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Gendered interactions mediated by design: Sexual harassment in public transport

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Abstract

This paper explores the gendered interactions that are mediated by designed products in actual use contexts. Our case is vehicle design for public transportation, a product category that is from the outset relatively gender-neutral, when compared to explicitly gender-segregated categories such as household electronics, cars and toys, even if its real users are more often women than men. The empirical basis of research comes from interviews with women passengers. Our analysis demonstrates that seemingly gender-neutral designs can be merely gender-blind in that they have significant impact in the gendered experiences of its users – which includes, in this case, being exposed to or feeling the risk of sexual harassment and assault in public transportation as a woman. Therefore, feminist design interventions into mobility environments can provide immediate practical solutions that would be complementary to the policy and law making efforts that are necessary to ensure safety for women in public transport.

Keywords: Gender; design; public transport; script; mobility; women

Introduction

In design literature, gender has mainly been explored in relation to women's omission from the history of design and uneven representation in various design fields, as well as the challenges they encounter in professional life (Kaygan 2016). These have paid attention to the design fields and industrial sectors in which designers work rather than the products themselves. Studies compared women's higher representation in the fields that are traditionally considered to be of women's interest and responsibility, such as home decoration and jewelry design; as opposed to product and automotive design, which remain male-dominated (Howard and Setliff 2000; Kirkham and Walker 2000). A body of work from the 1980s and 1990s endorsed women designers, suggesting that they would better address the needs and expectations of women users (Bruce and Lewis 1990; Buckley 1986, 1989; Doering et al. 1994). Women designers drew on their own work to illustrate how their experiences as women have enabled them to bring fresh perspectives into their practice (Perkins 1999; Amon 1999; Doering et al. 1994).

Contributions of these publications to our understanding of design as a gendered profession aside, design literature has suffered from a lack of interest in the gendering of designed products. Apart from exceptions such as Pat Kirkham (1996) and Penny Sparke (1995), and two recent papers by Ehrnberger and colleagues (Ehrnberger, Räsänen, and Ilstedt 2012;

Ehrnberger et al. 2017) based on conceptual critical design projects, the ways physical artefacts are gendered has initially been investigated in sociology, history of technology, science and technology studies, and information studies, often with reference to the symbolic features of products and to the gendered roles ascribed to the anticipated users. This paper aims to redress this gap in design literature by exploring how gendered interactions are mediated by designed products in the actual use context of public transportation. We focus on vehicle design, a product category that is from the outset relatively gender-neutral, when compared to deeply gender-segregated categories such as household electronics, cars and toys, even if its real users are more often women than men (Ramboll Smart Mobility 2021). Drawing on interviews with women users of public transportation in Ankara, our findings indicate and discuss the ways in which the seemingly gender-neutral designs have significant impact on the gendered experiences of its users – which includes, in this case, being exposed to or feeling the risk of sexual harassment and assault in public transportation as a woman. Our conclusions translate these findings to potential design intervention areas in vehicle interiors that invite transportation designers and manufacturers to reflect on their existing conceptualizations of user needs and expectations from a gender-inclusive perspective.

It is important to acknowledge two limitations that arise from the specific scope of this paper. First, our approach to gender from a feminist framework, which focuses on experiences women, and experiences of queer individuals remain out of the scope of this research project, notwithstanding the significance of similar problems for e. g. trans individuals in public space. Second, the in-depth character of our research limits our investigation to the impact of the designed elements on gendered experiences in a specific use context. We acknowledge that sexual harassment is a product of structural gender inequalities, which design cannot fully address without being part of larger and comprehensive political endeavors for social change.

Framing gendering of products by design

Feminist scholars have provided strong empirical evidence for the argument that if we look at everyday objects closely enough, we can see that products embody and convey gender relations. Early studies mainly focused on domestic technologies, where gendering reflects the dualistic gender roles at home (Cockburn and Ormrod 1993; Cockburn and Fürst-Dilic 1994; Wajcman 1991). Cockburn and Ormrod (1993) showed that household appliances used for household chores such as oven, washing machine and dishwasher, have been designed with a woman user in mind, and considered as basic products that need to be easy to use. Men, on the other hand, have been the anticipated users for home electronics such as television and camera, which are meant for leisure, and designed and mediated as new and ‘real’ technologies. A more recent questionnaire by Aaltojärvi (2012) confirmed Cockburn and

Ormrod's findings, and showed that domestic technologies are still strongly associated with gendered dualisms and divisions of work.

Outside the domestic sphere, a comparable argument has been presented regarding computers in the 1990s' office context. Lie (1995) discussed male office workers' resistance to desktop computers due to an association with routine secretarial work. On the other hand, laptop computers were identified with freedom, independence, access to power and technology, and therefore with masculinity, so that they were offered to high status businessmen (Atkinson 2005).

Scholars have also explored the gendering of products by adopting the concept of script (Akrich 1992). The concept suggests that designers' anticipations regarding potential users and use contexts are built into products by design. Reformulated through a gender lens, the concept of gender script made it possible to document how gendered user representations shape end products (Rommes, van Oost, and Oudshoorn 1999, Oudshoorn, Saetnan, and Lie 2002), such as domestic appliances (Aaltojärvi 2012), electric shavers (van Oost 2003), toys (Rommes, Bos, and Geerdink 2011), and mobile phones (Shade 2007). Drawing on this conceptual framework, scholars have also explored how specific user interactions are designed in line with these gendered representations. For instance, in an historical study that compared Philips men's and women's shavers, van Oost (2003) revealed how designers' assumptions regarding what men and women users expect from a shaver have materialized into two distinct product categories. Both the technology and the practice of shaving were emphasized in men's shavers, which evolved into devices where internal technologies were visible and accessible. The same qualities were masked in Ladyshavers by, for example, eliminating visible screws, using perfume to disguise the smell of oil, and providing a case that helped the women store their shavers discreetly.

A recent paper on the gendering of fountain pens takes the examination of the interactional aspects further, and studies men's and women's pens within the specific context of the office (Kaygan, Kaygan, and Demir 2019). Accordingly, fountain pens that represent the hegemonic executive masculinity in the office are intimately linked to a network of men's status objects, i.e. suits and accessories. Fountain pens that are designed for women, as well as those for other, subordinate masculinities, are "lesser" pens in the sense of product style and price as well as how their users display and carry their pens without a suit. The study thus represents a step beyond dualistic analyses of gendering of products (masculine/men's products vs. feminine/women's products).

Thinking in terms of Sandra Harding's (1986) gender triad, we conclude that existing research in social sciences deals with gendering by design either (1) on a "symbolic" dimension, e.g.

through the attribution of gender dualisms to anticipated users (men/women) and products themselves (masculine/feminine) or (2) on a “structural” dimension, by defining the purpose and context of use in line with gender roles and divisions prevalent in society. Harding’s (3) “individual”, or rather “interactional”, dimension remains understudied. We claim and demonstrate in this study that this dimension is particularly important when applied to the use of products. Acknowledging the interactional dimension requires asking how users deal with gender dualisms and divisions in actual use settings. This demands extending the focus beyond gendered associations in the market from the viewpoint of the designer and marketer, towards users’ actual gendered interactions with products, as we do in this article.

The point of Harding’s theory of gender triad is that an adequate analysis of gender should recognize that gendered social life is produced through gendering in all three dimensions. For our research, it is particularly instrumental since, unlike existing studies, we examine a product category, public transportation, that is not explicitly gendered in either symbolic or structural terms by design. In other words, design of public transport vehicles and services do not address women as the primary target user group (as it is, for example, in household appliances), even though women constitute the largest share of public transport users around the world, and there is extensive evidence on the urgent need for improving women’s safety in public transport (Allen 2018). Instead, public transportation appears as a product category for “everyone”, designed as gender-blind.

In this research, we explore the case of public transportation with a focus on vehicle interiors in order to answer the following question: How do designed elements of the vehicle interiors in public transportation mediate women passengers’ gendered experiences? By “mediation” we refer to the ways in which the products play a part in shaping their users’ experiences (Verbeek 2005; see Latour 1999; 2005). Our approach to the gendered experiences of public transportation in this paper, including our conception of “mediation”, also takes cues from mobilities design research. In this literature transportation structures are considered complex assemblages that link such diverse elements as human beings, products, technologies, semiotic codes, as well as rules and norms. These assemblages then mediate the experiences of human bodies in motion (Jensen 2013). The concept of affordance (Gibson 1986) is a key aspect of such mediation: Passengers navigate the material, virtual, social and cultural environments provided by these assemblages, “working hard to orient [themselves], make complex decisions and interpret the motives and intentions of other bodies” (Jensen 2013, 120). In these, our interest lies in gendering, and specifically the gendered interactions that these designed objects and systems afford their users.

Setting the research context

Literature documents that women face sexual harassment widely while using public space in general, and public transport in particular, both in the contexts of developing and developed countries. Studies include Latin America, Western Europe, Southern Asia, North America and the Middle East (Allen 2018, 15; Drăguțescu, Land, and Meskovic 2020; Arjmand 2017; Gardner et al. 2017; Madan and Nalla 2015; Loukaitou-Sideris 2016). Common threads in these studies include women's concerns of increased risk of harassment in both overcrowded and empty carriages, both by drivers and other passengers, as well as in transport connections. These concerns influence women's mobility-related choices, from everyday decisions regarding route, time and duration of travel to the choice of workplace, thus limiting women's freedom of movement (Allen 2018; Ramboll Smart Mobility 2021).

The literature also calls our attention to the fact that women across the world adopt identical strategies of self-protection: avoidance by changing clothes, adopting unapproachable expressions, travelling with others, selecting seats, routes or modes of transport as required, showing verbal and physical resistance, and reporting (Lea et al. 2017; Quinones 2020). For instance, according to a recent report of Ramboll Smart Mobility (2021, 33), women in Germany travelling at night on public transport are likely to 'prefer sitting close to a driver in a bus' in order to avoid getting bothered by men.

Turkish context offers an instance of the global context but with unique characteristics. Hundreds of sexual harassment cases in public transport are reported each year in Turkey (Durmuş 2013; Hanözü et al. 2015). University student Özgecan Aslan, who was killed while resisting rape by a minibus driver in 2015, is a recent case that resulted in public outcry (Kandiyoti 2016). In Ankara, where our fieldwork is based, a quantitative survey in 2017 has demonstrated the impact of transportation problems on social exclusion issues, not least based on gender. Due to the limited coverage of underground and rail systems, public transportation is largely based on buses and minibuses (Özkazanç and Sönmez 2017). In addition to public buses, these include privately owned buses as well as minibuses ('*dolmuş*' in Turkish), which are faster, but more costly, less dependable and less secure due to their informal and under-regulated character (Oğuz 2020). The problems posed by the coverage and character of public transportation limits its use for sociocultural activities, and relegates it to mandatory travel such as school and work while boosting private car ownership for those who can afford it (Özkazanç and Sönmez 2017).

While the problems that women encounter in public transportation have received considerable attention from feminist scholars in social sciences, only in few studies do we see any mention of design, and those are indirect. These include recommendations for improving the physical conditions of railways stations, such as increased visibility, comfort and monitoring; offering women-only carriages, seats and doors; and developing emergency help systems (Allen 2018;

XYX Lab n.d.). Despite utilizing actual bus interior plans and IDEO's design thinking tools in the workshops they conducted with users, Rivadeneyra et al. (2015) suggest communication campaigns for raising awareness and technological systems for reporting offenses. Thus, to our best knowledge, this is the first study that adopts a gender lens to examine the interiors of public transportation vehicles from a design perspective, with an eye to capturing feminist design intervention opportunities. Doing this, we aim to shed fresh light on women's problems in public transportation with specific reference to the affordances of the physical design elements in the vehicles, which have the potential of being redesigned to offer more gender-inclusive public transport solutions.

Research methodology

The methodology of our study is based on feminist standpoint theory. According to this, experience is a principal tool for accessing the knowledge of the oppressed, in opposition to a knowledge that is androcentric and ignores the experiences of women (Smith 2004; Hartsock 2004). Therefore, the feminist standpoint theory focuses on the daily experiences of women to constitute them as subjects of knowledge (Smith 2004).

Interviewing is a crucial method for feminist research as it "gives voice" to those participating in the research (Sprague 2005, 120). In order to reveal diverse experiences of women living in Ankara, semi-structured interviews were conducted with 32 women users under three categories based on their relationships with public transportation at different hours of the day:

- 10 domestic workers travelling from working-class neighbourhoods to more affluent neighbourhoods where they provide cleaning or infant-care services. These users spend long hours in transit and switch means of transport.
- 12 women university students commuting between university campuses and the city centre. These users often travel at night, e.g. after drinks.
- 10 women who are 65 or older who can travel free on public transportation except rush hours.

In order to recruit participants, we both posted invitations on social media and adopted specific strategies for each group. For the second category, we contacted our students to ask if they could share the invitation within their friend groups. University students responded promptly and were eager to relate their experiences. Finding participants from the first category was demanding due to the sensitivity of the topic. We contacted our personal contacts who employed domestic workers for cleaning and childcare and used them as gatekeepers. Most workers, however, had reservations about sharing their experiences with us, two middle-class women whom they did not know personally. Once we found a few participants, we resorted to snowball sampling. Those participants that we established rapport with, provided us with the

contact information for their acquaintances who were also domestic workers. Finding participants for the third category was also difficult, since during the COVID pandemic, many elderly women we approached had anxieties. Approaching our colleagues whose families live in Ankara, we could get access to their parents' neighbours and relatives. In this group, too, snowballing worked as a second sampling strategy.

Despite the difficulties, we ensured diversity across three categories in terms of the neighbourhoods where the women live, and the routes and modes of transport they frequently use. We did not employ snowballing in cases where it would lead to more participants with similar profiles, such as next-door neighbours or friends using the same route. As a result, our 32 participants travel from 24 different neighbourhoods to 27 different neighbourhoods, covering six of the eight central districts of Ankara (Etimesgut, Çankaya, Yenimahalle, Altındağ, Mamak, Keçiören).

The research comprised open-ended and semi-structured interviews, which took approximately an hour. At these interviews we explored the women's interactions with the vehicles as passengers, with other passengers, and with drivers. After the questions on demographics, the first part of the interview focused on their travel routines, while the second part turned to their daily experiences from the moment that they leave home to the moment they arrive at their destination. The last part of the interview included questions on being a woman in public transport. The interview guide included questions on how and with which concerns women choose their mode of transport (bus, underground, minibus, etc.), how they describe their journey, and to what extent they interact with the driver and other passengers. In the interviews we deliberately avoided mentioning harassment, assault or safety in order not to impose these concerns on the participants. Regardless, such concerns dominated their accounts when they reflected on how women's experiences differ from men's in public transport. In the context of public transport, gendered experiences emerge predominantly as being exposed to or feeling an immediate risk of sexual harassment.

Although we had a question in the last part that explicitly asks how and to what extent they consider the design of the vehicle interior relevant to their gendered experiences, most of the data regarding this relationship came from their detailed descriptions of their daily travel routines in the second part of the interview. Here they provided detailed descriptions of, for instance, how they choose a seat, where they choose to stand, etc. We probed such descriptions by "why" and "how" questions to generate in-depth data on their preferences and concerns regarding the interactions that are afforded by the elements of the vehicle interiors.

All interviews were transcribed verbatim and transcriptions were thematically coded via MAXQDA 2020 analysis software. Thematic coding was conducted in three cycles. In the first

cycle, the first and third authors of this article separately coded the selected six interviews, then discussed the results until they reached inter-coder agreement (Campbell et al., 2013). In the first cycle, our aim was to identify the types of gendered *problems* (lack of personal space, physical contact, dangerous and fast driving, feeling unsafe etc.), adopted *strategies* (sitting next to a woman, sitting in a high seat, looking out of the window, wearing headphones etc.), and the relationship between these and the *elements of the vehicle interiors* (seats, windows, doors etc.). The second cycle started after the two researchers agreed on the structure of the code tree, thereby lifting the analysis to an analytical level by identifying the similarities among the accounts of the women from three different groups. In the third cycle, with the involvement of the third researcher, the second author, the codes were developed into themes with reference to our conceptual framework. These themes are presented in the below sections of analysis.

While taking experience as a ground of knowledge, the feminist standpoint theory does not claim that all women share the same experiences. Instead, it underlines the intersectionality of experiences. Due to the diversity in women's experiences and power relations between women, all knowledge claims asserted from a feminist standpoint are always situational, locational, partial and conditional (Ramazanoğlu and Holland 2002). Within this methodological view, we sought to identify not only commonalities but also differences in the experiences of women as gender is intersected by class and age by interviewing domestic workers, university students and elderly women. In the analysis, however, we did not encounter significant category-based differences that would encourage us to present them separately or in contrast with one another. For example, it was surprising for us to see that regardless of their class and age, almost all our participants voiced concerns against segregated modes of transport such as “pink buses”, defining such segregating proposals as part of the problem, as they strengthen the conservative notion that women and men cannot safely share the public space. Moreover, elderly women (in both the first and the third categories), who did not feel the risk of harassment as strongly as the younger participants, still talked about their experiences of fear and actual harassment with reference to their past experiences. As we present below, they also considered themselves in a powerful position due to their age, which encouraged them to intervene when they witness harassment in the public domain.

Although in-depth interviewing is the most common method used in feminist research to reveal women's experiences, it offered some limitations. Due to the restrictions of the COVID-19 pandemic, we conducted online interviews with our participants, which hindered us to practice participant observations in the vehicle setting. As a solution to this limitation, during the interviews we encouraged our participants to make detailed descriptions, or even simple sketches, of the physical environment they mentioned.

Gendered affordances in the vehicle

In the first section of analysis, our focus will be on itemizing the ways in which various designed elements of the vehicle contribute to women passengers' gendered experiences. We show that the designed environment affords unsolicited, inappropriate interactions in certain ways that pose threat to women's safety and wellbeing when taken advantage by men. We discuss them in two parts: physical contact and lines of sight.

Physical contact

Cases of harassment in public transport that were described by our participants, range from inappropriate touch to sexual rubbing. These can take place while seated side by side, typically when a man spreads his legs and/or sidles in close to the woman's seat, making sustained or intermittent physical contact with the woman with his hand or leg. In other cases, it might be a man standing next to a sitting woman. Seat design and plan can exacerbate risks. Harassments often take place in double seats with narrow leg room, which afford little public visibility. It is also common there for men to initiate insistent flirting despite explicit disinterest, which can lead to stalking once the woman is off the vehicle.

Large, underdefined spaces reserved for standing passengers are another important point of gendered contact. In crowded vehicles, passengers share a limited standing room, with access to few straps, bars and poles. During the interviews, some participants questioned the multipurpose design of such standing supports, reflecting on how awkward it is to hold on to a handle behind a sitting passenger's head, or a bar that someone else is leaning against. Others can then take advantage of the lack of predefined personal space around the support as the following quote illustrates:

I had rested my elbow on a bar, and he was making it as if he was holding the handle, but really he was caressing my elbow. So as soon as a seat emptied, I went and sat between two people. That's how I got away. But then when I was getting off the bus, he was waiting by the door and I was afraid that he'd follow me.

When crowded, these spaces, together with paths that passengers follow to move around the vehicle such as corridors, also provide opportunities of sexual assault such as rubbing and groping. It is important to underline that the assaults rely on the self-doubt of the victims as well as the onlookers, who then hesitate to speak out: Did he really touch me, or was it by accident? Such an ambiguous environment is created by crowded vehicles as well as rapid acceleration and deceleration by private-bus and minibus drivers trying to maximize their profits. Here, the "mobility assemblages" (Jensen 2013), and in our case specifically the design

of the vehicle interiors, mismanage crowds, so that a sudden brake or the shove of a crowd translates accident into an assault, and more importantly, disguises assault as accident.

Lines of sight

In addition to inappropriate touch, a second set of issues indicated by our participants were about stares. While our points above mostly regard how the vehicle arranges the movement of bodies in proximity, the problem of stares regards how lines of sight are distributed inside the vehicle by the design of the interior space. We have already showed that visibility matters, since blind spots created by crowds or by isolated sitting arrangements afford harassment. However, high visibility and the unwanted attention it brings can also become a matter of concern for women in transport. Case in point is the seating arrangements that are typical in underground trains, where seats are placed with their back to windows along the vehicle:

Those standing places are very annoying. It's about the design of the seats. The seats are [placed] in a way that makes people look one another in the face, you know, opposite one another. Anyone standing in the middle is caught between both the person on the right seat and the one on the left seat. They can examine [her] as much as they want!

Our participants often cited lack of scenery in underground trains as a further factor that directs one's attention to other passengers. Here, it is not only being looked at that is perceived as a potential problem, but also looking at others. Women reported that it is also uncomfortable to sit in face-to-face arrangements, since it can be difficult to avoid eye contact. One may want to avoid eye contact because sometimes they simply do not want to annoy another person, and sometimes out of the fear that – in one participant's words – the man can “ascribe meaning to [...] an unintentional look” which can then “escalate to the risk of harassment”.

Placement of mirrors and cameras also seem to complicate visibility. This is particularly important in minibus and buses, where the driver can be perceived either as a threat or as security. The women told us stories of how drivers intervened in harassments that they witnessed through the mirror, such as by taking the vehicle to a police station or by taking the passenger off. In other cases, women conveyed their fear when left alone in the bus with a driver that kept looking at them in the mirror. The perception of the extent to which mirrors and cameras afford threat or security is shaped also by the travel time, since during late hours women feel more vulnerable due to the few numbers of passengers, especially women, in the vehicle.

To sum up, how vehicle design arranges bodies in proximity inside the vehicle and directs lines of sight in ways that make things visible or invisible, and meet gazes with bodies or with one another, have critical significance for women's gendered experiences. The design of the space,

as in the seating plan or the placement of mirrors, as well as the design of specific elements such as that of the standing supports have direct impact. The following two sections turn to women's strategies with emphasis on the social and material affordances of the mobility environment. The first of these describes the ways women navigate that environment and attempt to establish their personal space within it. The second reports the exit strategies, and puts particular stress on the role played by information and communication technologies (ICTs).

Personal space and command over interactions

The women's strategies start right from the selection of seat when they get on a vehicle. Single seats are the first preference for they let women sit alone. One participant commented: "When you get on a bus or minibus, you get tired in your body, but also in your brain. [...] Am I going to be harassed today? [...] But on a single seat I am peaceful." However, single seats are hard to come by. In that case, the women pay attention to choose seats away from individuals or groups of men that, they think, might pose a threat. Here the design of the seating plan is highly important, and frequent users seem to have a strong grasp of its affordances. Some women might prefer window seats so that they can avoid social interactions by looking out the window. Window seats are preferable also because women get uncomfortable that they are touched by standing passengers – which is also a problem with single seats. Some participants seem particularly fond of higher seats, for example those placed on wheel arches, where they are not level with the crotches of standing passengers. Another participant narrates that, during her night trips, she prefers seats "where no one would choose to sit", for example, "seats that are narrow because of the wheel arch".

If the women are unable to have sufficient control over potential social interactions, including both physical contact and lines of sight, they would rather stand. Similar to seating preferences, many participants could easily describe for us their favorite standing areas on the vehicles they commonly use. One example is as below:

When I am left standing, I try to reach a strategic location. For example in the bus, there is a space right next to the middle door, you know, I can rest my bag there, and— Actually I had talked about this with a friend: That location is very strategic for protecting from harassment. If you can get in there, you can relax, even if a little bit. I try not to be left in the middle of the vehicle, especially in a bus.

All such descriptions indicate that design of standing areas should prioritize providing participants with the opportunity to stand with their back safe against a corner, or at least a seat or a window. Without that, users improvise: A backpack turned towards the crowd is a tool for creating a personal space in an otherwise public, crowded transport. Alternatively, one can look out the window, have a book at hand, or listen to music through headphones. A virtual

personal space is thus constructed, with the additional effect that the woman looks more difficult to approach. Connected devices, especially mobile phones, are in this manner useful for managing to what extent one is private.

However, standing in a corner is not only about creating a comfortable space, nor just safeguards the woman's back as well as two sides, but also makes it possible to take a position with one's face towards the crowd, having command of the space and the actual and potential social interactions therein. It is important to underline that such preferences are less about comfort than risk management, making use of the designed affordances of the space for imposing control over an environment which they experience as risky:

How close someone is standing to you, I think, that's the biggest factor. I mean, you don't want him to be too close to you because he's himself adjusting how close he can get. You don't want to leave it to him; you want to be as far away as possible, because he can come and stand right at your feet or stand a little farther. I mean it is all up to him. Since it is so crowded, you cannot always ask someone to move a little further.

Lastly, our findings show that personal space is not always individual. We can talk about collective personal space when women who travel alone form a collective body with other women inside the vehicle, to sit or stand together in order to avoid or discourage physical contact. Women often find safer sitting or standing next to unknown women rather than men, or in the case of university students, sometimes with men from similar socioeconomic background and age group. Stories also mentioned how older women protect younger women by moving between a potential harasser and a younger woman, in the way of both stares and physical contact. Similarly, being in public transportation as a large group friends corresponds to creating their own space with more formidable boundaries. One participant explained why it is more comfortable to travel with friends by arguing that her "need to observe – like what can happen, who's standing next to me, what kind of a person he's –" gets less urgent, since in the vehicle "we create a space for ourselves, and it's like everybody surrounds one another".

Overall, we see that the interior of the vehicle is experienced by women users as a field of risk and opportunities that they need to safely navigate. They observe, perceive, and assess both the social and the material environment, then take necessary action to avoid potential or actual social interactions that involve the risk of sexual harassment. As in the previous section, here, too, the design of the vehicle interiors is central to experience. The space and the designed elements provide the women users with safe corners away from touch and vantage points over others, or else heighten the risks.

Exit strategies

In the previous section we discussed the different ways in which women navigate the mobility environment to prevent harassment and establish personal space. Part of risk management also requires them to have exit strategies. The most common strategy in this regard seems to sit or stand in a location that has easy access to a door. The need for an exit strategy heightens when women perceive themselves to be under immediate threat. In the following quote, a participant explains what she does when there is, in her example, a drunk person staring at her:

So if I have a backpack or something, I normally sit, like, I take my backpack on my lap, but I can also sit comfortably, I can even put it on the floor. I'd have my headphones on, there'd be music on, that's how I travel. But if there's [a risk], I take my headphones off, for example, I put my phone in my bag so that my hands are free, so that if something happens, I shouldn't have to think about it. I take my headphones off so that if I hear anything, I know what it is.

In such a situation, awareness of the surroundings becomes critical. This includes on the one hand social affordances such as knowing who is in the bus, what they are doing, and how they might behave. Another participant mentioned similarly that she would have headphones on only one ear when she is out at night so that she can hear others in the vehicle, and if possible, try to make conversation with someone else to find someone to support her.

On the other hand, there are the material affordances of the transit environment, including the design of the emergency doors and exits, readability and easy access to both the emergency controls and the exits themselves. The participant we quote above continues:

I imagine things like, if he approaches from the front, can I open the door, or how I would open the door... You can't help but think about things like that. [...] I mean, I don't know what I could hold and turn to open the door; I'm not sure about it. There's [a lever] on the top, I think, but I don't know if I can find that in that moment. Could it be closer to the door? Would I feel better that way?

To deal with the fear of being trapped in case of sexual harassment or attack, the women make abundant use of ICTs. In the previous section we argued that windows, books and ICTs can provide privacy during travel. ICTs also have the capacity to make one more public, rather than less. Phone calls, SMS messages, apps such as Whatsapp, etc. can be used to let one's current place and situation be known by acquaintances. GPS position can also be shared by women to communicate their location live. The following quote provides an instance where the woman uses her phone to become aware of the situation as well as to respond to it:

I got on the wrong bus. Some of them do go to Kızılay but some of them just go as far as Söğütözü. So this one was the one that went to Söğütözü, and the driver hadn't noticed me at the last stop, and he just went on to wherever he needs to go next. All this time I was listening to music and taking notes for myself. Then suddenly I notice that there's no one in the bus; it's only me, and according to the map we're not on route. That's when I thought, that's exactly what Özgecan [a student who had been raped and murdered by a minibus driver] experienced. Is it what's happening to me? Should I talk to the driver? Then I let my friends know, and sent my location. When I finally talked to the driver, he said he hadn't seen me. He dropped me off and indicated a bus for me to get on.

More than one participant told us that they had Whatsapp groups with either family or with woman friends where they posted information about their whereabouts: live GPS coordinates, plate number of the minibus or the taxi, or simply a note indicating what time they will be home. "Red button" apps, which allow one to call authorities with the press of a button, have been mentioned in passing, but no participant described using one. A further step can involve calling for someone to pick the woman up if she has reasonable fear of being followed after getting off the vehicle. Making real or fake phone calls is another widespread strategy that made our participants feel safer. Thus, even though mobile phones are not part of the designed elements of the vehicle, they do constitute a key part of the mobility environment. They are strongly integrated into women's strategies both to avoid unsolicited interactions, and to have access to others in case of emergency.

Concluding discussion

Our findings show that design of public transportation mediates gendered interactions between women and men, as passengers move along corridors together with or through crowds, placed across or next to one another standing or sitting, invited to hold, lean onto, look over and through the many interior elements. This mediation occurs via unsolicited and sometimes inappropriate interactions – specifically sexual advances and harassments that are afforded to a more or less extent by these spaces – as well as the strategies via which women take advantage of the affordances in the environment to assess, prepare for, control, avoid and react to potential or actual dangers. A summary of these gendered affordances can be provided below, together with related design considerations for transportation designers and manufacturers towards assessing and improving vehicle interiors for providing women users with safer travel experiences. It is important to note that these constitute an inventory of intervention opportunities, and further development and testing is required for developing reliable design criteria:

- Seat design, placement and height configure the *orientation and proximity* of a sitting passenger to sitting and standing passengers, and shape their *personal space*. Seating plans and seat designs can allow diverse opportunities to passengers in managing their physical relationship to others, and thus control over personal space.
- Seating plan and seat design can create *blind spots* that are not visible to other passengers and/or the driver, or they may create areas of high *visibility* and *attention* where lines of sight intersect. Potential design strategies can involve optimization of visibility inside the vehicles, as well as providing areas with differing levels of visibility.
- Standing plan and the design of bars and poles, can increase or mitigate *ambiguity*, especially in a crowded vehicle, which increases risks of sexual harassment.
- Certain arrangements such as corners afford passengers *command* over the space. Vehicle plan and the design of interior elements can prioritize providing as much such safe spots as possible.
- The vehicle and the environment may or may not afford *safe exit* in case of perceived emergency. Exits should be designed as easy to read, access and use. This concerns literal exits from the vehicle, as well as exits in an extended sense, including ways to change seats, move across the vehicle, alert others, the driver, or the authorities in case of distress.

In addition, two points below about ICTs regard not specifically the vehicle design, but are important in terms of the material affordances in the mobility environment. The overall design of vehicles and larger mobility systems can integrate ICTs for increased passenger safety against sexual harassment and attacks, in line with passengers' own strategies as below.

- Personal ICTs, especially mobile phones, play a significant role in managing how *publicly available* the woman is and feels.
- Personal ICTs are particularly critical for exit strategies in case of perceived danger, thanks to the *connectivity* they provide.

One major conclusion, therefore, is that the otherwise gender-blind scripts of the vehicles, still mediate gendered interactions between men and women, amplifying or reducing by their designs the risks of sexual harassment that women face in mobility environments. In more general terms, the specific ways in which designed products and spaces place their users in relation to one another, even when apparently gender-blind in their scripts, are, in reality, gendered since they do shape the gendered experiences of users.

As summarized above, gender scholars have provided significant evidence for the argument that products are gendered by design in a way that often conforms to and reinforces the prevalent power asymmetries between the masculine and the feminine as well as men and women in society. In these studies, the primary focus has been on gendering of products as men's and women's products. This gendering sometimes corresponds to separate market

categories (e.g. women's shavers vs. men's shavers), and sometimes happens more implicitly via designers' constructions of the skills and interests of the anticipated user (e.g. household technologies). In this study we shifted the object of exploration from categorically gendered products to a gender-neutral product that is publicly used by a broad range of users in age, gender and social class, and in different places of the city during various times of the day. This shift enabled us to move the focus of the analysis away from revealing the inscription of stereotypically dualistic gender symbols and structures into the products by designers and producers, toward the actual experiences of women in use and their everyday, creative, material engagements as they deal with gendered interactions, particularly of damaging nature, including sexual advances, harassment and assault. Current uses of gender script in literature fall short in taking such in-situ material interactions into consideration to the extent that, in line with the original definition of the concept of script by Akrich (1992), they deal with the question of which specific user roles and responsibilities are built into technologies and whether and how these are appropriated by their users. The user interactions that are not specifically intended by the designers and technology developers, therefore, remain out of scope. We argue that, for a comprehensive theorization of gendering of products by design, we need a more extended understanding of *gendered mediation*, which can also account for the gendered interactions products afford for their users.

A focus on gendered interactions, beyond symbols and structures, also resonates with feminist technology scholars' recent emphasis on material feminism, which has argued for incorporating materiality into studies of gender and technology (Barad 2003). Lagesen (2015) points out the fact that while several studies have provided a good understanding of how technologies are gendered via the association of technology with masculinity and men, the identified problems in design and use of technologies have not yet led to much feminist intervention in practice due to the lack of any inclusive strategies on initiating women-technology assemblages. This is aligned with our insistence that it is inadequate to study gendering of products from merely symbolic and structural dimensions of gender. As we listed above, an empirical analysis of women's material interactions with the vehicle interior and ICTs offers clearly delineated problem areas and intervention opportunities to relevant stakeholders, from policymakers to designers, technology developers to urban planners. As our findings showed, the gendered mediations of the designed, material environment of public transport is part of a comprehensive feminist solution. Feminist design interventions into mobility environments can provide immediate practical solutions that would be complementary to the policy and law making efforts that are necessary to ensure safety for women in public transport.

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