

Lived Experiences and Technology in the Design of Urban Nature Parks for Accessibility

Tiiu Poldma^{1,4}✉, H el ene Carbonneau², Sylvie Miaux²,
Barbara Mazer^{3,5}, Guylaine Le Dorze^{1,6,7}, Alexandra Gilbert²,
Zakia Hammouni^{1,6}, and Abdulkader El-Khatib^{1,6}

¹  cole de design, Universit e de Montr al, Montr al, Canada
{Tiiu.poldma, Guylaine.le.dorze, Zakia.hammouni}
@umontreal.ca, Abdulkader.elkhatib@gmail.com

² Department of Leisure, Culture and Tourism Studies,
Universit e du Qu ebec   Trois-Rivi eres, Trois-Rivi eres, Canada
{Helene.carbonneau, Sylvie.Miaux,
Alexandra.Gilbert}@uqtr.ca

³ School of Physical and Occupational Therapy,
McGill University, Montreal, Canada
Barbara.mazer@mcgill.ca

⁴ Centre for Interdisciplinary Research in Rehabilitation
of Greater Montreal - Centre de recherche IRGLM, Montr al, Canada

⁵ Centre for Interdisciplinary Research in Rehabilitation
of Greater Montreal- Jewish, Rehabilitation Hospital, Laval, Canada

⁶ Centre for Interdisciplinary Research in Rehabilitation of Greater Montreal,
Montr al, Canada

⁷ School of Speech-Language Pathology and Audiology,
Universit e de Montr al, Montr al, Canada

Abstract. This exploratory research project explores the mobility challenges of outdoor navigation and way-finding, through the lens of the person with a disability. Obstacles in social participation and human interaction with technology within the urban environment are salient issues driving this research study about mobility and accessibility when navigating urban parks. People with disabilities, specifically those with mobility limitations, such as people in motorized wheelchairs, have particular needs that must be addressed to maximize social participation within in the urban environment and involvement in leisure activities. This study examines the physical environment and social activities that occur in a typical leisure filled day at the park, what obstacles hamper navigation, and what issues emerge from the perspective of the person with the disability. The study data collection proceeds from a constructivist perspective using a participatory approach (Living Lab), wherein researchers and participants collaborated together to create the activity and also to assess its success post activity. Data collection tools included walkabouts, recording conversation in real time, and discussions both before and after the research activity. The study is presented with examples, and the emergent issues help reveal opportunities for potential ways to both respond to mobility challenges and integrate way-finding, as a means for future development of mobility and

navigational tools for better accessibility and enjoyment of social activities within the urban park environment.

Keywords: Accessibility · Way-finding · Inclusive environments · Urban nature parks · Navigational tools · Living labs · User experiences

1 Introduction

This exploratory research project looks at the obstacles in social participation, and how human interaction with technology within the urban environment has an impact on mobility and accessibility when navigating urban parks. Social participation is the key in activities such as leisure and people with disabilities, in particular those with limitations requiring navigation such as people in motorized wheelchairs, have particular needs that must be addressed to have access in the urban environment. Leisure activities are vital to social participation and quality of life. Too often, in urban city centers, parks are provided for able-bodied use with limited technological aids for people of different abilities.

In this paper, we present a current, ongoing research study that constructs how people with disabilities use and navigate parks for social activities and leisure, the challenge they encounter in terms of mobility challenges, what Human Computer Interaction (HCI) issues arise when navigating urban parklands and what solutions might be possible to enhance navigation and access to the parks and their various services. From a universal perspective, people with disabilities can benefit from urban parks as much as other citizens who frequent parks such as families with children or the elderly who might want to go to the park for leisure activities. Parks provide diverse activities to enhance both engagement with nature, as well as encourage social activities with others, as a means of supporting a more active everyday lifestyle (Poldma et al. 2014; Shikako-Thomas et al. 2008). For persons with disabilities, parks can be challenging, as what might seem easy to navigate, actually is complex for people, depending on their relative ability to navigate the park and its various features. In this research study, we investigated how the “Human Development Model - Disability Creation Process (HDM-DCP)” is applied when people engage together in leisure activities, and how to integrate both practices and devices that emerge from the research conducted. This paper proposes understanding the human needs, and provides prospective ways that navigation systems might be integrated into the user experiences of leisure through HCI tools. We will present how leisure activities can be enhanced for persons with disabilities, how social participation contributes to a more active lifestyle and what technological means might enhance leisure activity. We then present the ongoing research with a case study showing how these ideas are applied in a participatory action research project in an urban city park.

2 Background: Social Participation, Leisure, Inclusive Outdoor Experiences, and Navigation and Technological Aids for Accessibility

We explore these issues from the following perspectives: Social participation and active leisure, inclusive outdoor activities, and issues of mobility and technological integration (HCI integration).

2.1 Social Participation and an Active Lifestyle

Social participation manifests itself in 5 ways (1) Maintaining social relations as an individual; (2) Maintaining social relations in the context of a group; (3) Participation in collective activities (leisure, courses, conferences), (4) Doing organized or unorganized volunteer work; and (5) Engaging in socio-political causes (Raymond et al. 2008). Leisure activities include diverse practices that align cultural activities with physical activities and sports.

The latter are important for people with disabilities as they contribute to a more active lifestyle, and in particular, outdoor activities contribute to physical and mental well-being. Contact with people in outdoor activities plays a major role to prevent sedentary tendencies in society in general, and that is even more salient with people living with disabilities (Badia et al. 2013; Buttimer et Tierney 2005; Shikako-Thomas et al. 2008; Anderson et Heyne 2010). Furthermore, social contact alleviates a sense of powerlessness brought on by perceptions of alienation that can occur when people do not perceive themselves as part of a social reality (Hall 1981).

2.2 Inclusive Outdoor Experiences

While outdoor activities are a vital means to develop good physical and mental health, certain groups of people consider themselves excluded from these types of activities (Williams et al. 2004). In particular, persons with disabilities have more difficulties accessing outdoor activities outside of those offered by specialized centers, such as adaptive skiing for people with special needs, and what programs are offered for inclusive outdoor activities (Carbonneau et al. 2017; Freudenberg and Arlinghaus 2010; McAvoy). The outdoor setting plays an important role factor in the success of the outdoor activities and how these provide benefits for persons with disabilities, by providing a sense of pride, accomplishment and freedom. For example, in a study conducted within 15 different places such as ski clubs, sailing clubs, and provincial parks, the determinants of outdoor leisure experience aligned with specific sports such as swimming, cycling, etc. in the natural settings such as mountains, lakes, and forests and with adapted assistance (Carbonneau et al. 2017).

Furthermore, research on urban and outdoor environments show that how settings are conceived and designed affect how socially inclusive the spaces are as they receive participants (Lawton 1974; Dogu and Erkip 2000). An important aspect of the ability to enjoy the outdoors, for example, is how the activities evoke passion and pleasure while

in the activity for the person with a disability and their capacity to arrive and circulate socially. Furthermore, aside from the pleasure associated with being outdoors, the benefits of socialisation that accompany the activity reduce isolation (Sutherland and Stroot 2010) and enhance mental health (Wilson and Christensen 2012). Way-finding is a specific means to assist in grounding access and providing a means for such socialization, decrease disorientation and increase a sense of security (Dogu and Erkip 2000).

2.3 A Universal Design Approach and HCI Needs

A second issue is how easily an activity is accessible both physically and also in terms of the navigational aids available to the prospective leisure activity user. In this exploratory study we take a universal design approach that favors accessibility for all people in all types of situations (Mace 1997; Lidwell et al. 2003) and use HCI navigational tools. As disabilities vary in terms of scope and need, this has an impact on the nature of navigational aids and apps available for facilitating arrival and access to the leisure activities. People are able to navigate the urban park when their universal needs are met. When enhanced with HCI tools, this enhancement becomes positive (Lidwell et al. 2003). Studies show that when persons with disabilities are supported with universal accessible support in the form of navigational tools, whether physical or in the forms of apps, their capacity to positively enjoy the environment increases (Dogu and Erkip 2000). These issues have a direct impact on the capacity and persistence for the person with a disability in participating actively in the particular park or leisure activity. In this context, animation in terms of apps and adaptation, to aid in accessing the park, play a major role in providing optimal conditions for park access by the person with a disability.

3 Navigation and Technology Aides for Leisure Activities as a Means of Easing Way-Finding

There is a lack of literature and understanding about how the outdoor activity and its infrastructure affect the participation and the quality of the experience of the person with a disability, in terms of ease of navigation in urban parks. Way-finding is one way to facilitate how people navigate circulation paths and the various elements within the urban environment and offers a way to assist how a person makes decisions to go from one part of an environment to another. (Paul and Passini 2002; Lidwell et al. 2003). What way-finding markers assist in circulation and how navigational tools can provide clarity in how the way-finding occurs in an outdoor park are salient issues to be investigated. When way-finding is absent and cognitive mental maps are not available as part of the urban park experience, the very physical design of the urban park may hamper navigation and accessibility for persons with disabilities.

Issues such as the design of the park and the navigational tools provided in terms of access to the park with transport, access within the park and navigating the park using pathways and terrain that accommodates various needs are all factors to consider. It is thus vital to understand both the park and urban environment characteristics, the park

layouts and how they are designed, and what specific facilities are provided both physical and in terms of HCI navigational tools. (National Park Service 2015; Burns et al. 2009).

Finally, transport to and from the activity, and the park, are also factors that affect the quality of the experience. In urban parks the relative proximity of transport drop-offs and parking are features of importance and there is little understanding of these more personal needs of the person with a disability and their capacity to arrive and navigate with the park. A necessary and pertinent issue to understand is the navigation to and from the park, and how to develop specific activities accessible within urban parks (Fullerton 2003).

3.1 Experiencing the Outdoors in an Urban Park and How Social Factors Are Impacted by Environmental Factors

The experience of accessible outdoor activities in urban parks is tantalizing for persons with disabilities when they can arrive at the park with adaptive municipal transport services. Social participation as a component of this experience enhances the quality of the experience of citizens with disabilities and has been demonstrated as a factor in well-being. (Swaine et al. 2014; Poldma et al. 2014).

Social participation has a significant effect on environmental factors (RIPPH 2017). Studies show that social participation enables and enhances the quality of life of users within the environments that they do activities (Labbé et al. 2017). Social participation is also enhanced when environmental factors are considered as salient to social access (Poldma et al. 2014; Swaine et al. 2014). A deeper understanding of how environmental factors in an urban park is also necessary to understand how to maximize social participation, what role HCI factors play, and how socialization can be enhanced when considering the physical aspects of the environment. Environmental factors include the characteristics of the physical space, as well as the social and individual attitude towards a particular environment (OMS 2001; Poldma et al. 2014). In an urban park, the physical environment includes climactic, geographic and natural elements of the surrounding environment and the man-made, artificial and constructed features of urban parks.

The individual attitude towards the environment refers to the individual attitudes and capacities to situate themselves in the immediate environment. For a person with disabilities this is a salient feature of their capacity to navigate the spaces of urban cities in general, and urban parks in particular. The societal environment includes abstract features such as politics, procedures and community services of the society or of the culture within which the individual participates. The desire to maximize the ideal accessibility conditions of the outdoor experience for the person with disabilities depends on providing complete and appropriate infrastructure features that support access and that are able to assist in the full integration of the person within the urban park. HCI and apps are a means to accomplish these objectives and understanding the participants' individual and personal experience is vital for this purpose.

4 Methodological Overview and Objectives

This research study unfolds with two phases: (1) Activities that are documented in the situation of a leisure day out in the urban park, and (2) the analysis of what emerges from the data collected. The methodological approach is predicated on a constructivist approach, the Living Lab, wherein the researchers and participants participate together in the situation that is being studied, and the reality constructed reveals new insights into the issues facing persons with disabilities. Researchers and participants co-construct the issues of accessing and navigating the park together, first in a preparatory meeting and then in a leisure activity held at the park, including a picnic lunch and walkabouts. All participants participate collectively in the leisure experiences, and the researchers prepare the participants for the leisure activity in advance of the activity. During the walkabout, user conversations and observations in real time are documented to glean the park experiences first – hand and to understand the issues within the park hampering full inclusive leisure participation.

Specific objectives were to:

- (1) Understand the expectations and needs of the person with a disability regarding urban parks and outdoor activities;
- (2) Understand the inclusive outdoor park experience;
- (3) Identify the environmental factors that facilitate or limit the quality of the urban park outdoor experience;
- (4) Determine the environmental factors that facilitate access to urban parks, within the context of a Living Lab with park partners;
- (5) Document the actions that have effectively facilitated the accessibility to outdoor experiences in parks that assure an optimal outdoor experience for persons with disabilities.

A salient feature of these objectives is the ability of persons with disabilities to use HCI as a means to both access and use these urban park features.

4.1 Methodology

This research project is done within the framework of a participatory approach, within the Living Lab of the urban park. First, this qualitative approach is predicated on the «Living Lab» concept. Living labs are considered ideal mechanisms for studying in depth the persons' experience in real time. The Living Lab approach used here is done in an urban park, where participants and partner-collaborators collaborate with researchers in co-constructing the experiences. Leminen, Westerlund and Nyström (2012) define the approach as follows: «*Physical and other stakeholders, all collaborating for creation, prototyping, validating and testing of new technologies, services, products and systems in real life contexts*». The physical environment of the urban park is the place where all participants collaborate together to create and validate the activities and wherein the living lab, the lived experiences are accounted for. The services that are produced in a context of this real time environment are also at the basis of studying what supports experiences promoting pleasure and participation to the



Fig. 1. Views of the urban park with participants (Photo: courtesy Z. Hammouni)

fullest degree possible. The knowledge gleaned is co-constructed as researchers accompany the participants in leisure activities within the park that are planned in advance. Here in Fig. 1 we see the participants in the park as we toured in one of the case studies and that is presented in this paper:

Data collection proceeded using two tools. First, the experiences in the park are documented using the «Mobils» method (Murray 2009; Miaux 2007; Miaux et al. 2010). Mobils method is used to document the walkabouts in the urban park, the participant experiences and the determinant components of how the itinerary is experienced by the participants in real time (Miaux 2007). This data then informs the qualities and obstacles of the environment where people navigate. There are three stages that include: (1) Meeting the participants to discuss their concerns, desires, apprehensions and specific needs; (2) A visit using video camera, photo, and recording devices to capture the experiences «in-vivo», in real time within the urban park; and (3) a meeting post visit to talk about the experience.

Second, the physical features and characteristics of the outdoor visual environment and how activities are integrated physically and socially were documented using the Environment Quality and Satisfaction Tool (EQST) (Poldma 2007; Poldma et al. 2014). The EQST documents the physical, visual and activity characteristics of the physical site and throughout the walkabouts, the obstacles and features of the site during these activities, and how way-finding occurs. Photos are taken and integrated into the subsequent analysis. The EQST is used to permit the evaluation of the physical environment; circulation and way-finding paths are documented and the analysis of the features allow researchers to consider how the urban park and its features compliment, or hinder, the quality of the experience. Finally, using both tools researchers also document the inter-relations of the person with others in the park and their use of HCI to facilitate their journey.

Finally, the two data collection results were transcribed and brought together for two analyses. First, an interpretive analysis to consider what emerges from the data. The analysis proceeded with a culling of the emergent, salient themes from the data. Second, a Visual Content Analysis (Rose 2001; Poldma et al. 2014) was conducted to

evaluate the physical conditions of the site described in this study, as well as how circulation and way-finding occurred during the walk-about and leisure activities.

4.2 Sampling and Study Elements

This study was done in three locations; three different urban parks in various sized metropolitan centres. Both semi-urban and urban parks were selected in small, medium and larger metropolises. The sampling consisted of three urban park sites, with small participant numbers ($n = 6$ in small; $n = 5$ in medium and 6 in large parks) and included 2–4 research assistants and 3 of 4 co-investigators at each visit. The participants were people with disabilities of varying degrees and of different types, and this was done as a conscious choice, to provide the broadest cross-section possible of abilities and experiences. Characteristics of the participants included persons in motorized wheelchairs, persons with low vision or auditory impairments, persons with aphasia, and blind persons requiring guide dogs. In each case, the researchers accompanied the participants and were experts from rehabilitation or occupational therapy sciences. For the purposes of this paper, we present the emergent results of one of the case studies with visual and narrative examples.

5 Analysis of Preliminary Results: Constructing a Portrait of the Issues and Potential Solutions

In the analysis phase, initial results include several emergent issues and suggestions as offered by the participants. Given the constructive nature of the research, expression and discussion of ideas were encouraged as concerns arose. The analysis also included a visual content examination of the park's physical features and how the circulation and navigation occurred on site.

Participants spoke about having searched before the trip for information about the park, because they usually prepare a trip and identify the various accessibility features of the environment they will visit. However, participants had not found such information. During the park visit, participants identified the need for clear information on site, about the park's features in order to again plan and readjust the ongoing outing as needs arose (for example, location of toilets, of dog park, picnic area, etc.). Such information was not provided and affected their experience of the park. For example, the participant using an ordinary wheelchair had a long and tortuous journey, as well as difficulty navigating parts of the park that were not accessible in order to find the picnic area where other participants were having lunch. This anecdote was followed by many observations of the lack of way-finding sign posts to indicate pathways or directions. Clear visual maps and navigation tools for individuals with visual limitations in the form of apps provided both in advance or at the arrival of the park could facilitate navigation, exploration and satisfaction with the park experience.

Also noteworthy were difficulties in terms of physical accessibility, such as a complex system of fenced doors for entering and exiting the dog park, changes in the ground surface including rocks where cement sections ended, inclined sections on the

walkway. Another type of issue occurred where a feature was apparently accessible but was not in practice. For example, because a picnic table was a level up from the grass on a cement platform, it thus became inaccessible. In another example, at the children's playground, what appeared to researchers as "accessible" with even pathways to the play area, was not, as the people mobilizing in wheelchairs sank into the sand and had to deal with the concrete floor that was uneven underneath.

Aesthetic features such as the pagoda are there to encourage people to admire views and interact socially, and yet this feature was only accessible by stairs. This created a social separation and stigma for those who arrived with a wheelchair or a dog guide, and could not access the pagoda. Another aesthetic feature such as the lake area included a semi-circle of benches immobilized in cement without a section of space where a wheelchair could have backed in thus preventing one from enjoying the landscape and conversing about one's experience of the site with another non-wheelchair user, contributing again to the potential sense of exclusion one could feel (Fig. 2).



Fig. 2. A feature of the park (Photo : courtesy T. Poldma)

6 Discussion

The walkabouts and data analysis reveal that participant views on appropriate and useful navigation systems are vital for the development of both the physical and social nature of the urban park. The meetings with participants to discuss their concerns, desires, apprehensions and specific needs framed the visit beforehand, and the

post-visit meeting to discuss their perceptions and experiences after the activity, were vital for discovering the emergent issues.

Much of the discussion with participants about their views of issues and obstacles within the urban park experience centered around the lack of HCI integration to facilitate the navigation and accessibility features of the park. The addition of both apps and mobility navigation devices may enhance the park experience; however, without the integration of cognitive way-finding devices, such as maps, and social activities, such as having a picnic, the use of the apps and navigational devices is secondary. Of primary importance to the participants is the ability to pre-conceive their navigational pathways to and within the urban park, and then once there, use the navigational devices (HCI) and physical pathways and way-finding devices physically in place to move around and enjoy the park experience. However, with the features in the actual park such as the pagoda, eating areas and playgrounds, there is reason to believe that our participants' experience was not as pleasurable as it should have been. An app that could locate specific accessible spots for aesthetic experience and conversation could allow for the fulfillment of various needs that parks are assumed to satisfy.

Potential solutions are related to social participation, way-finding and navigational options and in particular, in terms of time and the overall visit experience. First, pre-visit participatory maps, apps and other assistive devices can facilitate the preparation for persons with disabilities. Second, way-finding apps and physical on-site way-finding benchmarks can be provided to facilitate the arrival and the activity itself. Finally, social participation can be enhanced with physical design elements that integrate activities for everyone, and by eliminating features in the urban park that create isolation and stigma. Hampering social participation are presumptions of solutions that are "accessible" and yet do not provide real access for the person with a disability, placing them into an uncomfortable situation of stigmatisation.

The documentation of both visual and verbal data in real time provided the researchers with rich and detailed data about the urban park walkabout and the outdoor activity experiences that were conducted on the three different sites. Each site had its particular characteristics and each group of participants had their particular needs. The analysis revealed how the physical features and characteristics of the outdoor visual environment provided either an obstacle or a support for certain social activities.

From the perspective of the participants, frustrations run high when (a) the access to information about an outdoor place is limited to only information provided to the general public; (b) when, upon arrival, way-finding and signage are unclear or absent in terms of providing cognitive navigational direction for the participant arriving on site, and when the physical conditions of the site hamper access, even with preparation and apps showing the way. For example, getting down a hill that was not part of the information provided, prevents people with wheelchairs accessing the social activity of a picnic as the hill was not part of the information that they received initially.

7 Conclusion

This exploratory study reveals the challenges of the people with disabilities when they attempt to navigate the outdoor environment and the mobility challenges that these produce. The results show that navigation systems and services would benefit from a closer integration of mobility apps, and how HCI offers a means to alleviate current mobility challenges and the information needed to access the urban park.

The urban Living Lab provided a rich experience for both participants and researchers to explore together issues of accessibility, what HCI solutions might be useful and how working together in experiencing a leisure activity forges new understanding about how to make the enjoyment of public parks easier for persons with disabilities and for everyone in an inclusive manner.

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