-FI: wizard of Oz
- short term & task specific
- Main concept of the design but with variation on the used technologies

Design goal	Interaction qualities	Design elements
Target group Pedestrian with the phone	Predictable Engaging Create consciousness Communicative Playful	Fidget mechanism Vibration Visible colors Challenge Illusion
Intended effect Feel aware and show it to others		
Context Crowded environment		

Evaluation plan

What do I want to test?

- Which characteristics best represent the interaction qualities?
- Are users motivated by using the device while walking?
- Do the user feel engaged during the interaction with the device?
- Is the interaction smooth or there are moment of misunderstanding and confusion?

- How are the other stakeholders perceiving the interaction?
- Is the side effect matching the desirable one?

Set-up

- Prototypes
 - Illusory vibration
 - Direction indicator

- Extra materials needed
 - Smartphones

- Users
 - At least 2 per interaction (but more would be better)
 - Each participant will use one prototype at the time and the other participants will play the role of random pedestrian without the phone
 -

- Context
 - The context will be the university areas, it will simulate the street but in a more controlled and easy to evaluate
- Plan test session
 - The test will be conducted in two sessions by using one prototype at the time, all the participant will use both the two prototype.
 - The participant will be asked to interact with the device while using the phone and walking.
 - The effect will be observed during the assessment of the task of the test
 - The context is controlled but plausible to recreate the actual situation

Evaluation plan

What is needed to trigger the effect?

- How much time does it take for the user to understand the utility of the device?
- How do users perceive the vibration in the illusory vibration device?
- How easy was for the users to interact with the direction indicator prototype?

What (part of) the effect is measurable?

What can be observed?

- The influence of the device on the user gait
- The body language of both pedestrian with the phone and without the phone

What can be asked?

- Questions about the feeling and the perception after use of the device both of pedestrian with and without the phone

What can be compared?

- Difference in terms of effect of the two prototypes “Illusory vibration” and “Direction indicator”
- Perception and experience of the pedestrian without the phone
- The gait of pedestrian while they are using the phone without the device and with the device

What data is needed to test the effect?

- In-situ observations
- Interviews
- Participants scales

Interview questions

How much time does it take for the user to understand the utility of the device?

Did the user understand the vibration is un illusion?

Did the users managed to interact with the direction indicator prototype?

Was the user gait straight?

Note.

Evaluation

Thanks for participating to the test! I would really appreciate if you could spend some minutes to answer to the questions below in order to evaluate your session

Illusory vibration

How engaging was to interact with this prototype? 1 2 3 4 5

How, the interaction with the device, make you feel?

What do you think the device is doing?

Did you feel like you are in control of the situation?

Direction indicator

How engaging was to interact with this prototype? 1 2 3 4 5

How, the interaction with the device, make you feel?

Did you feel like you are in control of the situation?

Evaluation

Thanks for participating to the test! I would really appreciate if you could spend some minutes to answer to the questions below in order to evaluate your session

Illusory vibration

How did you perceive the situation?

How the interaction with the phone user make you feel?

Direction indicator

How did you perceive the situation?

How the interaction with the phone user make you feel?

Do you think you would notice it in the street?

Final Evaluation plan

Appendix

Design Goal

I want to design a device that allows for **implicit communication**, about their movement, **between pedestrians, using their phone**, in a **crowded environment**

What I want to use to evaluate my Interaction?

The final prototypes that allow me to collect evidences that help to test the assessment criteria

- HIGH-FI final prototype, the technology used and the functionality it is very close to the final design
- Short term & task specific
- In the actual context

Design goal	Interaction qualities	Design elements
<p>Target group</p> <ul style="list-style-type: none">• Pedestrian with the phone• Random pedestrian <p>Intended effect</p> <p>Implicit communication between pedestrians</p> <p>Context</p> <p>Crowded environment</p>	<p>Predictable</p> <p>Engaging</p> <p>Create consciousness</p> <p>Communicative</p> <p>Playful</p>	<p>Fidget mechanism</p> <p>Lights feedback</p> <p>Visible colors</p> <p>Challenge</p>

Final Evaluation plan

Appendix

What do I want to test?

- Which characteristics best represent the interaction qualities?
- Are users motivated on using the device while walking?
- Do the users feel engaged during the interaction with the device?
- Is the interaction smooth or there are moment of misunderstanding and confusion?

- How are the other stakeholders perceiving the interaction? is the device visible enough?
- Is the side effect matching the desirable one?

Set-up

- Prototype
 - Direction indicator through the light feedback activated by the user

- Extra materials needed
 - Smartphones

- Users
 - At least 2 per interaction (but more would be better)
 - Each participant will use the prototype in a crowded environment. The pedestrian around will be observed and will be asked if they noticed the device and what do they think about it

- Context
 - The context will be the real context, it will be in the street in a crowded environment (ex. city center during the market)

- Plan test session
 - The test will be conducted in one sessions per participant
 - The participant will be asked to interact with the device while using the phone and walking
 - The effect will be observed during the assessment of the task of the test
 - The context is the real one

Final Evaluation plan

Appendix

Prototype and final concept?

- What are the prototype limitation?
- What are the difference between the prototype and the final design?
- What are the expectation towards the prototype and towards the final design?
- What are the insights from the tests and what are the recommendations?

What is needed to trigger the effect?

- How much time does it take for the user to understand the utility of the device?
- Do the other pedestrians understand the function of the device?
- How does it feel the interaction with the device for the user? does it feel natural and smooth? is there some impediment?

What (part of) the effect is measurable?

What can be observed?

- The influence of the device on the user gait
- The body language of both pedestrian with the phone and without the phone

What can be asked?

- Questions about the feeling and the perception after use of the device both of pedestrian with and without the phone

What can be compared?

- Perception and experience of the pedestrian without the phone
- The gait of the pedestrians while they are using the phone without the device and with the device

What data is needed to test the effect?

- In-situ observations
- Interviews
- Rating from participants

Evaluation

Thanks for participating to the test! I would really appreciate if you could spend some minutes to answer to the questions below in order to evaluate your session

Rate the prototype

After testing the prototype give a score from 1 (not at all) to 5 (very much) to the following questions

Did the use of the device help you to predict where you were going to walk?

1 2 3 4 5

Were you interested in continuing the interaction with the device during the test?

1 2 3 4 5

How much the device helped you to feel aware of your gait?

1 2 3 4 5

How much did you feel like you were communicating with other pedestrian around you about your intention to move?

1 2 3 4 5

Did you experience the interaction as a game?

1 2 3 4 5

How does the interaction with the device make you feel?

What do you think the device is doing?

Evaluation

Thanks for participating to the test! I would really appreciate if you could spend some minutes to answer to the questions below in order to evaluate your session

Rate the prototype

After testing the prototype give a score from 1 (not at all) to 5 (very much) to the following questions

Did the device help you to predict where the phone user was going to walk?

1 2 3 4 5

Did you feel somehow engaged in the interaction?

1 2 3 4 5

How much the device helped you to feel aware of the phone user gait?

1 2 3 4 5

How much did you feel like the phone user was communicating with you about his/her intention to move?

1 2 3 4 5

Did you experience the interaction as a game?

1 2 3 4 5

How does the interaction with the device make you feel?

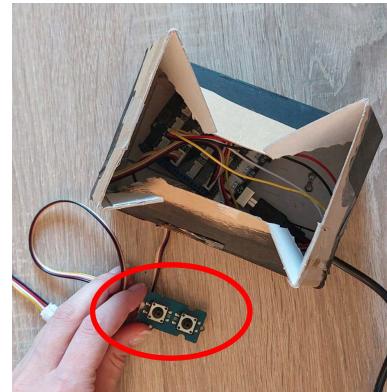
What do you think the device is doing?

Prototype 3

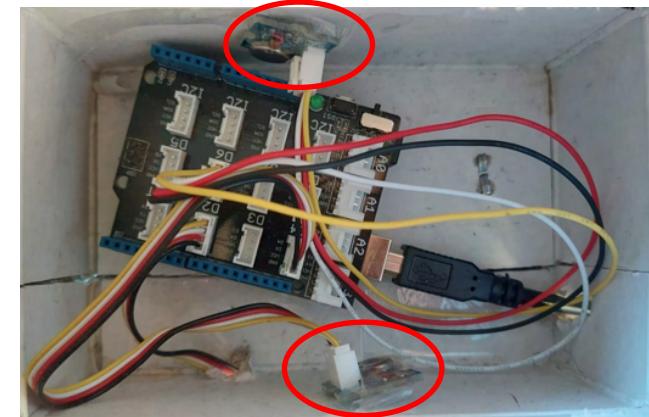
Gait supporting device with vibrational live feedback



Overview of the prototype



Button controller for the vibration of the left and right motor



Inside of the prototype with the two vibration motor

Test session



1. Set up of the device and explanation of the task

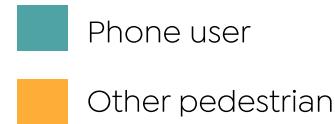


2. Actual test in action and observation of the participants behaviour



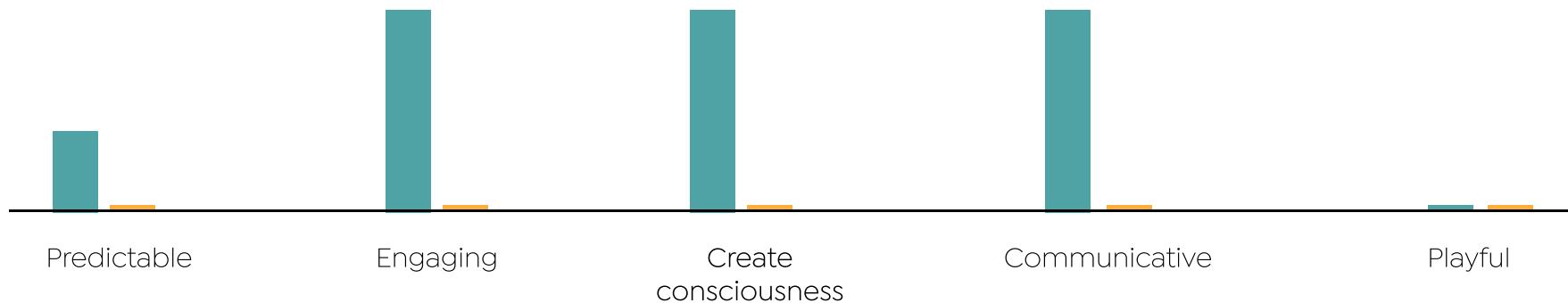
3. Discussion and comments about the test. Evaluation of the prototype by both the participants

Evaluation 1



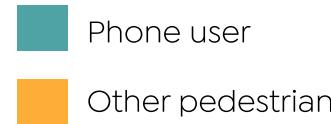
This test has been made without informing the participants about the function of the device. Both the pedestrian with the phone (which is then using the device) and the pedestrian without the phone had to figure it out themselves during the test.

Vibration prototype



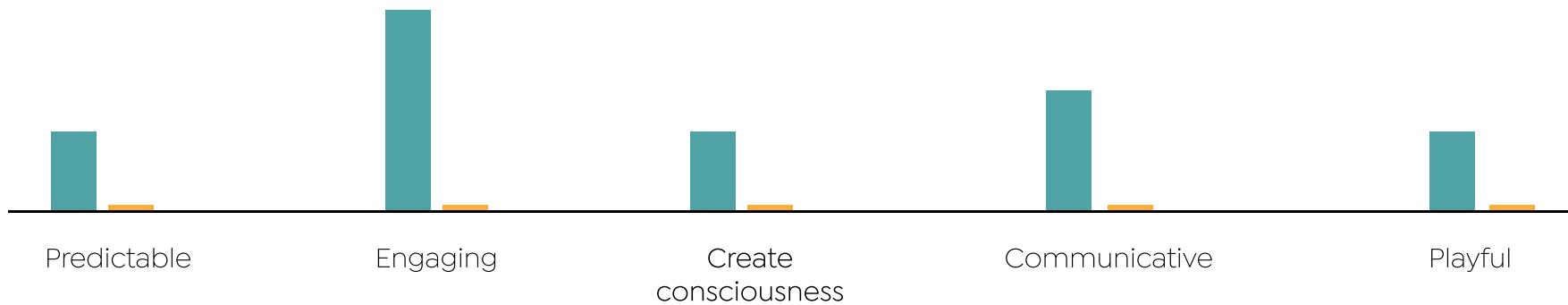
1. The other pedestrian was not at all aware of what was going on for the phone user
2. Phone user was more aware about the outside of his phone, he had the feeling that something was happening
3. The pedestrian with the phone was not really sure what the device was communicating but he had the perception that the device was telling him something
4. The vibration is not really playful

Evaluation 2



This test has been made without informing the participants about the function of the device. Both the pedestrian with the phone (which is then using the device) and the pedestrian without the phone had to figure it out themselves during the test.

Vibration prototype



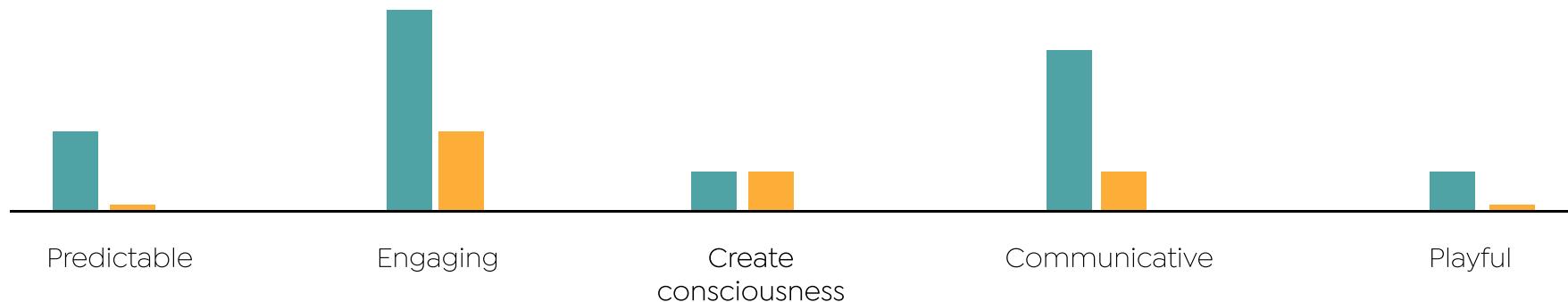
1. The vibration doesn't work that well in combination with the phone because there could be some misunderstanding in the information and a conflict of notification. The pedestrian with the phone wouldn't be sure if the vibration comes from the device or from the phone system.
2. It didn't create consciousness for the pedestrian that was using it because she was focusing more on the mechanism and to try to understand what the device was trying to communicate to her than on the environment
3. The pedestrian with the phone had the feeling that she was trying to communicate with the other pedestrians but had no clue and did not have the feeling that the communication went through.

Evaluation 3_Switching roles

■ Phone user
■ Other pedestrian

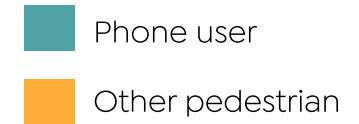
This test has been made after informing the participants about the function of the device. Both the pedestrian with the phone and the pedestrian without the phone knew what was going on during the test. They don't only knew that the functions but one at the time they played the two different roles. This helped them to know the device and the mechanism of it.

Vibration prototype



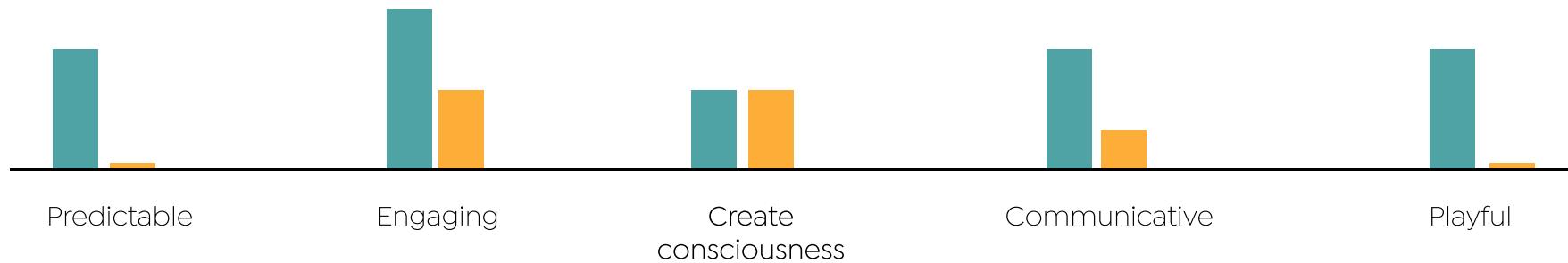
1. Knowing the device helped the pedestrian without the phone to feel more engaged, also the consciousness and the communicability of the device increased a bit but still not enough to consider the score satisfactory

Evaluation 3_Switching roles



This test has been made after informing the participants about the function of the device. Both the pedestrian with the phone and the pedestrian without the phone knew what was going on during the test. They don't only knew that the functions but one at the time they played the two different roles. This helped them to know the device and the mechanism of it. One was then playing the role of the Leader and the other the follower and vice versa.

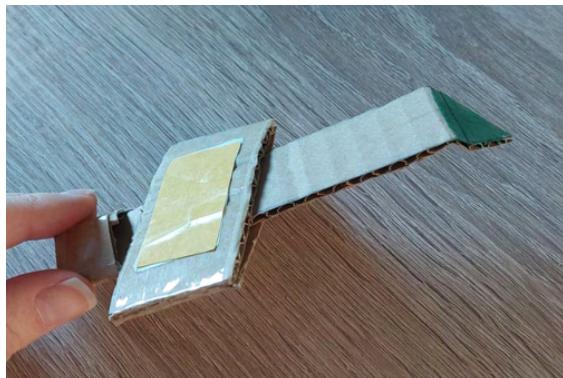
Vibration prototype



1. This shows that once the role have been switched some parameters increased a bit compared to the first half of the test. For sure communication to the participants the functions of the device helped them.
2. The results still show that the use of this kind of technology it is not optimal because doesn't rebalance the interaction but the results even if not with great success are still visible only in the pedestrian with the phone side

Evaluation

Direction prototype



Overview of the prototype



Indicator for other pedestrian



Mechanism for the movement of the indicator

Test session



1. Set up of the device and explanation of the task

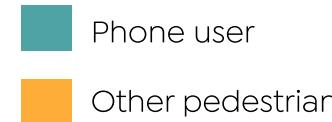


2. Actual test in action and observation of the participants behaviour



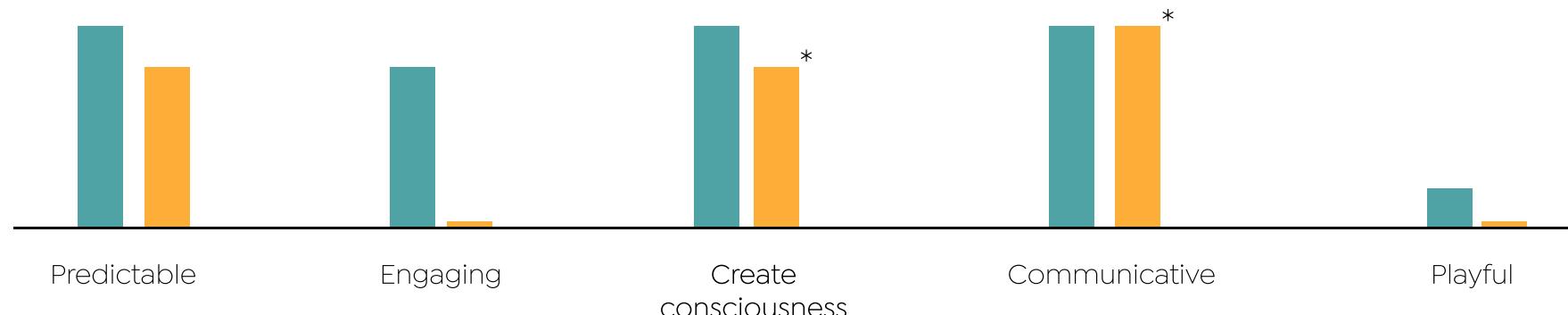
3. Discussion and comments about the test. Evaluation of the prototype by both the participants

Evaluation 1



This test has been made by telling the pedestrian with the phone to move and engage with the mechanism while walking around and performing tasks on his phone. The phone's user have been told that his aim was to control the mechanism by moving it right or left depending on whether he was going to move or he had the perception that he was right or left, at the same time do tasks on his phone. While the pedestrian without the phone was not informed about what to expect from the test.

Direction prototype



*the score given by the other pedestrian was justified by this sentence “If i know the product then i would know what it does”

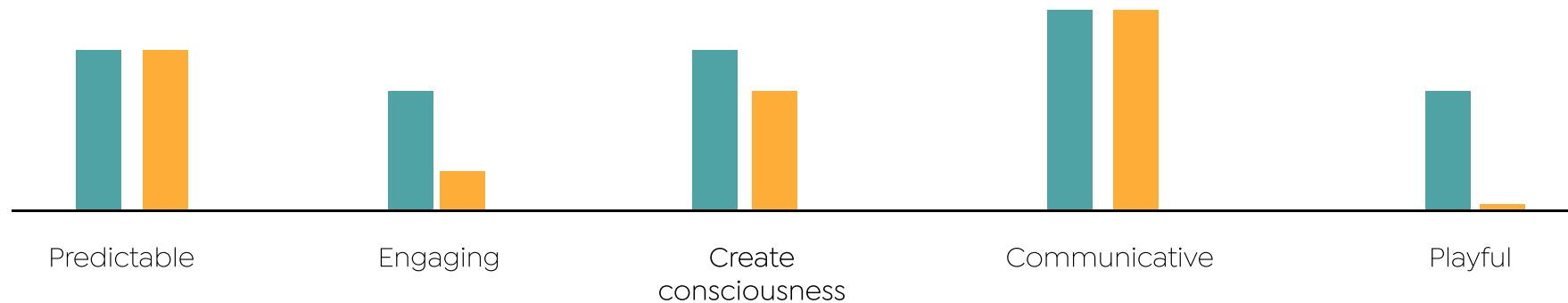
1. The fact that you control it yourself make it predictable
2. The arrow pointer made it predictable for the other pedestrian
3. For the phone user it was engaging but not completely. He wasn't sure he was doing it correctly
4. It wasn't engaging for the other pedestrian at all
5. It was creating a lot of awareness in the phone user
6. The phone user had the perception that the device was communicating more towards himself than to the others. He had no feedback about the other pedestrians understanding
7. A bit more playful than the other prototype

Evaluation 2

■ Phone user
■ Other pedestrian

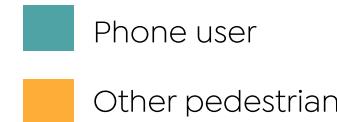
This test has been made by telling the pedestrian with the phone to move and engage with the mechanism while walking around and performing tasks on his phone. The phone's user have been told that his aim was to control the mechanism by moving it right or left depending on whether he was going to move or he had the perception that he was right or left, at the same time do tasks on his phone. While the pedestrian without the phone was not informed about what to expect from the test.

Direction prototype



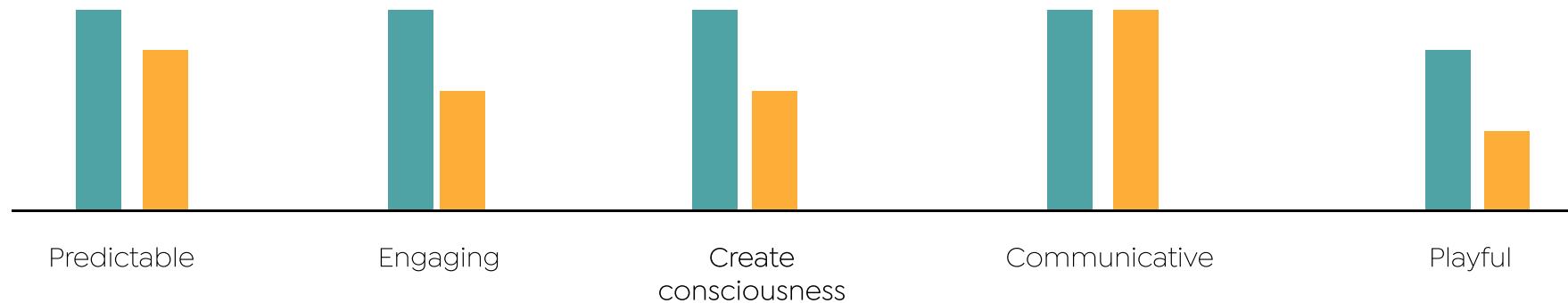
1. Pedestrian with the phone using the device “I really had to pay attention on what I was doing and where I was moving in order to control the device and the task on the phone and it made me more aware of my body movement in the environment”
2. It can be made more playful by thinking of different shapes but the idea of moving and interaction with it make it already pretty engaging for the pedestrian with the phone
3. The **pedestrian with the phone felt like she was communication with the others even without having a live feedback of it** but the experience was satisfactory already
4. It is predictable and communicative for the pedestrian without the phone but it could be even more if more visible.

Evaluation 3_Switching roles



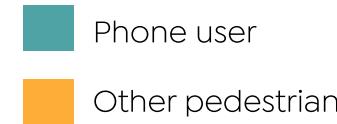
This test has been made by telling the pedestrian with the phone to move and engage with the mechanism while walking around and performing tasks on his phone. The phone's user have been told that his aim was to control the mechanism by moving it right or left depending on whether he was going to move (or he had the perception to move) right or left, at the same time carry out tasks on his phone. The pedestrian without the phone was also informed about the function of the device. In addition the roles have been switched and both the participant where at one time the leader and another time the follower.

Direction prototype



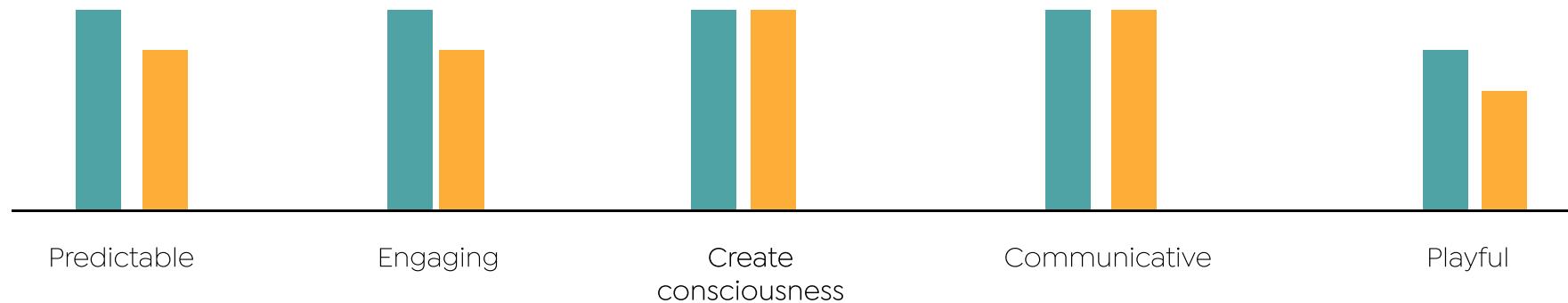
1. The score already improved by informing the participant about the functions of the device. Is results derives from the first half f the test, in the next slide the situation improved even more due to the fact that the roles where switched and this helped to rise the consciousness and the engagement for the other pedestrians.

Evaluation 3_Switching roles



This test has been made by telling the pedestrian with the phone to move and engage with the mechanism while walking around and performing tasks on his phone. The phone's user have been told that his aim was to control the mechanism by moving it right or left depending on whether he was going to move (or he had the perception to move) right or left, at the same time carry out tasks on his phone. The pedestrian without the phone was also informed about the function of the device. In addition the roles have been switched and both the participant where at one time the leader and another time the follower.

Direction prototype



1. The scores for most of the qualities increased by letting them know the function and by making them play the Leader role or the Follower role like in a dance.
2. They both knew what was going one and what to expect from the other. The device could be a little bit more engaging and predictable for the other pedestrian to make the interaction balanced for both sides.

Final prototype building process



Materials used

- 1 Silicone
- 2 2 Yellow pin led
- 3 Electric cable
- 4 Insulating tape
- 5 2 button cells
- 6 Mold in das material
- 7 Fabric lining

Final prototype building process

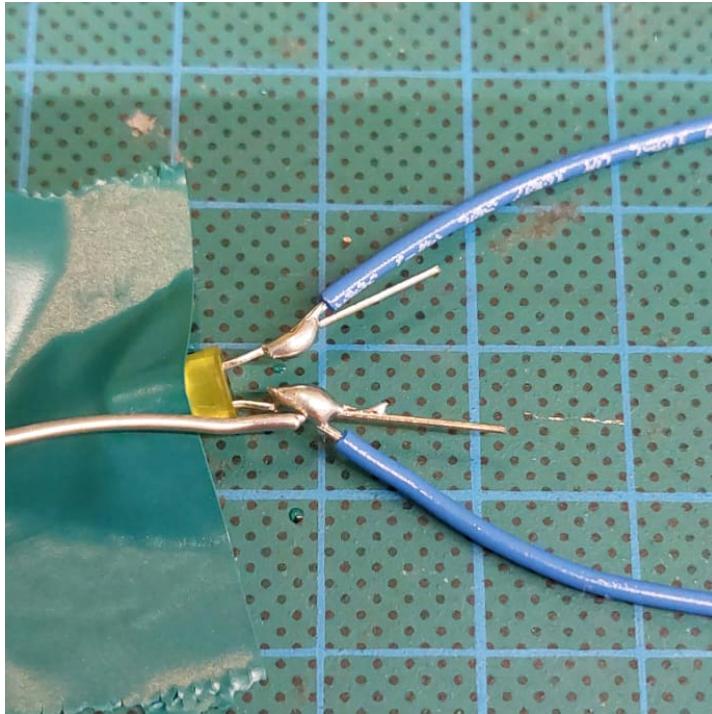


1. Process for shaping the mold



2. Prototype modelling

Final prototype building process



3. Soldering of LEDs to electric cables



4. Focus of one circuit

Final prototype building process

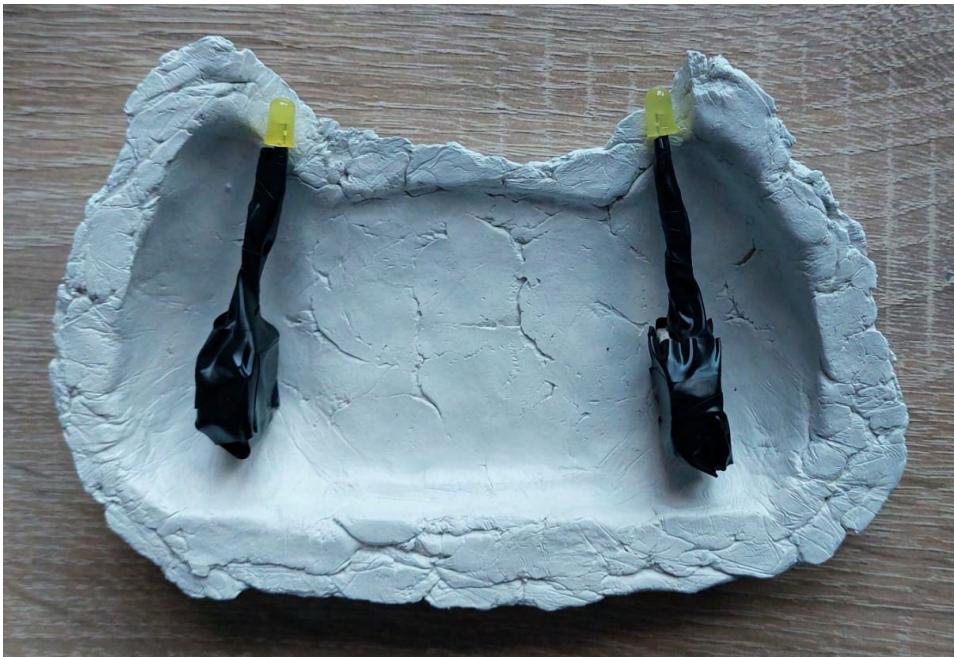


5. Creating the circuit where the leads only make contact with the battery when pressed

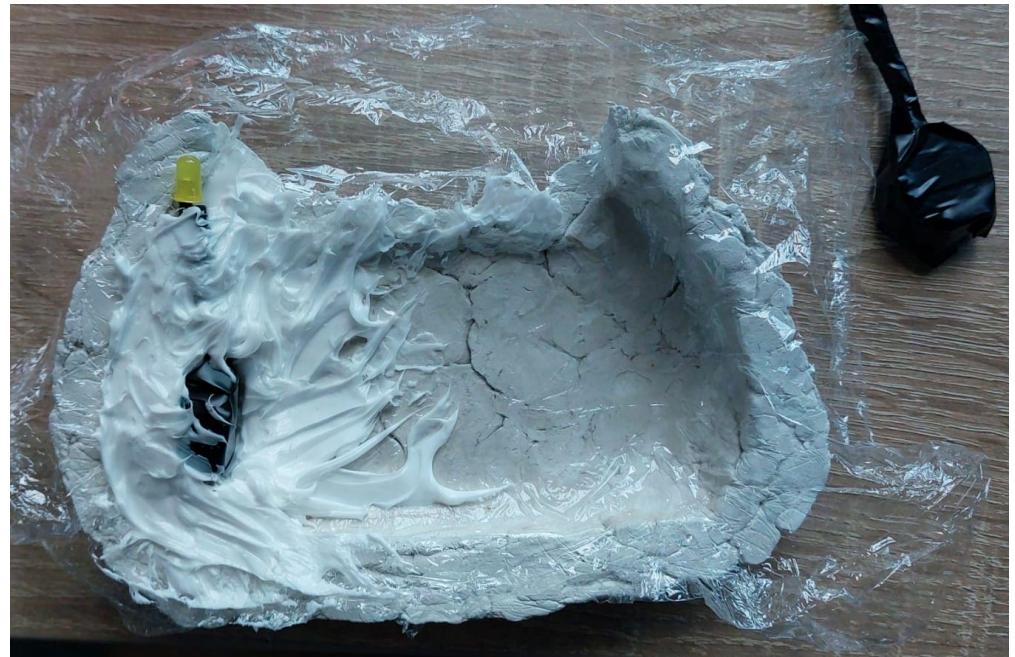


6. Circuit board coating for safety and stability

Final prototype building process



7. Positioning of the sensors in the mold



8. Coating with silicone

Final prototype building process



9. Positioning of the cover in the defined space

Final prototype building process



10. Finished shape taken out of the mould, inner side



11. Finished shape taken out of the mould, outer side

Final prototype building process

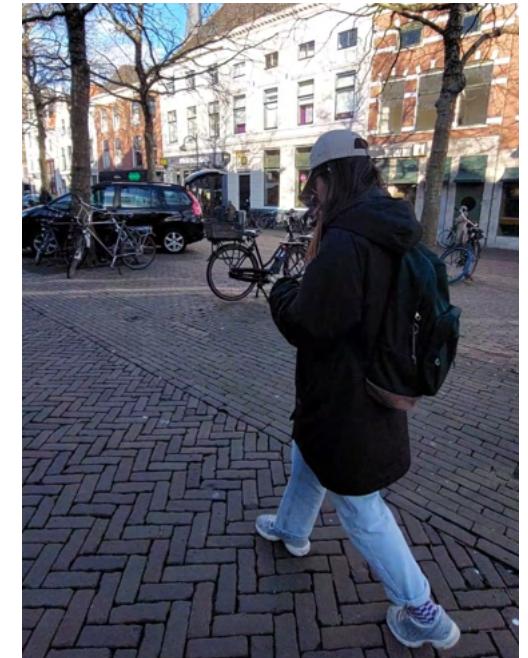


12. Finished shape covered by the fabric, inner side



13. Finished shape covered by the fabric, outer side

Evaluation 1



Evaluation 2



Evaluation 2



Evaluation 2

