Suggesting Pedestrian Experience Principles of the Mobility Handicapped

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ABSTRACT

The aim of this study is to establish pedestrian experience(PX) principles of the mobility handicapped. Due to the increasing attention to the pedestrian-friendly walking environment, walkability has been studied in the various field. However, walkability has been studied mainly in terms of ease and safety of walking although the walking environment has various functional aspects to a pedestrian as well as walking. It is difficult to reflect various experiences of the pedestrian as a concept of walkability. PX is a concept that expands the walkability to mirror diverse experiences of pedestrians. PX research needs to be given priority for those who often face with discomfort during walking. To constitute PX principles, we investigated which goals the existing studies set to design a pedestrian-friendly walking environment. The PX principles were supplemented by two methods; in-depth interview with the workers who works for the mobility handicapped and diary method with the mobility handicapped. The participants of in-depth interview worked for six types of the mobility handicapped; the visually impaired, hearing impaired, mentally handicapped, physically challenged, the aged, and a child. The types of those who participated in the diary method were the hearing impaired, mentally handicapped, physically challenged. Four PX principles and eighteen sub-principles were derived. PX principles we suggested would help to design walking environment for the pedestrian.

Keywords: Pedestrian experience, PX principles, walkability, the mobility handicapped, experience sampling

1. Introduction

The walking environment means the overall environment including the physical, sensory, and mental aspects affecting walking and other activities of pedestrians (Cho and Yoon, 2003). The walking environment has a variety of factors and spatial functions that affect pedestrians (Soria and Talavera, 2013).

A pedestrian-friendly walking environment has various aspects of effects on improving the residents’ quality of life with various factors and functions (Ewing et al., 2006). In social aspects, well-designed walking environment reduces the social cost of traffic accidents, noise, and air pollution and promotes the cohesion and vitality of the community. In individual aspects, people can promote physical and mental health by exercising and leisure through walking (Calvert, 2014).

Due to positive aspects of the pedestrian-friendly walking environment, the concept of walkability has been introduced into various research fields and has been utilized in the design process of an environment (Kaparias et al., 2012). Related studies have conducted in various fields such as traffic engineering, public health, urban engineering, environmental engineering, and ergonomics (Soria and Talavera, 2013).

The definition of walkability is not explicitly agreed among scholars, but generally refers to the degree of walking comfort of a walking environment for pedestrians (Park, 2008; Kari, 2016). Most existing studies on walkability have been focused on ease and safety of walk (Jaskiewicz, 2000; Landis et al., 2001; Ewing et al., 2006). Therefore, it is hard to understand pedestrian’s whole experience as well as walking.

In this study, pedestrian experience(PX), which is extended from the walkability, is suggested to consider
various activity in the walking environment. This paper defines PX as “pedestrian cognition, affect, behavior occurred from the interaction with a pedestrian passage and its' related environment.” In order for pedestrians to have a positive experience, walking environments should be designed in accordance with PX principles.

The study of pedestrian experience for the mobility handicapped needs to be prioritized. The people who need help on mobility are called the mobility handicapped such as the disabled, the aged, and children (MOLEG, 2016). The mobility handicapped has many difficulties in walking due to their physical and cognitive weakness. Therefore, the mobility handicapped goes out less frequently than the others (MOLIT, 2017). It is essential to identify the problems in the walking environment and find ways to solve them to improve their quality of life. To understand their experience deeply and widely, PX principles can be a standard of gathering experiences. In this study, we propose PX principles, which include the comprehensive experiences of the mobility handicapped based on the literature survey, in-depth interview, and diary method.

2. Draft of PX Principles

In order to propose a draft of PX principles, we collected and analyzed existing studies related to walkability and PX. Literature related to user experience(UX) was also collected to extend the scope of PX.

2.1 Method for Establishing Draft of PX Principles

The process for establishing a draft of PX principles consists of 1) collection of PX/UX literature, 2) collection of principles, 3) open card sorting and discussion. PX/UX literature in various types of documents was collected through google scholar. Walkability, walkable area, and pedestrian experience are keywords for PX literature and user experience, quality of experience, and usability for UX literature.

Principles mentioned in the existing study were collected. In the case of UX literature, research subjects are specific products or services such as mobile devices and software applications. This is somewhat different from the walking situation that PX is targeted. Therefore, we modified terms and definitions of UX principles to apply to the walking situation. UX principle that is not applicable to the walking situation was eliminated. Draft of PX principles was established through the open card sorting and discussion of UX experts using the collected principles.

2.2 Collected Literature

Twenty-five domestic and international literature related to PX were collected. The collected literature was based on various sources such as traffic engineering, ergonomics, environmental engineering, urban planning, public health, design, and psychology. PX researches have been conducted in a wide range of fields. We collected 220 domestic and international literature related to UX. The collected literature was based on the fields of marketing, business administration, computer science, psychology, ergonomics, and sociology.

Among the collected documents, only those documents clearly describing the definitions of each principle were chosen. As a result, seven articles of PX and 24 articles of UX were selected.

3. Refinement of PX Principles

PX principles were refined by conducting the in-depth interview and the diary method. We observed PX of the mobility handicapped in subjective and objective perspectives and they were reflected in PX principles by interviewing with the mobility handicapped and workers who are related to them.

3.1 In-depth interview

PX episodes of the mobility handicapped were gathered by in-depth interview with workers who are related to the mobility handicapped. By matching the collected episodes with PX principles, PX principles could be checked whether they comprehensively explain PX or not.

3.1.1 Participants

In this study, nine interviewers were recruited to cover various types of the mobility handicapped; visually impaired (3), mentally disabled (2), disabled (1), hearing impaired (1), elderly (1), and children (1). The average of worker's career was 4.33 years (SD 2.92 years), and each interview took about 1.5 hours.

3.1.2 Procedure
First, participants were informed of the background, the purpose of the experiment, and the concept of PX. The experiment was conducted in the form of a semi-structured interview because this experiment tried to identify and refine PX principles to cover overall experiences of the mobility handicapped. We not only tried to draw the experiences related to each principle by constructing interviews based on the PX principles, but also supplement the principles by letting the participants freely talk as much as possible. The participants were asked to explain the PX episodes of the mobility handicapped based on the specific physical and cognitive characteristics.

3.1.3 Results
As a result, 198 mentions were derived. episodes were categorized into 107 PX episodes and 91 noted items. PX episodes were matched to the corresponding PX principles. Two episodes were unmatched to PX principles. Unmatched PX episodes say, “If an animation character is drawn in a walking environment, a child might feel more familiar to the walking environment,” “When old songs come out of the street, the old might feel more familiar to the walking environment.” Although the episodes were closely related to “affect” of PX principles, they were not considered as a PX principle. These episodes were considered to add new PX principles through discussion.

3.2 Diary Method
Diary method is an experience sampling method by letting participants fill out their daily experiences on diary form (Jeong et al., 2015). Diary method can be used to collect diverse experiences that are not biased in comparison to other experience sampling method (Bolger et al., 2003). In this study, diary method was conducted to gather unbiased experiences, identify inclusiveness of PX principles, and fill the gap in PX principles.

3.2.1 Participants
A total of 27 participants were involved in the study. Three types of the mobility handicapped were recruited; the visually impaired, physically handicapped, and hearing impaired. The elderly, children, and the mentally handicapped were excluded because we judged that interviews with them are difficult. Even if participants are the same type of the mobility handicapped, it is concluded that the PX may be different depending on the severity of the weakness. Therefore, the partially sighted (4), blind (4), deaf (4), hard of hearing (4), the wheelchair users (5), and the cane or crutch users (6) participated. They were 13 men and 14 women, with an average age of 43.56 years (SD 7.62 years).

3.2.2 Procedure
First, we introduced the background and purpose of the experiment to the participants helping them to understand the experiment. In addition, we collected information about the walking pattern and the residential environment of the participants through the survey. We explained how to write diaries based on examples to the participants. After that, participants were asked to write a diary for practice so that participants could learn how to write a diary correctly. The participants wrote diaries for one week. The participants were asked to write a total of 14 diaries for one week; one positive and one negative experience per day at the end of each day. Diary form was developed based on the 5W1H so that participants can write their experiences in detail, and we can understand their episodes easily. Participants were provided appropriate experimental participants fees.

3.2.3 Results
As a result, 356 diaries (recovery rate: 94.18%) were collected. By matching the PX episodes collected from the diary method with PX principles, PX principles could be identified whether they comprehensively cover the overall PX of the mobility handicapped, and the deficiencies were improved. Among the collected episodes, a lot of episodes related to concessions and care of others were drawn such as “I was thankful for someone who lift my baggage when I was carrying a heavy baggage,” which was not included in PX principles.

3.3 PX principles
“Friendly” and “Consideration” were added as sub-principles to the affect and sociability through the discussion of UX experts based on the results of the in-depth interview and diary method. PX principles were revised and finally, four principles and eighteen sub-principles were defined (Table 1).

Walkability means the degree to which pedestrians can walk comfortably. Affect refers to emotions and images that pedestrians feel from the walking environment. Safety means the degree to which a pedestrian is not at risk.
Finally, sociability refers to the degree to which pedestrians meet the fundamental needs of social life.

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<tr>
<th>Walkability</th>
<th>Affect</th>
<th>Safety</th>
<th>Sociability</th>
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<tbody>
<tr>
<td>Accessibility</td>
<td>Pleasant</td>
<td>Public security</td>
<td>Equality</td>
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<tr>
<td>Efficiency</td>
<td>Friendly</td>
<td>Traffic safety</td>
<td>Consideration</td>
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<td>Informativeness</td>
<td>Neatness</td>
<td>Facility safety</td>
<td>Communication</td>
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<td>Flexibility</td>
<td>Stability</td>
<td>Public health</td>
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<td>Learnability</td>
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PX principles, we propose, differs from previous studies in that they cover not only pragmatic perspectives but also hedonic ones including affect and sociability as well as walkability and safety. In terms of walkability and safety, our principles deal with the more diverse viewpoint. While existing studies approach walkability in terms of efficiency and accessibility, this study divides walkability into five perspectives. Also, facility safety and public health have not been focused on the existing studies.

4. Conclusion

In this study, we propose PX principle to improve PX of the mobility handicapped. To do this, we surveyed the literature and conducted in-depth interview and diary method. This study emphasizes affect and sociability beyond the walkability and safety that are intensively studied in the existing walkability studies by presenting PX. It is significant that the researcher’s various perspectives to design a pedestrian-friendly walking environment are suggested. The PX principle proposed in this study reflects the PX of the mobility handicapped, so it can be used as a basic data for development of the index and guidelines for designing the pedestrian-friendly walking environment.

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