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“See the Place with Different Eyes”: Fostering Empathy by Communicating Spatial Experience

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ABSTRACT
Everything we do happens in the space around us. This is why understanding the human experience of space is a key research area in human-computer interaction. We explore how spaces can mediate an empathic response from their users. In our field study, participants used a mobile application to describe their experiences in different spaces. Subsequently, the experiences were shown to other participants to explore their empathic reactions in the same locations. We also conducted domain expert interviews to relate our findings to the practices of urban designers. Our results suggest that awareness of other people’s spatial experiences can foster empathy and that this is useful to designers but with certain reservations. We propose design guidelines for future applications that build on spatial empathy and propose a set of future research directions.

CCS CONCEPTS
• Human-centered computing → Empirical studies in HCI; Field studies; Collaborative and social computing systems and tools; • Applied computing → Architecture (buildings).

KEYWORDS
empathy, mobile applications, spatial experience

ACM Reference Format:

1 INTRODUCTION
The human experience of spaces is an important topic when technologies pervade public environments [23, 25, 28]. The nature of spaces informs every interaction that is suitable, or unsuitable, in the space, starting from the very mundane act of e.g., setting one’s smartphone to silent mode. Every moment of our lives happens somewhere, and such social interaction norms affect how spaces are used and how we perceive them [3, 23]. Even though the social effect of spaces has been long explored (see e.g. [3, 14, 23, 46]), we identify a research gap and an interesting opportunity to understand how spaces could be deliberately leveraged to foster empathy.

We present a study where we developed a mobile application GeoConno to gather experiences of spaces from users and subsequently present that information to other users in the same spaces. This way, the users of the application could share the felt human experience of the built environment to foster empathy. We also sought insights from urban designers, who are domain experts in using empathy in design practice. Based on our findings, we present guidelines for fostering spatial empathy using location-based multimedia content and suggest potential avenues for future research. Through our study, we aim to answer how multimedia can be leveraged to create more meaningful social interactions and foster empathy in public spaces.

In this pursuit, our work makes the following contributions:

• Adds to the understanding of how human spatial experience is affected socially and how it can be fostered with mobile tools
• Expands the theoretical understanding of spatial empathy with empirical research
• Contrasts the academic investigation of spatial empathy to the practical processes of domain experts

Analyzing our results, we confirmed that spatial experience can elicit empathy with personal experiences through contextual multimedia. Learning about others’ experiences of space in situ can subsequently change your experience of place as you empathize with others’ spatial experiences. Second, our participants and the domain experts indicated the need to have meaningful digital representations of spatial experience. In their practice with citizens, the designers found it beneficial to employ participatory methods to capture diverse experiences. As such, the experts’ tools for empathic inquiry need to be accordingly nuanced. Finally, our work contributes to the theorized connection between spatial experience and empathy.
2 RELATED WORK

The empathic effect of shared spatial experience is an underexplored topic and presents an opportunity for new insights. The primary related research stems from the separate accounts of spatial experience and empathy research, supplemented with knowledge from mobile tools for gathering spatial information.

2.1 Spatial Experience

In computing research, space and its relevance to humans has a relatively short but impactful history. In 1995, Kirsh [22] argued how spatial arrangements of our surroundings are an essential part of human intelligence. The management of objects and information is an integral part of the human capacity to perform more productively. The current understanding of space in computing is often contributed to Harrison and Dourish, who brought the notion of “place” to the discussion of collaborative computing systems [8, 15]. Their work was especially timely at the point when computers were limited in where they could be used. However, technology has permeated everyday spaces through the advancement of ubiquitous computing.

Through these considerations of space, there has been growing research interest in spatial experiences that clarify how various technologies are used or should be built with regard to space. Lentini and Decortis [28] studied what aspects of spatial experience are meaningful for developing technologies that are sensitive to their places. Notably, the paper proposes five interrelated dimensions essential for spatial experiences: geographical, sensorial, cultural, personal, and relational. Similarly, using the knowledge from the field of proxemics – the study of interpersonal distances – Krogh et al. [25] clarified how socio-spatial configurations affect the use of various technologies. Then, building on the notions of space and place, Scheuerman et al. [44] focused on how transfolk and people in vulnerable positions use space and how positions of power affect safety in these places. Focusing on the social aspects of spatial experience, Kirsh [23] argued that the interaction methods in architectural spaces are more complex than the ones used in human-computer interaction (HCI). In conclusion, he states that the modern HCI design is missing “empathy, shared understanding of momentary experience, shared valuation, a sense of place.” With crowdsourcing and field interviews, Paananen et al. [32] studied what aspects contribute to human scale spatial experience and how technologies could be developed in safety-aware manners. Finally, Liu et al. [29] elucidated how the context of our everyday situations affects the use of technologies and argued for a more nuanced understanding of people’s social and physical contexts. These pieces of research point toward a research trend that aims to understand how human existence is linked to spaces, situations, and contexts, as well as social interactions. Such contextual understanding of humans is pivotal in HCI [23].

Outside of computing, spatial experiences have been studied in fields such as anthropology [14], architecture [33], and philosophy [6, 11, 27, 46]. The notion of atmospheres – the vague, quasi-material sensed experience of a place – is a growing focus and even dubbed the “affective turn” in humanities [11]. In this vein, Trigg [46] argued how atmospheres could mediate emotion. This sharing of emotion is possible as public places serve as a common ground for experience. Recognizing and sharing a space’s present atmosphere is an integral part of spatial experience. In this way, the sense of togetherness is related to the pro-social behavior of empathy. In other words, the theoretical basis for empathy for spatial experiences exists, but empirical research is lacking.

2.2 Fostering Empathy

In HCI, there is a tradition of understanding the user and empathizing with them to understand their needs and experiences better [30]. However, it is also possible to develop systems that are meant to facilitate empathy, i.e., empathy tools (see, for example [16, 37]). Thus, the notions of “designing with empathy”, and “designing for empathy” are different concepts.

Empathy is commonly understood as the pro-social behavior that allows people to understand the experiences of others [10]. Empathy is typically divided into cognitive and affective components, allowing one to understand and feel others’ experiences. Empathy is also a personality trait affected by various factors. For instance, findings have suggested differences in empathic behavior between genders [38]. Further, as empathy is an interpersonal experience, aspects such as gender, race, and age can affect how people experience empathy. Elizabeth A. Segal et al. [10] earlier research has also identified how the differences in peoples’ empathic capabilities can lead to empathy gap, where empathy is biased towards people with whom you share something with [12].

There are different ways to measure empathy. The most often used research instruments are self-report surveys such as the Interpersonal Reactivity Index (IRI) and its more modern development, Questionnaire for Cognitive and Affective Empathy (QCAE) [10]. And as measures to understand empathy have progressed, so have the ways to attempt to manipulate it. Pratte et al. [37] surveyed empathy tools: technological instruments that could be used to evoke an empathic response in one way or another.

Finally, the term spatial empathy was first coined by Duarte and Pinheiro [9] to mean the process where the atmosphere of an environment elicits emotions in the person through empathy. Technology-wise, virtual reality has presented an effortless way to study spatial empathy. Using a virtual human, Boukricha et al. [4] developed a model for empathy informed by spatial distances. Further, Khadpe et al. [21] investigated online spaces with prosocial design elements that can benefit team skills.

2.3 Mobile Tools to Capture Spatial Information

While the research articles highlighted above contribute to a greater understanding of humans, spaces, and empathy, a wealth of research also uses mobile technologies to focus on socio-spatial experiences. Already in 2004, Paulos and Goodman [35] explored with mobile tools how the presence of unknown others – the Familiar Strangers – contributes to the social experience of public spaces. The authors recognized that “The very essence of place and community are being redefined by personal wireless digital tools that transcend traditional physical constraints of time and space” and called for further understanding of how technologies shape urban spaces. To build a sense of togetherness, Jú et al. [20] developed Social Network Service (SNS) to foster community empathy with place-dependent content. Rost et al. [41] used a mobile application to
understand how geotagged photographs affected the users’ sense of place. The findings suggest that an unfamiliar place warrants more exploration, whereas in familiar places, users focus on things that supported their previous experiences there. Related to familiarity, Papangelis et al. [34] used location-based mobile games to understand territoriality and sense of place. Their findings suggest that virtual game content can influence the perception of urban spaces and a sense of territoriality. Then, a recent study by Hirsch et al. [17] developed a location-based AR social network application that was focused on increasing socio-spatial connectedness. In a similar vein, Kostopoulou et al. [24] engaged the public to explore place-based digital heritage content using a mixed-reality application. The findings show that there is educational value in digitally mediated urban narratives, which can also promote sharing of this information through social encounters.

Mobile tools can help understand the experience of space. For instance, Sandstrom et al. [43] studied how a person’s emotional state was linked with their location, using situational questionnaires and Affect Grid, a 9-by-9 grid used to measure a person’s mood. By exploring how personality, context, and mood are linked, the authors make a case for using mobile tools to understand situational experiences. Hsu et al. [18] developed Smell Pittsburgh that engaged citizens to report odors around the city using a mobile application. The reports were publicly accessible and sent to the local authorities to promote community empowerment. The approach serves as a novel example of using human sensory capabilities for evaluating and understanding the sensory experience of spaces in the context of a mobile tool. And a specifically popular topic for mobile tools is the experience of safety, which has been explored in various ways, from safety report systems [36] to modeling safety [19], and to improve agency with a mobile application [2].

3 THE STUDY

3.1 Overview

We set out to foster empathy by communicating authentic spatial experiences of other people visiting the same space. To this end, we developed a mobile app (see Figure 2) to capture and showcase spatial experiences. We conducted a study where participants experienced spaces around the city, submitted their experiences through the app, and learned how others experienced the space. We also conducted follow-up interviews with the participants to understand better the process of sharing spatial information through a mobile solution. Finally, we interviewed three spatial design experts to understand how empathy is present in their work, if it is at all, and how our findings relate to their work.

3.2 Apparatus

While platforms such as Foursquare [47] have been employed for similar space-based research purposes, our current study design necessitated designing a custom mobile application. The mobile application GeoConno allowed for collecting spatial experiences from arbitrary locations in the city. The mobile application was developed with the Ionic 6 framework using the Google Firebase backend and built for Android. The familiar map-based applications inspired the application layout (e.g., Google Maps), where the main view presents an interactive map with a modal sheet for extra information, as shown in Figure 2. Allowing geolocation places a marker in the phone’s current location. Further, the application has a menu on the left that contains links for the map page, study information, and privacy description. The study information page explained the purpose of the study and had a button to contact the first author. The privacy page contained links to the privacy statement and contact information.

3.3 Study Design

We designed a user study with four phases, followed by domain expert interviews, as shown in Figure 1. The design allowed us to explore the role of shared personal experiences, investigate the felt empathy in the space, the changes in people’s own experience of space as a result of learning about others’ experiences, and the factors of spatial experience that might be useful in fostering empathy. Finally, we conducted interviews with spatial designers to understand how our findings relate to domain experts.

3.4 Questionnaires

We constructed questionnaires for each study stage to understand how the participants experienced the study locations and how other people’s responses affected them. The complete questionnaires are included in the Appendix A.

The background questionnaire contained participants’ age and gender as a number and open text responses, respectively. To understand their empathic background (personality trait), we used the 31-item Questionnaire for Cognitive and Affective Empathy (QCAE), which has been developed to assess a person’s characteristic cognitive and affective empathy [38]. The questionnaire has two components: cognitive (QCAE-CE) and affective empathy (QCAE-AE), ranging between 19 – 76 and 12 – 48, respectively. Adding the two components together produces the total empathy score (QCAE), which ranges from 31 to 124.
The first and second visits’ questionnaires focused on important aspects of participants’ experience of space: the experience of aesthetics and safety. The importance of the aesthetic experience of spaces has been researched extensively (e.g., [26, 27]), and safety is a critical component of spatial experience (e.g., [32]). The participants could rate the experienced safety and aesthetic experiences using a single 7-point Likert-style item, followed by an open-ended text field for more nuanced answers.

During the first visit, in addition to the aesthetics and safety metrics, we asked about the participant’s familiarity with a space on the first visit. Familiarity with a space affects how the space is perceived, e.g., through relationships with others [35], and perception of safety [45]. The participants could also write about their personal experiences of the spaces and take a photo of something relevant to the described experiences.

On the second visit, we asked if the participant’s experience had changed since their last visit, followed by repeated questions on safety and aesthetics. After this, other people’s experiences were shown to the participants (see Figure 2). After seeing others’ responses, we asked how well the participants understood others’ experiences and how much their experiences were to change. These Likert-style items were complemented with open-ended text fields.

3.5 Context and Locations

The study took place in Oulu, a city in Northern Finland with a population of around 200,000. We selected four locations with different characteristics to help the participants immerse themselves in various environments. We chose the locations because they are well-known spaces in the city for locals, their qualities such as openness and functionality, and a central location so that they are within comfortable walking distance from each other. The first author visited the spaces while testing the application and answering the questions, which took around 45 minutes to complete. These spaces are shown in Figure 3, and described as follows:

- **Market square:** A large square with a historical statue and a market hall from the 18th century. Hosts small vendors, cafes, and restaurants. Approximately 107m by 128m.
- **Small park:** A park with a lot of birch trees, a cafe, a small river, and a wooden bridge. Surrounded by apartment buildings, offices, and restaurants. Approximately 86m by 92m.
- **Large park:** A square park with a large open, paved area with benches and a playground. Surrounded by apartment buildings. Approximately 100m by 100m.
- **City center:** A paved pedestrian zone with a stage for performances and a famous local sculpture. Surrounded by offices and restaurants. Approximately 32m by 54m.

3.6 Participants

We recruited 13 participants using university mailing lists and flyers spread around the university to test the application for two weeks and to understand the topic in more detail with follow-up interviews. To run the study application, we limited the participants to people with Android smartphones. We compensated the participants with a 30€ gift card to a local grocery store chain.

The participants’ ages ranged from 20 to 44 years ($M = 24.0$, $SD = 4.2$), with 12 identifying as female and one as male. Their resulting QCAE scores ranged from 72 to 111 points ($M = 91.8$, $SD = 13.5$), where a higher score indicates more empathic traits.

3.7 Follow-up Interviews

We conducted semi-structured follow-up interviews with each participant ($N = 13$) to understand the participants’ experiences more thoroughly. We focused the interviews on four main themes: 1) The usefulness of the app itself for its intended purpose, 2) Understanding how the knowledge of others’ spatial experience can foster empathy, 3) How empathy towards others affects your own experience of space, and 4) What aspects of spatial experiences are the most salient in fostering empathy. We used the interview
structure described in Appendix B as well as the participants’ responses from the in-app questionnaires for findings that needed further clarification. The interviews were conducted by the first author either face to face or remotely with a video call, and they lasted between 23 and 38 minutes ($M = 33\text{min}, SD = 3\text{min}$). The interviews were audio recorded with the participant’s consent and further transcribed into text for analysis.

3.8 Data Analysis
The follow-up interviews were analyzed with reflexive thematic analysis, where the codes were generated inductively from the data [5]. The first and second authors familiarized themselves with the data and conducted two rounds of coding individually. After generating the codes, the codes were discussed and refined with the first and the second author. The first author then produced themes based on the codes and reviewed them with the second author. Finally, the first author further checked the codes and the themes against the responses from the in-app questionnaire questions C8 and C10 (see Appendix A) for completion.

3.9 Domain Expert Interviews
We conducted interviews with three domain experts (E1 – E3) to understand how spatial designers consider empathy and how our multimedia application and the results relate to their work. We asked them about their current design practices when working with users, how they understand them, what tools they use, and after presenting our findings from the user study, how our results are relevant to their work. The domain expert interview structure is described in Appendix C.

The first author contacted the experts through the authors’ networks and online searches, and their expertise is as follows: E1: urban designer and university teacher, 15 years of expertise; E2: participatory urban designer, seven years of experience; and E3: urban planner and university teacher, 15 years of expertise. E1 and E2 worked in private companies, and E3 in the public sector. The first author conducted the interviews remotely in Microsoft Teams, and they lasted around 46 minutes ($M = 46\text{min9s}, SD = 0\text{min27s}$).

Like in our user study, the interviews were audio recorded and transcribed by the first author. The first author extracted key points from the interview data and organized them using affinity diagramming. The results were summarized into three categories that describe their current methods of understanding, their position as a designer, and how empathy is part of understanding users.

4 RESULTS AND DATA ANALYSIS
4.1 Application Use
Based on the final interviews, the participants found the application easy to install and use. The application functioned successfully for the study, such as data collection and presenting others’ experiences, as shown in Figure 2. The participants felt that the app’s modalities were sufficient for expressing their views, whether with a numerical scale, text, or a photo.

The participants told us in the interviews that an option to record sounds would be an interesting possibility to explore. Further, some participants indicated that there were too many other people’s experiences depicted in the app. We consider these as future development ideas.

4.2 In-App Questionnaires
The in-app questionnaire items provided information on the participants’ context and experience of the spaces and served as the stimulus for understanding others’ experiences during the second visit. The results are described in the Table 1. On the first visit, we asked about the participants’ familiarity (B1), aesthetic pleasantness (B2), and experience of safety (B4) of the spaces. A Kruskal-Wallis test showed no significant statistical differences between spaces for any of these metrics. Most of the spaces were quite familiar to our participants, except the large park which was unfamiliar to some of the participants. The perception of aesthetics in Market Square differed from other spaces, which many attributed to the prominent construction site and the news coverage related to it. Notably, all of the spaces were experienced as relatively safe, with no negative responses.
In the second visit, we asked if the participant’s experiences of the spaces had changed between the visits (C1), along with their current experience of aesthetics (C3) and safety (C5). We can see that the experience of space between the visits was mostly the same. Further, the aesthetics and safety were experienced similarly to the first week.

Finally, after seeing other people’s experiences, we asked on a 7-point numerical scale how well the participants understood others’ experiences (C7) and if their experience of space changed (C9). On question C7, “In your own opinion, how well do you understand the experience of other people in this space?” (not at all well – extremely well), the participants felt they understood others’ experiences well, with a clear majority of the answers being positive. This was often attributed to the participants studying the experiences of others through the app, as discussed later in the qualitative analysis section. Item C9 was designed to capture people’s feelings about how their experience changes as a result of getting to know other people’s experiences of the spaces. Concerning this one, “If you would know how all other people experience this place, how much would your experience of this place would change?”, participants were more divided in their opinions.

### 4.3 The Relation of Spatial Experience and Empathy

By applying reflexive thematic analysis [5] to our qualitative interview data, we unfolded the most important ways in which people experience spaces. Further and most relevant to this research, we uncovered how spatial understanding could be shaped by empathizing with others.

#### 4.3.1 Spaces Are Experienced From the First Point of View

The participants brought up how they experience spaces in their unique ways. In this sense, there are no key informants for spatial experience, as everyone is always somewhere, but the personal perception and interaction with one’s environment are unique. The culture, person’s history, and personality all affect how they experience any given space. However, often we take spaces for granted without paying too much attention to the felt experience. Consider, for instance, the following:

“The study made me look at [the spaces] more carefully, because before the study I would just pass through and not pay a lot of attention to what the space is, and not even think about what this space makes me feel. They were just spaces without any emotion attached to them.”

(P2)

The participant clarified the personal connection further: “I feel that in those spaces – like memory, history, our familiarity – we mostly connect to what we did in that space, than what we saw.” (P2) Through such personal connections, spaces are made meaningful. Our results show that meaningful spaces are also seen as more aesthetically pleasing. P7 stated the following: “I recognize that when I have many experiences or nice experiences in a space, I probably find it more aesthetically pleasing, than the places I have no connection to.” (P7)

Participants also mentioned a need to have a first-hand experience of places before jumping to conclusions. When talking about the usefulness of learning about others’ experiences, P6 emphasized the following:

“No, I don’t think about [others’ experiences], just about my own experience. If you’re going somewhere to experience something, then you should focus on experiencing.”

(P6)

However, there exist apparent use cases for increased awareness about others’ first-hand experiences, as exemplified by P8: “I think it is useful, for instance, if I’m traveling to a place that’s new, but as I’m living here, I prefer to create my own impressions of a place.” (P8)

Some places are experienced more peripherally, e.g., on the route to work, while others are places people seek for the places’ sake. Besides having different purposes for experiencing these places, there are also different ways to experience them, which was brought up by P3 with regard to criticality:

“Also I began to wonder how critical I am, for example when asked about the aesthetics, like what is the perspective, should I evaluate it critically or what? And when someone says that the place is nice, I might agree and say yeah it is. So you compare your experience in that way. Your own experience changes in that way. Also, you begin to wonder like what should I compare [the places] to? For example, the [city center] which still has unfinished construction, do you compare it to a major city, like, should this place be nicer? So when there’s a feeling of community, you don’t need to be as critical about everything.”

(P3)

And so, we can see how spatial experience can move between the foreground and background perception and between different

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**Table 1: Results from the in-app questionnaires.**

<table>
<thead>
<tr>
<th>ID</th>
<th>Item</th>
<th>Small Park</th>
<th>Large Park</th>
<th>City Center</th>
<th>Market Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>Familiarity</td>
<td>5.5 ± 1.1</td>
<td>4.1 ± 1.7</td>
<td>6.2 ± 1.1</td>
<td>6.2 ± 1.1</td>
</tr>
<tr>
<td>B2</td>
<td>Aesthetics</td>
<td>5.2 ± 1.1</td>
<td>5.2 ± 0.9</td>
<td>5.5 ± 1.0</td>
<td>4.8 ± 1.4</td>
</tr>
<tr>
<td>B4</td>
<td>Safety</td>
<td>6.0 ± 0.7</td>
<td>5.5 ± 0.9</td>
<td>5.8 ± 0.7</td>
<td>6.0 ± 0.5</td>
</tr>
<tr>
<td>C1</td>
<td>Change from previous visit</td>
<td>2.8 ± 1.7</td>
<td>2.5 ± 1.5</td>
<td>2.2 ± 1.0</td>
<td>2.5 ± 1.6</td>
</tr>
<tr>
<td>C3</td>
<td>Aesthetics</td>
<td>4.8 ± 0.9</td>
<td>5.2 ± 0.6</td>
<td>5.2 ± 1.0</td>
<td>5.1 ± 1.0</td>
</tr>
<tr>
<td>C5</td>
<td>Safety</td>
<td>5.5 ± 1.3</td>
<td>5.3 ± 1.0</td>
<td>5.5 ± 0.8</td>
<td>5.8 ± 0.9</td>
</tr>
<tr>
<td>C7</td>
<td>Understanding others’ experiences</td>
<td>5.7 ± 5.9</td>
<td>5.1 ± 1.7</td>
<td>5.7 ± 1.7</td>
<td>5.9 ± 1.6</td>
</tr>
<tr>
<td>C9</td>
<td>Change in own spatial experience</td>
<td>3.5 ± 1.9</td>
<td>3.5 ± 1.7</td>
<td>3.5 ± 1.4</td>
<td>3.1 ± 1.6</td>
</tr>
</tbody>
</table>
levels of criticality. While these aspects are more related to the person perceiving the places, we can also think about the role of the place. P9 highlighted how an overpowering environment could take over your perception:

“But maybe in some extreme examples like if the atmosphere is really oppressive or difficult, it’s challenging to take others’ opinion then. But I don’t know how it would work in a public space, could it be like that.” (P9)

As the participant states, public spaces are rarely of this overpowering quality. These can be attributed to the common goals of urban design to make public locations enjoyable for the general public. However, a case can be made for more artistic approaches to spaces, where spatial experience is a medium that is experimented with.

While we chose aesthetics and safety as distinct aspects of spatial experience, we were surprised at how interconnected they are. The link between aesthetics and safety was most often present in the maintenance and care of different environments. Well-kept places also seemed safer, as some participants felt that trash is also a sign of people’s behavior. Also, the perception of aesthetics and safety of a place share a quality of staying in the background until something stands out. And so, these experiences are situation-dependent, as described by P7: “Because it’s a feeling which comes kind of naturally if you are somewhere, you feel safe, you don’t really think about it, you are just feeling safe.” (P7)

While some participants did not consider aesthetics too relevant to their life, almost everyone saw safety as important. For instance, P10 felt that safety was a major factor in choosing a place to live in:

“I feel I’ve chosen my place of study based on my feeling of safety. It’s safer here than in Helsinki. So it is a big thing.” (P10)

P1 explained that there are expectations on how some people experience spaces, and specifically, men are expected to feel safer, which informed the participants on the possible backgrounds of other participants:

“I kind of felt that there were clearly more men, due to the questions on safety, and there were people who had answered very highly on their perception of safety. So in current times it is still is so that men feel more safe.” (P1)

4.3.2 Sharing Spatial Experience as a Form of Empathy. Other people were essential in the experience of places in two critical ways. First, the presence of others improved the place’s liveliness and contributed to people’s safety. In these ways, the presence of others can foster empathy and perspective-taking in different ways. For example, “It’s a bit of a double-edged sword, people can affect positively or negatively” (P1). Some participants expressed that having people from many age groups is also beneficial for safety: “So to see people from different generations taking part and using the place, it gives me a sense of security.” (P8) Safety of a place is then partially social: “if something happens it’s good that there are other people around you” (P1). When talking about various spaces, nearly all participants mentioned how other people affect their experience of place in one way or another. Other people were especially relevant for a person’s perceived safety.

Second, we can recognize a few ways the information changes people’s experiences of places. When others’ experiences align with a person’s own experiences, they support them, like for P9: “Maybe it supported, like the others thought this way so it’s not such a dumb idea” (P9). The person can have opposing views. For instance, P1 generally felt less safe about places, which changed after seeing others’ experiences: “I hadn’t visited [the small park] often, so when others wrote that the place is now safe – especially after the café – it made me feel more positive towards the place.” (P1).

A statement brought up by P8 was especially at the core of empathy and shared experience of place that has been theorized in the literature. The information from other people about a place promoted a sense of togetherness:

“I think making some sort of imaginary bonding, in the sense that this other person thinks that, so maybe it makes sense what I’m thinking. Like maybe in this sense what I think, also makes sense to other people, as a collective. It’s not only an individual perception. It’s like a collective consciousness.” (P8)

The disparity between experiences was also related to how your experience is represented. One participant felt a conflict between their feelings and the scores others gave. In this case, the numerical scales were perceived linearly, where the extreme values regress towards the mean because of social conformity, as shown:

“It does kind of affect your own responses when you see how others respond. For example, if others gave really positive comments but you gave a 3 and other people gave a 7. So you wonder why I gave such a low score when others gave so high scores. So it does affect you.” (P12)

Further on, the participant went on to say:

“Yeah I felt that I should have answered more similarly to others. For example why I answered so negatively to some of the questions when everyone else was so positive.” (P12)

On a similar note, P13 learned from others how positive their responses were in comparison:

“Yes, I did change some of my views based on other people. Because when I read what people experienced, then I wondered why I only focused on the positive parts. People also mentioned the junk, the cigarettes and the trash. Like I also saw that but I didn’t mention it.” (P13)

The self-reflection the participants experienced brings nuance to how a person’s experience of space is partially socially created. It raises the question of how experiences are presented in data visualization: a numerical scale implies certain convergence, whereas text is less susceptible to it. Regressing to the mean also means that people who feel safe in a place are made feel less safe, which might not be optimal.

The social effect can come from different sources. In the context of education, P4 remarked how her parents maintained certain stereotypes which still affected her, despite cognitively being against them:

“Yes it affects, I’ve noticed that there’s stereotypes that have affected for a long time. And I try to think like it’s
the old way of thinking that your parents have taught you, but they’re not true anymore, so you need to learn away from it, like it shouldn’t be scary really.” (P4)

Finally, a person might learn about others’ experiences that they have not even considered. This was especially relevant for aesthetics, where participants noticed litter or cleanliness in different places. As so, empathy works to help understand how someone else experiences the world. For instance:

"when I was reading about [people’s experiences], I realized how differently people can see the places and what they pay attention to. So I realized you also see the place with different eyes.” (P9)

Also, P7 did find safety as a new aspect to focus on: “because I didn’t think about the safety aspect before that much”. However, participants found it also important to understand where the opinions of places are coming from:

“If their opinion is well told, I can think about it in another light. I can look at their opinion and step in their shoes, like how they see the situation, like I understand this point of view. But if the answers are short and not clear, you think that I don’t agree, or hold that opinion as mine, or can’t relate to it in any way. So I need that background or context for it.” (P4)

Further, the person’s familiarity with a place was seen as an aspect that can bring nuance to a person’s opinions:

“I think most of them have stayed here longer than me. That’s why they can have positive and negative aspects in their comments.” (P13)

As our participants were uniquely affected by others’ experiences, empathy is affected by its relational and situational nature. Experiencing empathy about spatial experiences is thus dependent on the lifeworlds of the self and the other.

4.3.3 Design, Maintenance, and Care Towards a Place Affects How It Is Perceived. Finally, participants found it important that the places they inhabit are cared for. This is seen in the design phases relevant to architecture, urban design, and planning, which are concrete ways to shape the urban environment. Further, the construction site at the market square and the various renovations brought up the value of maintenance. While the signs of upkeep were often aesthetically pleasing, the outcome of clean and organized places was appreciated, e.g., as described by P4: “Which also at the same time the city keeps care of itself and that it’s good to be in” (P4)

Many participants agreed that places should be designed to have some functional components so that there are things that you can do. This relates to the first theme, where places with relevant designs are also personally meaningful. P10 also recognized the need for accessibility, even though the topic was not personally relevant for her: “Well generally accessibility is important, it might mean a lot to someone that can they go somewhere if they have mobility or vision impairments.” (P10)

However, the quality of the architectural styles brought mixed responses. Some participants valued modern styles, some preferred older styles, and the mixture of these was also a point of personal opinion. Beyond architectural styles, participants also valued public art in their unique ways.

“Also in the Mannerheim park [Large park] there’s that statue, and also in the Toripollitii [Market square], these are things that add to the perception of the place if you know there’s some history to the place. So the culture makes the place more interesting.” (P7)

Few participants suggested the information is valuable for urban designers and planners, who can improve the experience of different places. For example “Maybe related to the safety for the city administrators and planners, like if there’s a place where people feel more unsafety than usual, so the urban design could focus on that with more policies, for instance.” (P3)

While the participants did not explicitly recognize this, the common urban planning procedures often use participatory methods. The human experience of urban places is relevant information for designers. Still, the information is not readily available, and an empathic design process requires an active approach to working with the users. With this in mind, we set out to interview architecture and urban design experts to understand how applicable our findings are.

4.4 Domain Expert Interviews

Through the three interviews with experts in urban design, we investigated how empathizing and interacting with users can support the design process. We summarize our findings with the following three categories:

4.4.1 Tools for Understanding Users’ Experience of Space. The experts employed different user research methods in their design work. The most used methods, such as interviews, surveys, and workshops, were also the most conventional ones that tackle different aspects of inquiry. The experts emphasized that the specific methods were chosen based on the needed information.

For instance, surveys were seen as useful but sub-optimal: “And we have seen that while the surveys are boring, they are useful to us.” (E1). E1 found surveys beneficial for providing data that are also actionable through visualizations. And further, the surveys can reach a wide audience, and the advertisement through channels like the city website, local newspapers, and radio advertisements were seen as relatively easy. However, for the topic of our inquiry, surveys might not be optimal: “But when you want to gather more experience-based knowledge, i.e., qualitative information, [surveys] do not apply well” (E2). As such, the choice of methods was important to understand the users in the necessary ways. Issues like sampling were also brought up, as the participants who engage in the participatory methods may not represent the resident population.

There were also some more applied approaches that the experts used. For instance, E1 and E2 used map-based questionnaire services that help to provide information about a certain place. However, these did not seem to be in great use, and E2 brought up how maps are often relatively rigid and do not facilitate asking the right questions. Further, E2 had used Relief Maps [39] in academic teaching to gather and visualize how a person’s experience of a place is intersectional: through the collection of gender, sexuality, ethnicity, class, and age.

Finally, while many of the methods were refined by the experts, they sometimes used systems other stakeholders provided. E1
shared how often the public systems do not have necessary options for interaction, leading to misguided participation:

“Also, sometimes cities have their own systems, which are basically without exception, not very good. They are mostly meant to show some material and to leave comments, and some poor city official has to respond to those comments, as the people answer to things that are not even related.” (E1).

4.4.2 Designer and the User in Participation. All experts felt that participation with the users could improve the design process. Informing users about development processes is mandated by law in Finland, but the approaches differ. In the public sector, E3 found that the current methods are rigid and that “we should make a difference between interaction and communication”. E1 brought up how citizens and designers are often oppositional when participation is conducted. Still, the core value and process of user participation were clear:

You first need to ask, and then you contribute with your expertise, and you pick up the best parts of both. And through dialogue like this, you should get the best outcome. (E1)

Our experts found it important to be in a mode where you’re sensitive towards perceiving your surroundings. This mode of deliberate perception differs from the usual way of experiencing spaces, which our study participants also recognized. We can see this kind of self-adjustment as a type of priming you see in other contexts. E1 explained this: “And if you ask things about spatial experience, or the questions are focused on it, and to make the person tuned into the mindset that they understand why these things are done, what questions should be answered and how.” (E1). For instance, interview methods often vouch for building rapport to ensure a shared context of meaning. Having a sphere of understanding can assist in sharing information that would otherwise not be possible. As so, building rapport and trust are necessary for sharing information.

4.4.3 Spatial Empathy at Play. Perhaps most interestingly, the subjective experience of space and its empathic dimensions were not immediately recognized as something often thought of. E1 considered that users understood spatial experiences mostly through their senses:

“But on the other hand, [the users] do pay attention to sensory experiences quite a lot. Often things like, how a place looks like. Which is often very much tied to how places feel like. And often a place is ugly, or it is horrible, run-down, or something like that.” (E1).

As we learned from the user interviews how personal spatial experiences are, the experts emphasized the value of understanding spaces through the eyes of others: “Maybe the point of the participatory design is that as there are many kinds of people and different needs, you should bring more people into the process so that you can consider that not everyone sees things the same way.” (E2).

Still, E3 raised a point about how people’s co-location itself is not a guarantee of spatial empathy: “As we think that everyone has a right to use the public space, the existence of the public sphere in itself develops the people’s understanding of the presence of others. Of course, it can come off as seeing other people as annoying or bad when they’re moving there.” (E3). As such, the setup presented in our study builds a case for fostering empathy through external tools. Like the participants in our study, the effects of social conformity were also recognized by E2: “So maybe if everyone repeats that a place is really negative, people like to fit in so you might agree as well, even though there’s no foundation for feeling that way, or haven’t been in that place before.” (E2)

5 DISCUSSION

Through the findings from our user study and domain expert interviews, we contextualize our work with a discussion on developing spatial empathy, its implications, and future potentials.

5.1 Designing for or with Empathy

Different aspects of empathy are employed by different people and for different purposes, e.g., designing for and with empathy. The traditional view to see empathy as a way to understand the user has the purpose of improving a designed artifact. Yet, how empathy is used in different design contexts varies. Sandman [42] proposed that architectural designers can use different “registers” of empathy – empathy from a distance, engaging empathy, and empathy in depth – in order to understand the users in nuanced ways and for different purposes. And so, our study is positioned as an approach to foster and facilitate these registers of empathy.

Our experts found it important to use empathy in the design process, but we argue that conventional methods may not be suitable for fostering empathy. As the person’s context is essential for fostering empathy, facilitating those in often-used surveys is left to the capabilities of the designers. Our results suggest that multimedia supports fostering empathy, and so we argue the tools for understanding should be equally multimodal when the aim is to understand the users. However, the experts saw value in conversations and other more non-linear forms of inquiry, which can help to understand others.

Besides the tools, we also suggest great value in fostering these interactions in relevant contexts. Our study design had users experience others’ experiences in their respective locations to retain the context, as it has been shown that situated content can enhance a sense of place [17]. We suggest that the added embodied context can help the design process. Put simply, co-location helps to understand where your opinions are coming from, and recognizing the experiences of others in a shared space builds common ground between people, as argued by Trigg [46]. Highlighting how human cognition is largely relational, Kirsh [23] emphasizes that co-presence is vital for making a shared understanding of other’s experiences. In this sense, a robust empathetic approach in design would necessitate working more closely in the users’ world and context. And so, in the process of empathizing others, it is relevant to consider who the designers and the participants are and to what extent they can understand others. Can this lead to situations where some necessary voices are left out?

We envision that future participatory design methods in fields concerned with spatial experience could begin to work in a more empathic way. Architecture and urban design are necessarily concerned with the production and experience of space, leading to a sensible application area for spatial empathy. Additionally, we
see how the application areas such as Human-Building Interaction and smart cities could benefit from a deeper understanding of the user’s context and a research focus towards "empathic cities" has been proposed to emphasize human well-being [1]. As public spaces are ever-changing, there is a requirement for interaction and participation. To this end, Crivellaro et al. [7] proposed that democratic participation in public spaces benefits from social togetherness and perspective-taking. In support of this, our experts felt that many current forms of public participation are rigid and lack the necessary interaction for meaningful participation.

5.2 (Re-)Presenting Spatial Experiences for Empathy

Our participants and experts identified various ways to represent spatial experiences. For example, the numerical ratings were easy to use, but they were also biased toward social conformity. On the one hand, it was clear that the app helped people understand others’ spatial experiences. On the other hand, seeing others’ responses makes you reconsider your own feelings, especially with the numeric ratings. The effects of social conformity in online settings have brought up insights into how users change their opinions towards the majority opinion [48]. Presenting a range of personal experiences can bring richness and depth to understanding a place, but it can also reinforce negative stereotypes of a place. For example, a map-based application that presents people’s experiences of safety in different places could emphasize that a place is subjectively experienced as unsafe and should be avoided. Further, sensitizing someone to experience certain qualities in a place can overemphasize perceptions of the place, creating a self-fulfilling prophecy.

A pervasive challenge in computing is its limited ability to process information that is not clearly defined. Computing systems leave out experiences that “do not compute” [31], which was also present in the modalities chosen for the mobile application. As such, our quantitative and qualitative responses capture only a part of those experiences. One approach has been to quantify or to "thicken" [11] the fuzzy aspects of the world, but this can be at odds with how attempting to computationally represent quasi-things like spatial experiences and atmospheres that are experientially real but not physically localizable. As such, we also see value in using methods that do not aim for quantification but rather work with the fuzziness of spatial experiences. For instance, the Relief Maps method [40] used different ways to represent spatial experiences without further defining them into more specific, computable categories. And so, these issues are at the core of computing systems: how do they represent aspects of the world that do not lend themselves well to quantifiable data? Misrepresenting or characterizing a place or someone’s experiences of it can lead to false understanding. We saw that personal aesthetic judgments, history, and outside knowledge can influence perceptions of places, especially in unfamiliar situations. Or as Griffio [11] put it: "wandering around in a church as if it was a mall". For instance, supporting our participants’ experiences were. Haines clarifies how aesthetics is used in HCI and brings up how personal aesthetic judgments are:

Nevertheless, there are no second-hand judgements of beauty. There is no way that you can argue me into a judgement that I have not made for myself, nor can I become an expert in beauty, simply by studying what others have said about beautiful objects, and without experiencing and judging for myself [13]

The participants in our study found that their perception of places can be affected, which in turn affects their aesthetic experience of places. The "second-hand judgements" stated by Haines are limited to consciously perceived phenomena, but attunement to perceive certain aspects of places is personal and – extending Haines’ statement – also socially informed. This suggests that spatial empathy warrants further research and expands how experiences of spaces are both personal and socially informed.

5.3 Guidelines for Designing for Spatial Empathy

Using the findings from the participants and the domain experts, we propose the following two guidelines that help to foster spatial empathy:

5.3.1 Wide Use of Multimedia. Experience of spaces is multimodal, sensory, and personal, necessitating multiple input and output modes to be used accordingly. Our participants and experts valued multimodal information. Furthermore, the multimedia needs to be contextualized appropriately to keep the experiences of spaces meaningful and relevant.

The participants found value in using the number scales, open text fields, and taking a photo through the application. On top of that, recording soundscapes was seen as an interesting possibility. Similarly, the experts saw value in a diverse set of information, although at the expense of more work required for analysis.

5.3.2 Maintain the Context of the Original. The participants valued knowing where other people’s experiences and opinions were coming from. This supports the idea that the questions need to be formulated to retain some background of users’ experiences. A person’s age was seen as one relevant piece of information.

And conversely, when presenting the users’ experiences to others, contextual information about a person’s background can help foster empathy. For instance, the experience of safety was seen to be affected by gender, so different people’s opinions can be relevant in different contexts.

5.4 Limitations and Future Work

Studying contextual phenomena such as empathy and spatial experiences is bound to have limitations. We acknowledge that we can make no universally generalizable statements about how spaces mediate empathy with our study design setup, our small sample size, and the gender distribution. Our participants had a mixed range of scores on the empathy questionnaire, and some participants also found themselves more affected by others’ experiences. Further research is needed to understand how these are connected. Our study also contained a limited number of relatively homogeneous spaces that were perceived similarly by the participants, and studying a broader set of spaces will be useful.

For future potential, we highlight two possible research opportunities. First, a study could map how spatial empathy is applicable across cultures. A large-scale crowdsourced survey on spatial
empathy could be used to understand what aspects of a person’s background are related to their shared experience of place. Second, an empathy application using immersive technologies can answer how digitally mediated information affects the experiences of real places and how extended reality experiences could focus on spatial empathy.

6 CONCLUSION

The spatial experience in our everyday spaces is a complex collection of personal, social, and cultural meanings. The research landscape is increasingly more concerned with the contextual and networked understanding of humans and theoretical literature has postulated how the experience of space can elicit empathy. To address this gap and to point towards empirical research in spatial empathy, we conducted an in-situ study on the social effects of spatial experience, using mobile tools for inquiry. Through user testing and follow-up interviews, we developed three themes that describe what affects spatial empathy between people. Subsequently, we conducted three expert interviews that clarified that spatial empathy requires suitable context and multimedia to be meaningfully applied in participatory design processes. Our research helps to bring empirical understanding into the much-theorized notions of socially affective experience of space. We suggest that the current research into the experience of space could benefit from further qualitative research to understand the role of empathy in shared meanings of space, and developing interactive applications could showcase how multimodal systems could foster spatial empathy.

ACKNOWLEDGMENTS

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REFERENCES

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<td>Numerical scale 1-4 (1 not at all – 4 extremely much)</td>
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<td>Numerical scale 1-7 (1 not at all familiar – 7 extremely familiar)</td>
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<td>B2</td>
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<td>Numerical scale 1-7 (1 not at all pleasing – 7 extremely pleasing)</td>
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<td>B3</td>
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<td>Open-ended text</td>
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<td>B4</td>
<td>How safe do you find this place generally?</td>
<td>Numerical scale 1-7 (1 not at all safe – 7 extremely safe)</td>
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<td>Image</td>
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<td>C1</td>
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<td>C2</td>
<td>Please elaborate why</td>
<td>Open-ended text</td>
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<tr>
<td>C3</td>
<td>How aesthetically pleasing do you find this place?</td>
<td>Numerical scale 1-7 (1 not at all pleasing – 7 extremely pleasing)</td>
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<td>C4</td>
<td>Please describe what aspects contribute positively or negatively to your aesthetic experience of this place</td>
<td>Open-ended text</td>
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<td>C5</td>
<td>How safe do you find this place?</td>
<td>Numerical scale 1-7 (1 not at all safe – 7 extremely safe)</td>
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<td>In your own opinion, how well do you understand the experience of other people in this space?</td>
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<td>C8</td>
<td>Please elaborate why</td>
<td>Open-ended text</td>
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<tr>
<td>C9</td>
<td>If you would know how all other people experience this place, how much would your experience of this place would change?</td>
<td>Numerical scale 1-7 (1 not at all – 7 extremely much)</td>
</tr>
<tr>
<td>C10</td>
<td>Please elaborate why</td>
<td>Open-ended text</td>
</tr>
</tbody>
</table>

B FOLLOW-UP INTERVIEW STRUCTURE

(1) Study overall
- How did you feel about the study?
- How long have you lived in Oulu?

(2) GeoConnex (application use)
- How did you feel about the application?
- Were there any issues?
- Do you feel you were able to express your experiences of places through the application?
- In what contexts would you see this kind of application being useful?

(3) Safety
- Do you often pay attention to your safety?
- Do you find that safety matters to you?
- What aspects contribute to your safety positively or negatively, in general?

(4) Aesthetics
- Do you often pay attention to aesthetics?
- Do you find that aesthetics matter to you?
- What kind of things you pay attention to in aesthetics?

(5) For each of the four locations
- Has your experience of the place changed? Why?
- Did you have previous knowledge about these places? Have you heard someone describe these places to you?
- Do you feel that you experienced the places differently between visits? How? Why?

(6) Spatial experience
- Has your attention to your spatial experience changed after the study? How? Why?
- We asked you about your perception of safety and aesthetic appreciation. Do you find there are other experiences of spaces that are important to you?
- What ways could your experience of place be changed?
- If you were to communicate these experiences to someone else, what would be the best way? What kinds of media would you use? Why?

(7) Empathy
- Have you found yourself thinking about other people’s experiences more after the study? How? Why?
- Can you remember something you learned about someone’s experience of a place? How did it affect you?
- Do you think these people were very similar to you (e.g., age, gender, family status) or very different from you?
- Do you think it affected your opinion? What if the person was very different/similar from you?
- Did you find their experience of the places was very different from yours? How did you feel about it?
- Would you like to know more about how other people experience the spaces you like/dislike or are familiar/unfamiliar?
- When would you like to know about others’ experiences of places?
- How would you like to know about these experiences?

(8) Concluding remarks
- Is there something else that I should have asked?

C DOMAIN EXPERT INTERVIEW STRUCTURE

(1) Expert background
- How many years of expertise you have?
- How would you describe your current position?

(2) Users and design
- When is it useful to take the users into account in design?
- How do you take the users into account in design?
- To what extent are the users part of the design process?

(3) Presenting the study
- What do you think about our study and the results?
- Are these in line or contradictory with your experiences?
- Do you find that there was something missing?

(4) Empathy
- Do you feel that your experience of a place changes through users?
- Do you find it easy or difficult to relate to users? When? Why?
- Does the participants background affect how easy it is to relate to them?

(5) Technology
- Do you use any tools to understand users? Why/why not? If yes, what kind of tools?
- What kinds of challenges are there for using technologies to understand users?

(6) Concluding remarks
- Is there something else that I should have asked?