

# Behaviour Change: Enhancing Social Interaction in Public Transport

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Current student behaviour on public transportation appears withdrawn and unsocial towards other passengers. This, despite the fact that loneliness is a big issue for this segment of the population and public transportation provides possibilities to develop social contacts. This study examined the current social behaviour of students on public transportation, as well as opportunities for behavioural change toward a new intended behaviour: social activity on public transportation. Using different theoretical frameworks for designing interventions to evoke behavioural change, a successful intervention is built; attention lights and suggestions to talk about on trains to persuade travelers to have an enhanced social behaviour.

Additional Key Words and Phrases: Social Interaction, public transport, behaviour change

## 1 INTRODUCTION

The Dutch government's aim is to have more people using a larger network of public transport by 2040 [17]. But is public transport and the social behaviour of its travellers really ready for this? This study will look at students and scholars who currently use public transportation the most. Research shows that this group also experiences the greatest amount of loneliness [23]. Phones are used more often and face-to-face social contact is reduced, increasing the likelihood of depression.

We focus on improving social interaction on public transport to boost these face-to-face contacts, make people socially interactive and give a sense of a faster and better experience of public transport. This can be beneficial for travellers, the public transport company and its employees. The overarching goal is to trigger conversations during a ride in order to boost social contacts and interaction. So, the behavior could be a response to feeling less "alone," and it could also help one become more socially aware. However, a brief glance into today's society shows us that most of the time, people shield themselves by means of social barriers (eye contact) or physical barriers (backpacks). Because of this, it makes it much harder for us to meet new people on our own. Unfortunately, because this behaviour is so standardized and we are accustomed to living in our own bubbles, there can be an edge to the desired behaviour. The biggest obstacles here are the willingness to exhibit the behaviour and the open-mindedness of others. An important factor is also mutual conversation and the idea of a spontaneous social conversation.

To evaluate this behaviour and see whether improvements can be made, the Theory of Planned Behaviour (TPB) [6] is used, focusing on control beliefs. The matching behavioural frameworks are the influence framework by Cialdini [13] and the persuasive system design framework by Harri Oinas-Kukkonen [24].

## 2 DESIGN PROCESS

### 2.1 Interviews

Before choosing an intervention function [Appendix II, II.1, II.2, II.3], we wanted to gain knowledge of the target group. We conducted interviews with students who use public transport. The questions were based on the TPB [6] because, according to the literature, loneliness is a major health issue

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[8] and (genuine) face-to-face interactions improve health and lead to happiness [5]. Currently, public transport isn't encouraging [Appendix VII]. It forces intimate distance, leading to social discomfort and negative social interactions [1]. For example, people would rather sit in empty rows or not make contact with others [25]. Research shows that public transport is missing interactions to reduce social discomfort [1] like information services that reduce travel time [20] or other types of interactions.

## **2.2 Result Interviews**

To analyse the old behaviour, participants were questioned on how to overcome the barriers with others. The questions were categorised into opportunity beliefs, subjective norm and attitude [6]. In this part of the interview, the participants mentioned that they foremost found it quite easy to talk with strangers, but the starting point was missing, such as overlapping interests or interactions. According to the normative influence, it was questioned who would help the participants to use fewer devices while on transport. Most of the time it was friends, family, or the conductor to have small talk with. It was mentioned that these people are stimulating to talk with, and it would be mean to interact with your device in these cases. If the opposite were the case, participants mentioned that it stimulates them if others are also on their phones or in awkward situations. According to the experimental attitude, thoughts were asked about having a connection with others when taking public transport. The answer was most of the time no, because of a lack of energy and no need to bond with strangers because you don't see them again. Expectations are only if there is a hold-up. In addition to this, participants do not know if others are interested in social interaction, which stops them from initiating a conversation. As a result, small talk with strangers was relatively simple, but always included referring to a situation or interaction that overlapped with another.

## **2.3 Brainstorm**

Based on the results from interviews a brainstorm was done with several requirements. First, the intervention should remove barriers by providing the option to interact in a playful manner. Secondly, it should lower the threshold and therefore allow the first step in social contact. After the Crazy 8's method [12] and voting for ideas that fitted the requirements and frameworks [Appendix XIV], three ideas were constructed. The first concept is based on the 'Functional Triad Framework' the floor projector has two virtual avatars that appear and interact with each other when travellers want to sit with each other and begin to have a conversation [Appendix II.4]. The second concept is based on the 'Persuasive System Design Framework'. The attention light show if someone is open for talking (green) or not (red) [Appendix II.4]. The third concept is based on the 'Influence Framework'. An avatar gives interesting topics or questions for people to talk about [Appendix II.4].

## **2.4 The final intervention**

After feedback from the midterm presentation, the choice was made to combine the most important aspects of the three ideas. The intervention consists of two parts: lights that can be turned green or red and suggestions for conversation starters, see Fig 1. Green stands for 'open for social interaction', while red means the opposite. The conversation starters range from random questions to "would you rather" statements [Appendix XII]. The reasoning behind these aspects will be explained in the upcoming chapters.

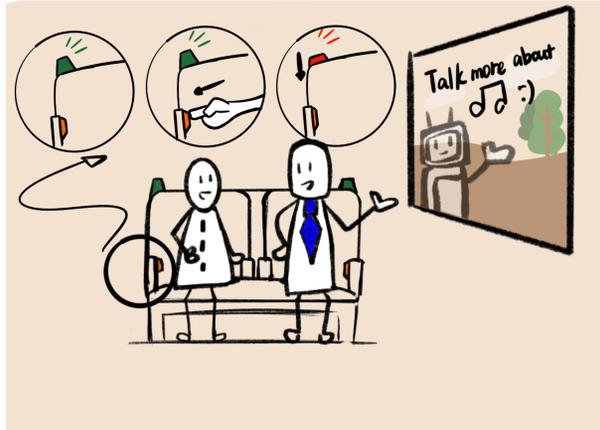


Fig. 1. Final concept

### 3 THEORETICAL RATIONALISATION

According to figures from the Central Bureau of Statistics (CBS), students and scholars are by far the largest segment of the population that uses public transport [2]. This makes targeting this population segment not only easier but also more interesting. A 2015 study found that “limited face-to-face social contact nearly doubles someone’s risk of having depression” [22]. Next to that, according to a New Zealand study, loneliness is highest among youth aged 15–24 [25]. This makes it both necessary and desirable to modify social behaviour on public transportation in order to improve face-to-face contact among youngsters.

#### 3.1 Opportunities for Public Transport

Several studies show that the seating layout of public transport forces people into an intimate distance with strangers, causing social discomfort [1]. The concerns of public transport providers are focused on economic imperatives rather than a concern for the actual experiences of patrons [11, 23, 25]. Other studies argue the great potential public transport has in decreasing loneliness and improving mental health. These studies show that commuting by bus or train makes people happier than driving and that these ways of transport provide opportunities for having face-to-face contact [21, 25].

#### 3.2 The Theory of Planned Behaviour

**3.2.1 Behavioural Beliefs.** The interview analysis showed that the target group has certain thoughts and beliefs about the outcomes and attributes of performing the intended behaviour. It seems that younger people do not start interacting with others on public transport as they think that they might make certain situations feel awkward. It was also found that the target group often has the idea that strangers are not worth the time to interact with because it does not necessarily bring something of value. The target group prefers to spend the travel time relaxing or doing some work, as this brings more value.

**3.2.2 Normative Beliefs.** The analysis showed some clear normative beliefs as well. The target group indicates that they are open to social interaction but have difficulty starting conversations themselves. This is because they do not know if others want to interact. The people in the target group also say that talking to a friend on the phone is usually better than talking to a stranger

on the train. In this way, friends on the other side of the phone do have a certain influence on the behaviour as well. The target group takes their phones out at the very moments that other travellers are on their phones as well. This means that the target group is socially influenced by others on the train.

**3.2.3 Control Beliefs.** It seems that there are several facilitators to perform the behaviour, but there are especially some barriers that stop the target group from performing the behaviour. A strong facilitator is that there are enough seats to sit next to someone to encourage interaction. But because of the space between the seats, the target group thinks this seating arrangement is uncomfortable. Another barrier that makes interacting with others more difficult is the rise of technology. This phone usage can be seen as a barrier to behavioural performance, as people create their own bubble while using their phones. The final impediment to performing the target behaviour is that there is nothing to talk about on the train. If they knew they shared a certain interest with a stranger or they experience something together, starting a conversation would be way easier

## **4 IMPLEMENTATION DESIGN RATIONALE**

The final intervention concept is based on two theoretical frameworks: The Influence Framework by Robert Cialdini [13] and The Persuasive System Design Framework by Harri Oinas-Kukkonen [18].

Within the Influence Framework, focus has been laid on the social proof and consensus parts. By getting the target group on the train to watch how other people act (socially), they are more likely to do the same. This was also found while analyzing the normative beliefs branch, wherein it was shown that the target group grabs their phones when they see others in the train doing this as well. By integrating the principle of "social comparison" performance of the intended behaviour by our target group can be achieved by having them see others performing this behaviour as well.

The social comparison principle is used in the intervention in such a way that when others in the train keep their attention light green, the target group keeps their attention light green as well. Next to that, this principle can also be highlighted in another way. This means that the target group will talk to another person on the train when they see others talking to strangers as well, or when others start a conversation with them.

Within the Persuasive System Design Framework, focus has been laid on the Dialogue Support part. By exposing the target group to suggestions to talk about, they are more likely to start a conversation with a stranger. The framework shows that if you make suggestions at the right time, you can make them more convincing. When looking at the control beliefs branch of the TPB[6], it was seen that a conversation starter could make it easier to start talking to a stranger. This is why the principle of "suggestion" is integrated within the design intervention. By providing the target audience with a conversation starter while a stranger is seated next to or across from them, the barrier for initiating conversation is decreased, and they are convinced to engage in the desired, intended behaviour.

## **5 ETHICS ANALYSIS**

For our behavioural change, not all the stakeholders of these public transport parties play an important role. The selected behavioural change specifies three forms of stakeholders. Core team, involved team, informed team. [Appendix X.1 ] describes a schematic overview of what the gains and losses are per stakeholder group.

## 5.1 Moral Values and Value conflicts [Appendix X.2]

One of the key moral values within this intervention is mutual respect for making certain choices [4]. Travellers should respect each other's choices and also be open to rejections. Next to this, autonomy and heteronomy are important: The person has to make their own choice about changing their behaviour in certain situations at their own pace and will/ability [3]. However, autonomy can also turn into heteronomy of others. By making your own choice, you influence the choices of others, which can trigger others to make a certain choice for them. Furthermore, collaboration and especially dialogue are needed for this intervention to succeed [7]. Interaction is a key component and thus crucial to the success of the intervention. However, cooperation can also be distorted by excluding people, this can actually make a person feel lonely and alone without their intention to do so. Additionally, a person must be able to be honest about their choices to avoid unpleasant or uncomfortable moments [14].

Intervention is made to make connection easier when one wants to connect, but this is not always the case. In some cases, honesty can tip over into being too honest [14], which comes hard on the other person and can potentially trigger difficult situations. One has to have confidence and courage to connect with other travellers, too [19]. Moreover, public transport must dare to take the step of dedicating part of their compartments as social meeting spaces. People need to be open to looking at their train journey from a different perspective. Open to interactions and technologies that provoke this. Too many open-minded people can cause the extroversion in the space to become so high that people want to enter a social bubble and instead shut themselves off from further conversations, becoming close-minded [10].

## 5.2 Scenario mapping [Appendix X]

Dilemma 1: Environmental restrictions - The lights in the train, and especially the social interaction lights, can be questioned by their presence and default colour of green. The threshold to change them to a different colour, with the associated interactions and reactions of people in the immediate vicinity, can influence the person to actually make the choice.

Dilemma 2: Connection Created - While obtaining a connection and starting a questionnaire, there may be questions that are not ethical to ask or answer by a stranger. This can put people in an uncomfortable situation where they are forced to answer personal or private related questions.

Dilemma 3: Behaviour Change - There may be a saturation of questions and conversations after a few minutes. Here, the change of light colour to the red social interaction light may trigger a discussion between the two participants in the interaction.

## 5.3 Reflection attitude and approach

5.3.1 *The person must have full autonomy.* People's choice to make a choice creates an ethical difficulty in how far you want to let people choose to have a light on or off at all. This plays into the moral values of mutual respect, autonomy, and honesty.

5.3.2 *The encouragement for open-mindedness is just a trigger, not a task.* The intervention that triggers behavioural change should encourage people to be more open-mindedness. However, ethically, this trigger could also turn out to be wrong and not encourage but denigrate people or even impose a task to be more interactive and open-minded when in some situations it does not work out well. This one plays on the moral values of courage and open-mindedness.

5.3.3 *The person should have a positive experience of collaboration on the train.* Collaboration and dialogue require an important element of mutual respect and approval. If this is not the case, it can

be ethically irresponsible and even result in a situation where the other person simply prefers not to talk to a particular person. Moral values that address this are collaboration, respect, and honesty.

## **6 EVALUATION PLAN**

The evaluation would take place on a train ride between Eindhoven and Utrecht. One-third of the train is observed without intervention, while two-thirds experience the design in two different versions. This will give enough opportunity for the researchers to observe the key determinants.

### **6.1 Fidelity - Did the target group use the intervention the moment they were exposed to it?**

The fidelity of the design intervention is evaluated by measuring how the target group's intention to perform the behaviour changes based on the implementation of facilitators, attention lights and suggestions, to perform the intended behaviour. It is important to evaluate the fidelity to find out if it breaks down barriers in the target group's existing control beliefs.

The attention lights are meant to awaken social comparison and lower thresholds to start a conversation with a stranger on the train. During the evaluation, every seat in the train would have its own attention light. Public transport travellers are directly exposed to the lights and can be observed in how they handle these: the frequency, the understanding, and the timing. In this way, they can see if travellers are influenced by others, so if they turn to put their lights on red or green when they see fellow travellers doing this. Furthermore, they can start talking to others when they see that behavior around them.

The other facilitator is the suggestions, which are meant to increase persuasive powers and lower thresholds for starting a conversation with a stranger. Suggestions in the form of questions are exposed for the participants to talk about. It can be observed how often participants start a social interaction with a stranger at the moment that they are exposed to the suggestions. Next to that, the opportune moment to expose travellers to the suggestion can be studied by doing two separate experiments. During the first experiment, it can be observed how often people start social interactions after exposing them to suggestions at random moments. The second experiment is meant to observe how frequently a conversation is started after exposing them to suggestions immediately after they enter the train.

### **6.2 Impact - Does the intervention change the perceived control to perform the target behaviour?**

Perceived control [9], which correlates highly with intention, is chosen as the determination which should be observed during evaluation. Within the TPB [6], a specific independent determinant of behaviour intention is to be measured and observed.

Before travellers interact with the intervention, the control beliefs can be measured with a 'likely-unlikely' scale and the perceived power with an 'easy-difficult' scale [16]. Then the outcome of both can be multiplied to find the perceived control. Afterwards, the same survey can be done again to see if the perceived control changes.

As described before, three barriers were identified within the control belief branch: uncomfortable seating arrangements, the rise of technology, and the lack of conversation starters. The barriers are processed in the survey [Appendix V] to see how the intervention impacts them.



Fig. 2. Set-up empirical evaluation

## 7 PROTOTYPE AND EMPIRICAL EVALUATION

### 7.1 The final intervention

The empirical evaluation existed of two parts in an analogue setting. First, we determined the baseline and then introduced the intervention. The full setup can be found in [Appendix III, XII, XV]. The fidelity was tested by first observing the behaviour of six participants when no intervention was available and they pretended to be on a train. The frequency of social interaction was measured by researchers [15]. The participants sat randomly in the ‘train’ for five minutes. Then, a brief explanation was given of how to use the intervention. At the moment people were willing to interact, the screen with the questions was turned on to show interaction. The interaction was used once. The second experiment lasted for ten minutes. The research started with an explanation of what the intervention was and how it was supposed to be used before the experiment started. Afterwards, feedback on the experience was asked [Appendix III]. The impact was tested by observing the participants and making notes of the context [Appendix XIV]. Next to this, feedback from people was asked after participation to answer the question if the intervention would change their behaviour in public transport. The frequency table was used to observe the participants’ behaviour [Appendix XV]. Two researchers observed the behaviour of switching the ‘light’, of the switching chairs and the interaction between participants. The other two researchers took notes of the sayings of participants, to gain an understanding if the content would matter.

### 7.2 Reflection

After the evaluation, there was a realisation that it was more focused on an interaction level than an intervention level. As the frequency was measured of interaction between the participants with and without intervention, it is missing the level of impact. This could have changed by adding a short survey at the end of the evaluation. Now it just consists of input from participants and some observational notes, but this is missing how the control beliefs and perceived power add to the perceived control. Nevertheless, looking at the frequency sheets, an increase can be seen in the interaction between no intervention vs intervention [Appendix XV]. This matches the expectations of the effect of suggestions and social comparison. However, the social comparison of the lights could have two sides. On one hand, it can motivate people to turn the light green, too. On the other hand, people could join others in turning the light green. In this way, social comparison

works negatively. Furthermore, the suggestions interrupted conversations and/or weren't necessary anymore as people were already talking. Participants let us know that they would not really initiate conversations in a real-life situation, but would not mind talking to people during public transport. This shows that intrinsic motivation is an important factor to take into account.

### **7.3 Discussion**

Early findings have revealed the broad range of social interactions that are facilitated by a physical intervention like a green or redlight combined with questions. In addition, by merging the two interventions, the lights and suggestions performed well instead of independently since the framework and principles' assumptions were in line with the evaluation's findings. Furthermore, using the Theory of Planned Behavior worked well to take down the control belief branch from this theory including the other following branches. However, there were also downsides. Overall, we chose to focus on the students, but the inclusiveness of other groups, such as other adults or blind people was not taken into consideration. In addition, because the intervention was only tested in a lab context, participant behavior may have varied from that of a real train configuration. The students' lack of personal items, such as backpacks, would typically affect the availability of seats and be interpreted as a lack of interest in interacting with others. Next to this, the seats and screens during the evaluation were quite far away from each other, which did not reflect the social discomfort public transport travellers usually feel [1]. Furthermore, most travellers are strangers to each other and vary in age. Nevertheless, during the session, several participants already knew each other, which lowered the threshold to interact. One was on a low-prototype base, which may have made it unclear how to utilize it according to the interventions (even though there were posters with explanations). Thus, it could have been preferable to assess each component of the physical and digital interventions alone. The effectiveness of different statements to start a conversation or even the difference between visual and audio comments, might have been investigated separately from the digital intervention.

### **7.4 Future Work**

Several adjustments and considerations needed to be made to make the concept mature enough to apply in public transport. First, different parts of the interventions should be reconsidered like the statements, how the light and the interaction works, how the statements are communicated like audio, video, button to press individually for new statements etc. Secondly, co-creation sessions should be conducted to further iterate on the interventions also related to the involvement of other age groups. Third, more interested parties should be involved in the process, as well as the business's dependability and how to launch it. Finally, the actual evaluation should be reconsidered.

### **7.5 Conclusion**

Overall, the empirical evaluation indicates that the intervention can alter people's interactional behaviour. Uncertainty exists about whether the intervention can also do this at the evaluation level. Additional user studies and research may shed light on this matter. In terms of changing behavior, the intervention is based on the TPB model and, more specifically, on control beliefs. This is because these barriers can be removed if the intervention is done right. In addition to the 2040 goal that the Dutch government has set for the country's young people and people who use public transportation, the design calls for more research because it addresses current problems like loneliness, overcrowded trains, and social interactions in the train, including face-to-face contact.

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## APPENDIX

### I INDIVIDUAL CONTRIBUTION

#### *Design Process*

- Literature research (Rick, Wouter)
- Interviews (Sichen, Lotte, Alicia)
- Brainstorm (Everyone)
- Idea Sketch and Journey map (Sichen)
- Presentation 1 (Rick)
  - Presentation content (Everyone)
  - Presentation design (Rick)
- Presentation 2 (Wouter, Lotte)
  - Presentation content (Everyone)
  - Presentation design (Rick, Sichen)
- Presentation 3 (Alicia, Sichen)
  - Presentation content (Everyone)
  - Presentation design (Rick)
- Conducting the test (Rick, Wouter, Sichen, Lotte)
- Prototype (Alicia, Sichen)
- ERB and Consent forms (Alicia, Lotte)

#### *Report writing*

- Introduction (Rick)
- Design process (Lotte, Sichen)
- Theoretical rationalization (Wouter)
- Implementation design rationale (Wouter, Sichen)
- Ethical analysis (Rick)
- Evaluation plan (Sichen, Wouter, Alicia)
- Prototype and empirical evaluation (Alicia, Lotte)
- Conclusion (Alicia, Rick)
- Discussion and future work (Everyone discussed, Lotte wrote it down)
- Appendices (Wouter)
- Finalizing format and reference list (Sichen)

## II (BEHAVIOUR) MAPPING DURING WORKSHOP

### II.1 Selecting target behaviours

Target Behaviours	Impact	Likelihood	Spillover	Measurement
Leaving your phone in your pocket (more often)	<ul style="list-style-type: none"> <li>Less addiction</li> <li>more social contact</li> <li>more open</li> <li>Relaxing for the eyes</li> <li>more social skills</li> </ul>	<ul style="list-style-type: none"> <li>Willingness to interact with others</li> <li>Business related calls / Work related</li> <li>Sleeping / bored</li> <li>See train as me time</li> </ul>	<ul style="list-style-type: none"> <li>Less time to unwind</li> <li>Take measurement</li> </ul>	<ul style="list-style-type: none"> <li>See how many people are talking to each other</li> <li>Measure phone connection activity</li> </ul>
sit next to people you dont know	<ul style="list-style-type: none"> <li>more social contact</li> <li>improve social skills</li> <li>more open</li> <li>Bigger network</li> </ul>	<ul style="list-style-type: none"> <li>Willingness to interact with others</li> <li>See train as me time</li> </ul>	<ul style="list-style-type: none"> <li>More social anxiety</li> <li>Being annoyed when someone talks to you</li> <li>Do subtle measurements on more groups</li> </ul>	<ul style="list-style-type: none"> <li>You can ask people if they know the one next to them</li> </ul>
Not dropping stuff on seats next to you	<ul style="list-style-type: none"> <li>More social contact</li> <li>More kindness to others</li> <li>More places to sit</li> </ul>	<ul style="list-style-type: none"> <li>When you have a lot of stuff, it is very crowded</li> </ul>	<ul style="list-style-type: none"> <li>Feeling of confinement</li> <li>Have to move through it even in public, are without people</li> </ul>	<ul style="list-style-type: none"> <li>Easy to see how many people are standing/sitting</li> </ul>
....				
<b>Total Assessment</b>	<b>Promising/Unpromising/Unacceptable</b>	<b>Promising/Unpromising/Unacceptable</b>	<b>Promising/Unpromising/Unacceptable</b>	<b>Promising/Unpromising/Unacceptable</b>

## II.2 Specifying target behaviour

Target behaviour	Sit next to people you don't know	Interact with people you don't know			
Who needs to perform the behaviour? (Characteristics)	Confidence	Relaxed	Social skilled	Openminded	
What do they need to do differently?	Talk	Interact	Choosing seats	Move belongings	Omit phone
When do they need to do it?	When traveling by train	When waiting for train			
Where do they need to do it?	At the train carriage	At the 4 persons + 2 person seats	At the train station (platform)		
How often do they need to do it?	Each time they travel by train	Each time they wait for the train			
With whom do they need to do it?	Other passengers	Conductor			

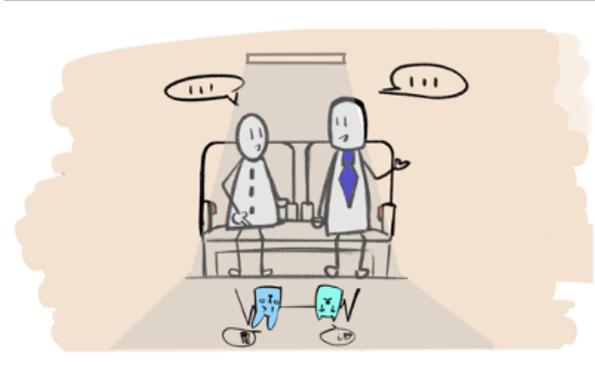
## II.3 COM-B analysis: What needs to be changed?

Com-B components	What Needs to happen for the behaviour to occur	Is there need for change?
Physical Capability	to be able to sit/talk	No change needed, this is a biological thing
Psychological capability	to be able to think and communicate on the same level	There needs to be something tangible to change this; the social anxiety wall needs to be removed
Physical opportunity	to be able to sit next to someone a free chair available	Change needed; by booking seats and people put their bags somewhere else than on the seats; Therefore the carriage needs to be restructured; to have more opportunities for this.
Social opportunity	to be able to social interact with people to see strangers connect with each other	Change needed; by causing a domino effect in which strangers talk to each other faster when they see others doing the same. Therefore the carriage needs to be restructured; to have more opportunities for this.
Reflective Motivation	Believe in the willingness of others Believe in interacting with other people will make you happy	No change needed, this is a biological thing. There are people who have more difficulties with believing and estimating other's willingness, but that is difficult to change.
Automatic Motivation	Always be open to other people and free their way > changing the train culture	This can be changed. Even though there are people who have more difficulties with opening themselves up towards others, the train structure can be changed in such a way that there is no other choice. This will also change the train culture.
Com-B diagnosis	Physical and social environment that enables the behavior need to be changed to establish the target behavior (opportunity in COM-B model)	
Determinants	Difference between the behavior of travelers in a unstructured train carriage and a restructured train carriage.	

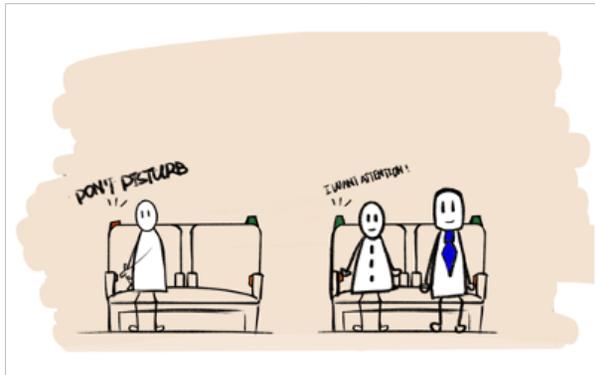
Michie, Atkins, & West (2014). The behaviour change wheel: A guide to designing interventions. London: Silverback Publishing.

## 11.4 Brainstorm ideas

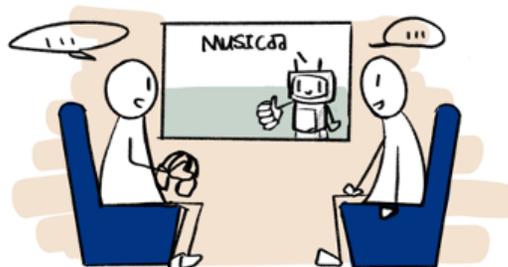
Floor Projector



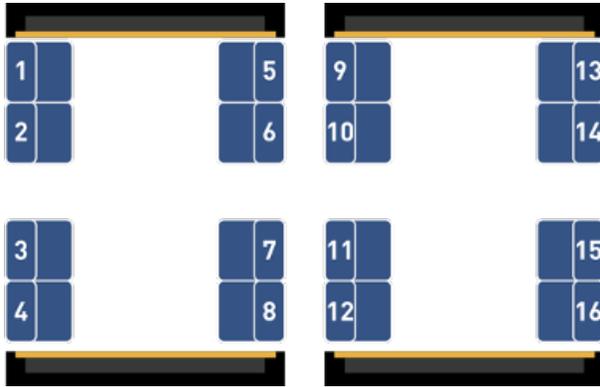
Attention Light



Window Avatar



### III EVALUATION SETUP



#### *Materials*

- Classroom
- 4 laptops
- 16 chairs
- 16 double-sided printed paper with a red and green side
- 6 posters
- 4 screens with a PowerPoint slide on it (changing every 30 seconds) containing 40 questions
- Frequency model to observe
- Paper+pencils to write down observations
- Consent forms
- Overview of seats
- Sticky notes for the feedback afterward

#### *First round (2 x 5 min)*

- Screens were inactive
- 6 Participants
- At the door: "you will step into a train, take a seat, and pretend to be in the train"
- Consent was signed
- People walked into the room and took a random seat
- People sat for 5 min
- After 5 min a small explanation of the 'lights' was given
- Last 5 min, people were sitting and (possibly)interacting
- When people were interacting, the screen was turned on

#### *Second round (10 min)*

- Screens were turned on: so the questions were visible during the research
- 16 participants
- At the door: "During the experiment, you will step into a train. Take a seat and pretend to be on the train. If you are seated, you might notice that there is a two-sided paper on the back of your chair. This means two things: either you are willing to interact, put it to green, or if not willing to do this turn it red".
- Consent was signed
- People walked into the room and took a random seat
- People sat for 10 min

Participants were thanked and asked to leave feedback on sticky notes

#### IV FEEDBACK FROM PARTICIPANTS AFTER THE EVALUATION

##### *Written sticky notes*

- The questions on the screen may interrupt my mind if I'd like to have a conversation that is not related to the one on the screen
- Backpacks on chairs are essential for socio(cult) train dynamics. Also missing (partly) the stranger aspect. Train different classes/groups to share space - contested?
- Awkward at first
- Really need an extrocent to start the conversation
- The questions on the screen really help!
- It was a fun experience
- The questions on the screens are great to start a conversation
- Nice prompt
- Wondering how it will work if 3 + 4 people talk, maybe someone didn't expect such an active environment, and then will leave
- I think it is a nice way to investigate conversation for people who wish to interact. I probably will just keep my light red but it also saves me from having to talk when I don't want to, so great!
- I noticed the seats are quite far away from the rows. I neglect the screen somehow
- Noticed the big screen. But because I am with my colleagues, no need for any new topics
- Could feel more like a train, the questions did bring a conversation which usually does not happen fast
- The prompts were nice, but I think in real life I would not initiate the conversation I do think I would join tho if someone else starts
- Maybe it will be more 'realistic' when people pretend they are strangers
- Instructions were a bit vague
- It was fun
- Starting a conversation is already very "energy consumption " during the color past is almost 10th like starting a conversation or declining a conversation
- Students sitting together will always talk. Suggest trying with strangers.
- You cant see the labels

#### V SURVEY QUESTIONS

##### **Public transport situation before using intervention**

- Rate the likelihood of encountering an uncomfortable seating arrangement in public transport *Extremely unlikely, unlikely, more or less unlikely, neutral, more or less likely, likely, extremely likely*
- Rate the effect of uncomfortable seating arrangements in public transport on increasing social interaction between public transport travelers *Very difficult, difficult, somewhat difficult, moderate, somewhat easy, easy, very easy*
- Rate the likelihood of encountering the rise of technology in public transport *Extremely unlikely, unlikely, more or less unlikely, neutral, more or less likely, likely, extremely likely*
- Rate the effect of the rise of technology on increasing social interaction between public transport travelers *Very difficult, difficult, somewhat difficult, moderate, somewhat easy, easy,*

*very easy*

- Rate the likelihood of encountering a lack of conversation starters in public transport *Extremely unlikely, unlikely, more or less unlikely, neutral, more or less likely, likely, extremely likely*
- Rate the effect of a lack of conversation starters on increasing social interaction between public transport travelers *Very difficult, difficult, somewhat difficult, moderate, somewhat easy, easy, very easy*

#### Public transport situation after using the intervention

- Rate the likelihood of encountering an uncomfortable seating arrangement in public transport *Extremely unlikely, unlikely, more or less unlikely, neutral, more or less likely, likely, extremely likely*
- Rate the effect of uncomfortable seating arrangements in public transport on increasing social interaction between public transport travelers *Very difficult, difficult, somewhat difficult, moderate, somewhat easy, easy, very easy*
- Rate the likelihood of encountering the rise of technology in public transport *Extremely unlikely, unlikely, more or less unlikely, neutral, more or less likely, likely, extremely likely*
- Rate the effect of the rise of technology on increasing social interaction between public transport travelers *Very difficult, difficult, somewhat difficult, moderate, somewhat easy, easy, very easy*
- Rate the likelihood of encountering a lack of conversation starters in public transport *Extremely unlikely, unlikely, more or less unlikely, neutral, more or less likely, likely, extremely likely*
- Rate the effect of a lack of conversation starters on increasing social interaction between public transport travelers *Very difficult, difficult, somewhat difficult, moderate, somewhat easy, easy, very easy*

## VI INTERVIEW QUESTIONS

### Current situation

- Describe your behaviour when you use public transport. You can think of boarding, after sitting down and going away, etc.

### Experimental Attitude

- What do you think about the rise of technology in public transport?
- How do you think this influences people's interaction with each other?
- What do you think about the phenomenon that people always use smartphones while taking public transport?
  - Positive and Negative thoughts
- How do you think the current situation is that emerging technology reduces people's connection with others?
- Do you want to have a connection with others when taking public transport?

#### Instrumental Attitude

- What benefits can you gain if you do not use a device when taking public transport?
- What do you think are the negative effects if a person keeps using their device when taking the train?
- What do you think of social interaction with others in public places?

#### Normative Influence

- Who will help you to use your devices less while taking public transport?
- And the other way around? (Who will not help you use devices less while taking public transport?)

#### Perceived Control

- What things make it easy for you to build a connection with others?
- What things make it harder for you to build a connection with others?

#### Self-Efficacy

- If you want to build a connection with others, how certain do you believe that you have the social skills for this?
- And if you would say this on a scale of 1 (not sure) to 7 (absolutely sure)?
- What kinds of things would help you overcome any barriers to building a connection with others? You can think of experiences, situations, or products.

#### Final question public transport type

- In which type of public transport do you see the behavior you have described in the beginning the most often?

## VII INTERVIEW ANSWERS AND INSIGHTS



## Experimental attitude

### Thoughts about the influence of the rise of technology on the interaction between people

There is not a social environment, so it's okay that people are more on their own. They take others less into account (loud music etc)

More individualistic. People used to watch sports with you or help with a game. Now everyone is somewhere else online.

Negative. People do their own thing in PT and don't connect

Negative effect for conversations. I think for example the development of VR will motivate people play more singlehanded rather than building connections.

No interaction. But with alcohol a good mixer. Or if you meet people you know or if someone old starts talking to you

For the people travelling with me on my train.  
- For people who are not to contact with. With the technology means things easier.

Not really a need with strangers

### Thoughts about having a connection with others when taking public transport

No need for a deep friendship with strangers, but it's nice to connect with friends when traveling together. But it should also be possible to do your own thing

It is nice to connect with someone that takes the same route every week. But now PT feels like a thing to use to go from A to B

Not really a need. More a moment for myself. Except when there is a holdup

I will not start a conversation most of time. Ok with that but prefer not to be bothered.

Not really. After a day at uni energy levels are low and listening to music is nice then

- Hate strangers talk with me without my consent  
- Don't feel comfortable when strangers talk with me.

More aware travelling. A individual but peace time.

## Perceived Control

### Things make it easy for participants to build a connection with others

Some people look approachable, some not. Or how broad their answers are to questions

Something that is accessible for everyone and has nothing to do with PT. Like a newspaper to lend and borrow.

Shared interests or if something happens

Several hobbies, travel experiences, and some news. (Common chatting topic)

- Small things, for example, someone help me with my luggage.  
- Someone with pets

### Things make it harder for participants to build a connection with others

Phones. Short answers. 20 bags next to them.

I use PT as something to go from A to B, not to get to know others

When you don't feel the need you won't put energy in it. And you don't know what the other likes.

- Noisy environment  
- I enjoy chatting but I won't start a conversation because I don't want to be impolite.

First impression

## Instrumental attitude

### Thoughts on benefits they can gain if they do not use a device when taking the public transport

More aware of where you are traveling. Spontaneous deep conversations with travelers. Open for surprises.

Being up to date. Always something to watch

It is a moment of peace that you can grab and fill for yourself. Which is not necessarily an advantage for society or for others on the train.

Have a break or appreciate the view outside

- Gain knowledge?

### Thoughts on negative effects if people stick to using their device in the public transport

Higher threshold to connect with others. And people are more rude (listening to music without earphones)

Less in the moment. Not enjoying watching outside or something

Own bubble. No communication with others. Don't know what happens around you

- Smartphone battery will run very fast  
- Bad for their eyes

- Miss the train  
- Bad for eyes  
- Missed some beautiful views.

## Self-Efficacy

### Thoughts on certainty of social skills by building a connection with others

sure, feel comfortable talking to strangers

I don't find it difficult to approach strangers

Small talk is easy. Don't really go into depth

70%

- Below medium.  
- In my own country, I never realize that small talk is a problem.

### Certainty on a scale 1 (not sure) to 7 (absolutely sure)

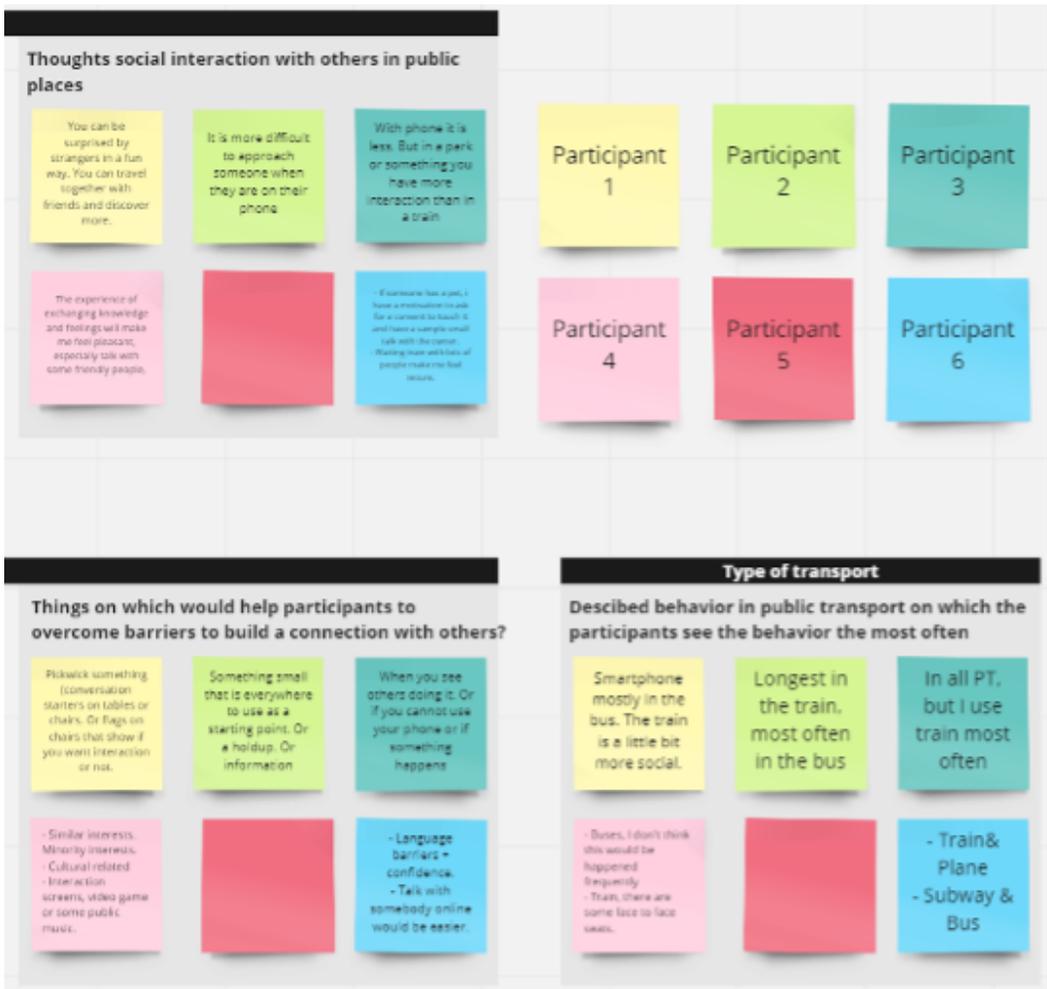
6

6

4

4.9 :)

3



## VIII CONSENT FORM

### Subject Consent Form

#### *Social Interaction during public transport usage*

- I have been given information and I understand what this research is about. I was also able to ask questions. My questions have been answered to my satisfaction. I had enough time to decide whether to participate.
- I know that participation is voluntary. I know that I may decide at any time not to participate after all or to withdraw from the study. I do not need to give a reason for this.
- I know that some people can access my data. These people are the research team and professors and tutors of the course Design for Behavioral Change (TU/e).
- I consent to gather and usage of my data for scientific publication and additional research on my data.
- I consent to my data being stored at the research location for another 5 years after this study.
- I consent to minutes being made during the interview for analysis in the context of this study.

I want to participate in this study.

Name of study subject:

Signature:

Date: - / - / -

I hereby declare that I have fully informed this study subject about this study.

If information comes to light during the course of the study that could affect the study subject's consent, I will inform them of this in a timely fashion.

Name of investigator (or their representative):

Signature:

Date: - / - / -

-----The study subject will receive  
a copy of the signed consent form.

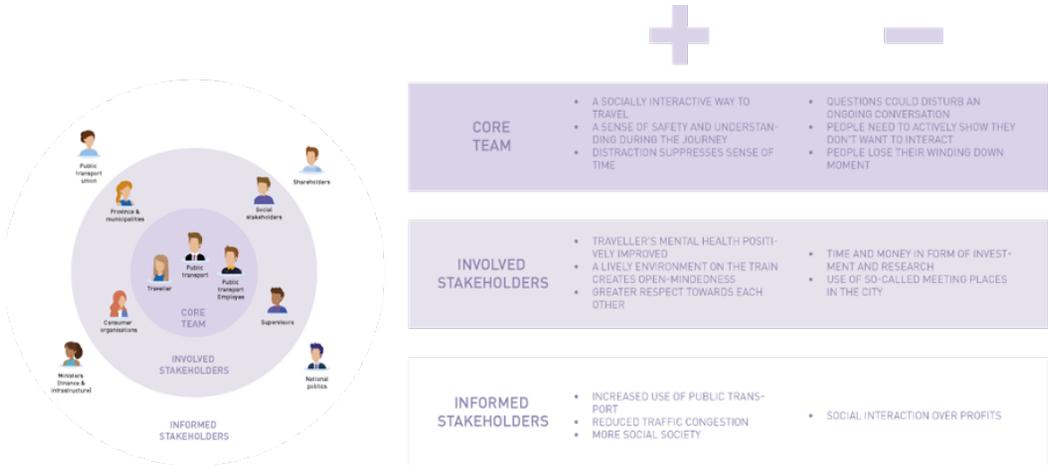
### IX LINK TO ERB FORM

To access, you need to ask permission.

<https://docs.google.com/document/d/12NIBYH6q32PXbm2oUZ5dwBYiLAWrnkTl/edit>

### X ETHICS ANALYSIS

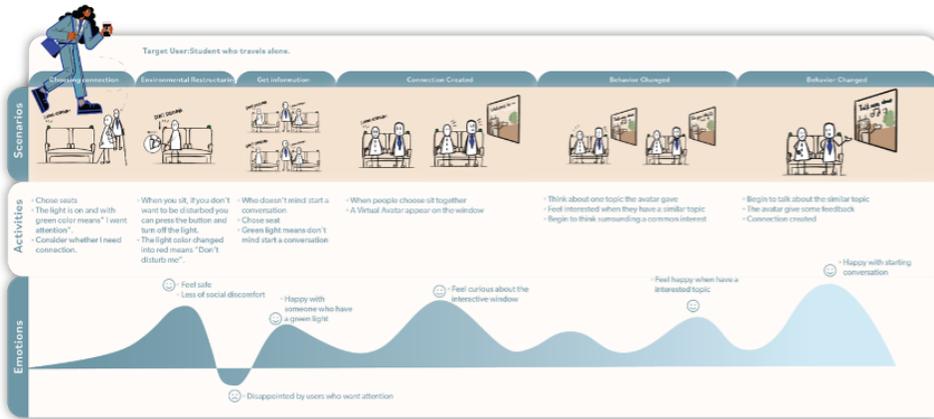
#### X.1 Stakeholder Analysis



#### X.2 Moral values



## XI CUSTOMER JOURNEY / EXPERIENCE MAP

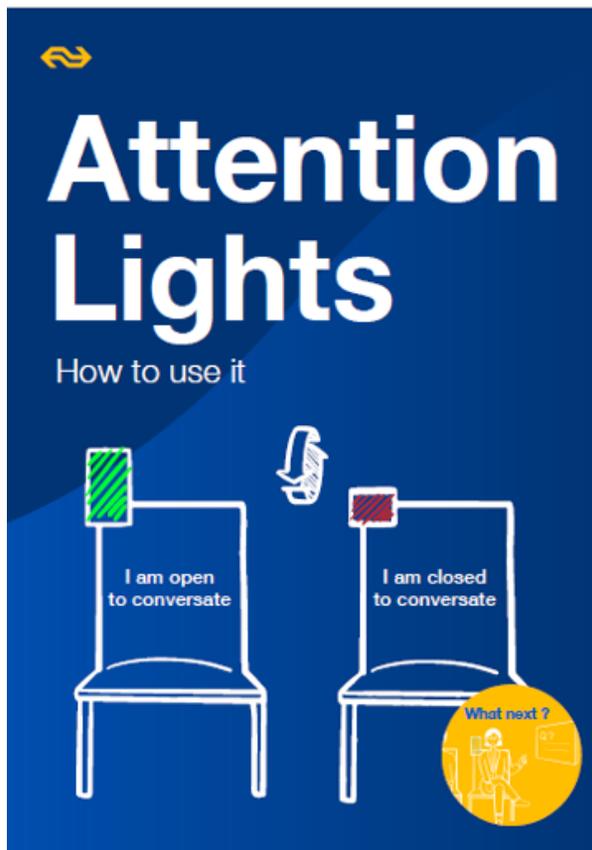


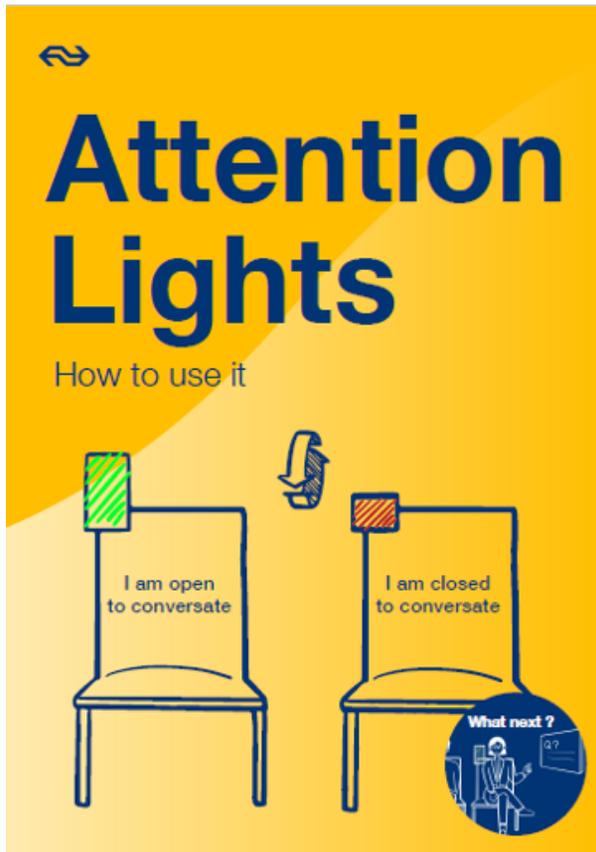
## XII SUGGESTION QUESTION USED DURING THE EVALUATION

1. Are there any words that you simply can't stand?
2. What is something that will instantly annoy you?
3. What do you love most about where you grew up?
4. What app or website completely changed your life?
5. What has been your 15 minutes of fame up to this point?
6. What would someone who doesn't know you well be most surprised about?
7. If you were to devote your life to art, what type of art would that be?
8. What do you see happening in your future?
9. What recent event have you seen that restored your faith in humankind?
10. What is something that you like that your parents do?
11. How well do you trust your gut feelings?
12. What's something that you thought you'd have already done by now, but haven't?
13. What would your dream day look like?
14. What was the best thing you learned in the past year?
15. Would you prefer to leave where your hometown and never come back or stay in your hometown and never be able to leave?
16. If you had to wear a hat for the next week, what type of hat would you choose?
17. If you knew the winning lottery numbers, would you keep them to yourself or share them with others?
18. Have you ever been to an event that you think will one day be in history books?
19. Can you name 5 things you wouldn't do for a million dollars?
20. If you had to walk away from one technology in your life, what would it be?
21. What country sounds interesting but you know very little about it?
22. If you were to work at a circus, what job would you choose?
  1. Would you rather be the first of your kind or the last of your kind?
  2. Would you rather eat steak with a spoon or soup with a fork?
  3. Would you rather dress in only pink neon or only black for the rest of your life?
  4. Would you rather earn 1foreachwordyousayorearn1 for each step you take?

5. Would you rather spend a year on an island with someone who never stopped talking or completely alone?
6. Would you rather never have to sleep or never have to go to the bathroom?
7. Would you rather have the ability to speak to animals or the ability to speak all languages?
8. Would you rather always feel hot or always feel cold?
9. Would you rather be famous now and forgotten when you die or unknown now and famous after your death?
10. Would you rather stub your toe or get a paper cut?

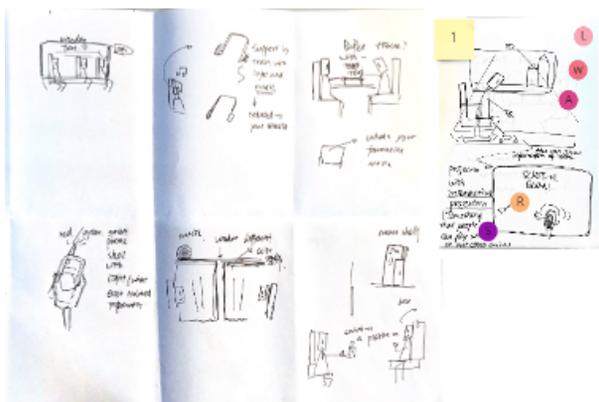
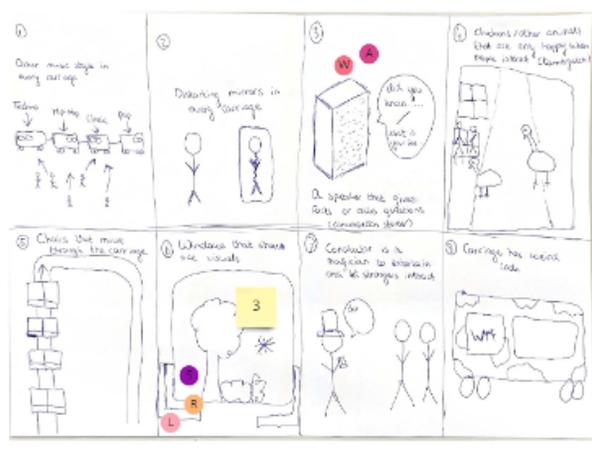
### XIII ATTENTION LIGHT POSTERS USED DURING THE EVALUATION





**XIV IDEAS AFTER BRAINSTORMING ACCORDING TO THE CRAZY8'S METHOD**







## XV EVALUATION OBSERVATION NOTES

*Test 1:* The vibe is silent so people are less of interaction

- Participant 1: Looks curiously around him at the beginning of the test but is quickly confused about the intention of it.
- Participant 11: Look at the screen and poster.
- Participant 14: Didn't flip the attention prototype into red after the introduction, but still wore earphones with her.
- Participant 14: Seems to feel uncomfortable or awkward. She doesn't know what to do.
- Participant 9: Turns his card from red to green at the slides presented.
- Almost all participants: On their phones and thus, no interaction with each other.
- All the participants: Don't even look at each other.
- Even though the cards are green, there is no interaction between participants. This can mean that they do not understand the purpose of the cards well enough.
- It was definitely not clear what the cards meant at the beginning of the test. After telling them during the test, it became a bit more clear, but that was probably too late.

*Test 2:*

- Participant 2: Feel awkward at first, drinks water, and looks around.
- Participant 7: Have eye contact with participant 8 but don't have other interactions.
- Participant 14: Keep talking about some topic to gather others together (Maybe because they already know each other, so they are easier to start a conversation with) Participants 13 and 14 don't talk too much based on the questions.
- Participants 2 and 7: Feel curious about the questions and begin a conversation based on the questions.
- Participant 6: First ask
- Participant 5: Tries to touch the screen / interact with the screen
- Participant 5: Is playing with his card. He turned his card from green to red and almost immediately back to green again. Maybe he is doing this to get attention.
- Participant 7: Looking at the screen with a great smile, but still not interacting. The moment someone else started talking, she was immediately into the connection as well. (this can mean that travelers do need an extra stimulus to start talking to a stranger).
- Participant 6: Tries to start an interaction immediately by saying hey to the rest.
- Participants 3, 4, 7, 8: Starting a conversation quite fast about the sentences on the screen.
- Participants 6 to 5: What do we need to do? → Sentences not clear enough?







Frequency Data Sheet

Name: 1512  
 Observer: S. K. S.  
 Definition of behavior being recorded:  
Interactions  
Conversations

Date	1	2	3	4	5	6	7	8	9	10	11	12	Daily Total
1	X												
2	X		X	X	X	X							
3		X	X										
4		X		X		X							
5													
6													
7	X	X	X	X	X	X	X						
8	X		X	X	X	X							
9	X	X		X									
10	X	X	X	X									
11													
12													
13			X	X									
14	X		X	X									
15													
16													

## XVII SCENARIOS OF CURRENT BEHAVIOR IN PUBLIC TRANSPORT

### XVII.1 Scenarios train: second class

*Full scenario train second class* While entering the compartment, there were still quite a few spots available, after I had a seat, a student association came in and divided up the remaining spots. The reactions of the passengers, especially the older generation, were mostly disappointed looks and sometimes some sighing. The group loudly announced their presence on the train and loudly sang several songs. I saw in the corner of my eye someone looked at the "nuisance sticker" on the train and then grab her mobile phone, a few minutes later the conductor stood in our compartment to alert the group to the presence of other passengers. What was striking about this was the calm tone of the group, but above all the laughter (without sound) of many a traveller who did listen in somewhat to the nonsense coming from the group.

- A remarkable thing about the whole situation was that the people sitting next to persons from the study association were all on their mobiles or grabbed their mobiles. This was probably to avoid any communication with the group.
- During the different stops and the new load of passengers in the compartment, the threshold to ask to sit next to someone was lower due to the limited availability of seats. People still wanted to sit during their journey and thus took a concession to sit next to a stranger. People more often than not ask if they can sit next to someone, the cases where
- People don't ask to sit next to someone result in the person already sitting there feeling uncomfortable and especially a greater threshold to say anything at all to the person in question
- I myself chose to read a book to be able to watch the situation from a distance as unobtrusively as possible. The most that stood out was
  - People have no verbal contact apart from the sorry (if something wrong happens) and may I sit here or may I just take a moment to perform a very quick action. The rest of the contact is through facial expressions.
  - The older people on the train mostly look outside or at the TV screens with information, somewhere they miss a connection. It is noticeable that they often still look at the person next to them with some hope of a conversation

*Silent compartment* Finally in Sittard I switched to the silence compartment, here people are required to have no contact verbally so different behaviour is or should be displayed here.  
*Caller* In this compartment, a new passenger started calling. The other passengers started to sigh, some looked at the man emphatically after which one person stood up to point out the man's silence print on this compartment.

## **XVII.2 Small scenarios train**

### *Dog interaction - Overlapping interests*

A child crossed the dog with her mom which was the way of communication between the dog and the child (around 5 years old) and the mom and dog owner started to have a small conversation about the dog.

Same woman with a dog sitting in a 4 seater talks with someone who is allergic to dogs so the allergic person left angry. Quickly afterwards another person sits awkwardly in front of her, this person looks uncomfortable.

Woman with a dog is laughing out loud while reading her message on her phone, the girl looks very annoyed. The dog stood on the feet of the man next to the girl which created an "sorry" and "is okay" reaction.

### *Old people - good will*

Old woman was looking around her and couldn't find any interaction. However when stepping in the train people helped her with the stairs and were friendly, laughing at her.

Old man was looking at the signs of where to go. He looked confused so a guy in the 30ths asked him is everything was alright and pointed him to the right train.

### *Attention screen - overlapping point of interest, no interaction*

One screen at the perron shows a dancing drawn cat. 50 percent of the people waiting for the train are staring at the same scene.

### *The conductor*

A conductor checked a ticket from an international airport so he didn't understand why he couldn't check in so it was a kind of awkward situation. People were looking at what was happening. Since the foreigner didn't understand English the conductor spoke it into google translate. Many people were looking at each other and trying to follow the conversation or talking about it with a friend.

Someone (me) was eating a slice of bread, the conductor had a something to interact with so said "lekker boterhammetje hoor, smakelijk"

### *Impersonal space - do not disturb*

A guy wants to sleep so he has positioned his bag next to him to block the seat for others. At the moment people were willing to sit using body language, he wasn't willing to put his bag somewhere else so people responded with irritated sighs.

Train is pretty full so people have to sit next to each other. Some people ask if it is okay if they could sit next to them. Others just sat without having any interaction.

People in the silent couple are talking softly and a man next to them looks very angry. It looked like he was willing to say something but he didn't.

### *Annoyed*

Two guys were fighting and people around it looked quite scared. "Stop now okay" <tough talk> people looked angry, but no one said anything about it.

## **XVIII SCENARIO BUS**

### **XVIII.1 Full scenario bus**

The public transport of the bus is solidly different from that of the train. The spaces are smaller, it is like one big compartment and there are some unwritten rules to make the ride as easy as possible

- The bus was enormously full, it was rush hour and every seat was occupied in the bus. This situation compromised people's personal space so 95

- The people who were not on their phones were the older generation, this generation quietly looks around outside or at the people on the bus. It was noticeable that couples pay less attention to their mobile unless someone is close in their zone, then the mobile was used frequently.

- The attitude of the bus driver (grumpy) creates a depressed atmosphere in the bus, people stand on the platform smiling and come walking out of the bus with a stern and serious look after checking in.