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# Assessing the Experience of People with Autism at the Canada Science and Technology Museum

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**Abstract**

To provide universal accessibility, public community spaces such as museums must be designed considering the experience of all patrons, including visitors living with Autism Spectrum Disorder. To develop a better understanding of the experience of visitors with autism at the Canada Science and Technology Museum, we invited four school children and one adult male for a visit, all of whom identified as being on the spectrum. They were joined by their support persons. We interviewed the adult, his caregiver and the teaching staff accompanying the school children. We analyzed our interviews and observation notes using thematic analysis to formulate key findings and suggestions to enhance the experience for autistic people. They include adding elements at a variety of developmental levels, offering options to reduce sensory stimulation, improving navigational resources and providing more resources for support persons.

**Author Keywords**

Accessibility; autism spectrum disorder; museum experience; wayfinding; website efficacy

**CCS Concepts**

• **Human-centered computing**~**Accessibility**;  
*Accessibility design and evaluation methods*

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*CHI 2020 Extended Abstracts, April 25–30, 2020, Honolulu, HI, USA.*  
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ACM ISBN 978-1-4503-6819-3/20/04.  
DOI: <https://doi.org/10.1145/3334480.3382834>

**List of collaborators**

**CSTM Staff** who gave us a comprehensive tour of the site, including an overview of existing accessibility features, programming, and insights into areas that are still under development.

**A parent of a child with autism** who advised us on the nature of the questions we planned to ask Museum visitors with autism and their support persons.

**A counsellor for people with autism**, also the coordinator of a transition support centre for people with autism at a post-secondary institution, who advised us on accessibility solutions used at the transition support Centre.

**A recreation therapist from a Children's Treatment Centre** who discussed direct experiences of accessibility issues that children with autism face.

**Introduction**

The Canada Science and Technology Museum (CSTM) is a cutting-edge museum in Ottawa, Ontario, Canada, entirely rebuilt in 2017 [4]. Much thought and attention have gone into providing universal accessibility for mobility, visual impairment, hearing impairment, and different levels of cognitive ability: the CSTM was the first national public institution in Canada to receive the Accessibility Certified Gold rating under the Rick Hansen Foundation Accessibility Certification Program [5]. To assess and improve the museum's accessibility, staff organized consultations with individuals with disabilities, as well as advocacy groups during the museum first year of reopening. To date they hosted groups of visually impaired and hearing-impaired individuals, as well as members of an autism spectrum disorder (ASD) advocacy group.

The museum's staff and management are in the early stages of reviewing accessibility for autistic people in detail, and this case study was carried out as a contribution to that process. ASD is characterized by three main impact areas: social interaction, communication, and restrictive or repetitive interests and behaviours. Autistic people also commonly have sensory processing difficulties [8]. This exploratory study provides new insights on the holistic experience from planning the visit, engaging with museum artefacts, and leaving the museum. We emphasize the importance of support services for people with ASD and their caregivers and the presence of engaging exhibits, in order to ensure an overall positive experience to people with ASD. This area of remains underexplored in the literature, and we aim to open up the space of doing exploratory open-ended research with people with ASD in similar contexts.

**Background**

Museums can be complex environments to experience and navigate due to their novelty or unfamiliarity. These factors may pose unique challenges for people with ASD and their parents or caregivers [6]. The experience of a museum visitor with sensory processing challenges can be improved if information about sensory elements at the museum is provided in advance using a 'sensory guide' [3]. Web-based resources that help parents and children prepare for a visit can improve their museum experience [7]. When a parent of a child with ASD is planning to visit a museum, a major factor in their decision-making process is the availability of strategies for use while at the museum [9], including 'early open' or low-sensory events for people with ASD [11]. Early open events can provide times during which sensory challenges are reduced such as the presence of fewer other visitors. It should be noted, however, that a provision of low sensory 'early open' events requires a significant amount of preparation and logistics on the part of the organization in question [11].

**Methods**

To assess the accessibility of the visitor experience, we began by exploring the CSTM's website and spoke with CSTM staff to determine what accessibility features were already in place, considered relevant literature, and consulted with external collaborators who helped us challenge our assumptions and consider different aspects of accessibility, as detailed in the sidebar. These discussions informed our study design, which centred on observations and interviews with people on the spectrum and their support persons.

## Interviews

**I** = the number of instances

**P** = the number participants

**Resources** (I=60, P=5/5)

Suggestions/feedback about current/future resources.

**Likes** (I=43, P=4/5) Elements of the Museum or exhibits that were liked.

**Other visitors** (I=12, P=4/5)

The influence of interactions with other museum visitors on museum experience.

**Overstimulation** (I=10, P=3/5)

Reports of or suggestions for mitigating overstimulation.

**Developmental**

**appropriateness** (I=8, P=4/5)

Reports of or suggestions for developmental appropriateness of exhibits, as to meet the needs of the individual in relation to their development, rather than their age [2].

**Physical accessibility** (I=5,

P=2/5) Physical barriers preventing full access.

For this case study, we invited five autistic people to the museum: four school children (grade six) and one male adult, along with their caregivers. These individuals allowed us to observe them and take notes about how they interacted with the exhibit elements. After the observation, we conducted interviews with the three teaching staff who accompanied the school children, the male adult, and his caregiver. As recruitment was performed under short time constraints, we adopted a minimal-risk approach to ethics approval by omitting direct interaction with the child participants. Similarly, the recruited group was small for this preliminary exploration to gather insights on their experience at the museum. The research team highly recommends a more expanded study working with children on the spectrum using participatory design technique. To improve our understanding of considerations, we relied on our observations of their interaction with museum elements and the knowledge of their teachers. The study was approved by our academic institutions research ethics boards (Carleton University #107243, Queen's University #6022018).

On the first day, we observed the four children while four teaching staff assisted the children, over two sessions running two hours in the morning and one hour in the afternoon. The Museum was busy, with classes from other schools present as well as the public. There were frequent moments when the children needed to wait for their turn at an element or needed to move on to accommodate others. We interviewed one teacher during the lunch break and two other teachers on a separate date.

On the second day, we observed a 35-year old male adult. He used a wheelchair and a communication

device and was assisted by a caregiver. This observation took two hours, with an additional hour for the interview. The museum was much quieter during this visit so he could move between exhibits and exhibit elements without the impact of other visitors' presence.

## Findings

We performed thematic coding [10] on the observation notes and interview transcripts. We identified recurring themes from the thematic coding of the interview transcripts and observation notes. 47 codes emerged from the interview transcripts, further grouped into six interview categories. 58 codes emerged from the observation notes, grouped into six observation categories. We report the number of instances and the number of people in whose interview or observation they occurred to identify the categories that stood out. We detail the categories in two sidebars. Due to our small sample size, we have been cautious about drawing strong conclusions from our findings.

### Interviews

Overwhelmingly, **Resources** was the most prevalent category. Participants frequently recalled resources that worked for them at other community spaces and gave suggestions for improving Museum resources. Common desired resources included: low sensory spaces, clearer signage, preparation materials on the website, and transportation assistance. *"It's hard especially if somebody is having a bit of a challenging time, you bring them out and they are going to be ten other things that they are going to obsess about that they want to see. So, sometimes it will be nice to have these almost little nooks of nothing in the spaces."* (Teaching Staff)

### Observations

**Likes** (I=72, P=5/5) Elements of the museum that appeared to be liked.

**Engagement** (I=65, P=5/5) Engagement or interactions with specific elements. This also includes the observation of behaviours that suggest engagement (e.g. willingness to move on, signs of agitation, returning to an exhibit).

**Support persons** (I=14, P=5/5) Interactions with support people during their visit, including both restraining and encouraging interaction with exhibits.

**Other visitors** (I=9, P=4/5) Influence of interactions with other museum visitors.

**Dislikes** (I=6, P=5/5) Disliked elements of the museum that were disliked, judged by restlessness or inattention on the part of a participant.

**Physical accessibility** (I=6, P=1/5) Physical barriers preventing access.

**Likes** was also a prevalent category. Our participants engaged for longer periods with the exhibits or exhibit elements that they liked. For instance, stationary bicycles were especially engaging for the children who were unable to ride a conventional bicycle in their day-to-day life (Figure 1). *"Everybody enjoyed the bikes and those physical things. They could sit on the bike and pedal without having to worry about the balance of the real bike."* (Teaching Staff)

Participants referenced **Overstimulation** and suggested low sensory days or hours. They commented on general busyness due to the number of **Other Visitors**. *"When we were in here before the children came and we had access to everything, he wanted to try everything. When there is too much stimulus, it affects his ability to focus."* (Teaching Staff)

Under **Developmental Appropriateness**, we noted a need for a variety of developmental levels during the demonstration. Given the few participants with physical disabilities, and that the CSTM put a strong focus on their physical accessibility, it was no surprise that issues with **Physical Accessibility** was the least prevalent category. Still, we noted instances when the participant who used a wheelchair could not access certain elements.

#### Observations

Observation results mirrored much of the interview results; overlapping category included Likes, Other visitors, and Physical accessibility. A common **Likes** theme was that participants enjoyed tactile interactions like touching, pressing, and spinning. We found that touch screens were popular with participants, but only when there was ample opportunity to receive

immediate feedback. The adult participant particularly enjoyed interacting with the large interactive tabletop screens at multiple exhibits as they were accessible from a wheelchair, in addition to being quiz-like and informative (Figure 2). Additionally, most participants appeared to like elements that provided unique sensory experiences, such as the anechoic chamber.

A category that stood out in the observations was **Engagement**, meaning any engaged interaction with a specific exhibit element by our participants. The prevalence of both Likes and Engagement in the observation results reflects positively on the experiences provided by the CSTM.

The importance of **Support Persons** emerged as a prominent requirement in the observation findings, emphasizing that providing resources for support persons could be an important measure.

### Suggestions

Based on these findings, including subsequent meetings with our collaborators, and reviewing the relevant literature, we propose five preliminary areas of focus which may assist the CSTM in their goal of improving the experience for people with ASD. We note that the CSTM was well liked by the participants. In addition, common themes did emerge from the interviews and observations. These provided us with insight that led to the following suggestions to support the museum's efforts to improve accessibility for people with ASD.

#### *Create Interactive Elements for a Variety of Developmental Levels*

Being interactive was the number one characteristic of museum elements 'liked' by our participants. Despite



Figure 1: Children using stationary bicycles.



Figure 2: Man interacting with interactive dress-up display.

our small sample size, we learned that the presence of interactive features at a variety of developmental levels was beneficial to the enjoyment of our participants during their visit. To enhance this, we suggest that the Museum incorporate elements for a variety of developmental levels during the live demonstration.

#### *Enhance Options for Reducing Sensory Stimulation*

To mitigate difficulties associated with sensory processing difficulties, we suggest:

- **Incorporating more low-sensory spaces throughout the Museum.** Classroom spaces, typically reserved for school programs, could be more actively made available to visitors who have issues with sensory overstimulation, when not being used by larger groups. In addition, quiet spaces throughout the CSTM would be useful, since the Museum is large and there is no way to get to the classroom space without walking through many high sensory exhibits.
- **Providing sensory processing tools.** Items such as weighted blankets, noise-cancelling headphones, earplugs, communication headphones, or shaded glasses could be available for visitors to borrow. This would be beneficial to address unexpected needs of individuals.
- **Allowing personalized booking of specific elements or stations for visitors with special needs during low traffic times.** The sensory element contributed by other visitors could be reduced if Museum visitors with special needs could book an element for their own use even for short periods of time (e.g. 10 minutes). However, we

acknowledge the challenges in facilitating this while meeting the expectations of other paying visitors.

- **Informing visitors of high-traffic times.** Notes on the website [7] could inform visitors about busy mornings during the week due to school visits, to minimize having to negotiate many other visitors. The afternoon visit with the adult participant and his caregiver was much quieter and more conducive to focused interaction with the exhibits.
- **Open early/stay open later program.** Further, to provide a quiet environment that is conducive to engagement with the exhibits, the museum could have low sensory hours by either opening early or staying open late [9, 11].
- **Reinstating the 'Museum on the Go' program.** Before the recent rebuilding, the 'Museum on the Go' program allowed the school children to remain in a familiar environment while still benefiting from the Museum's offerings. These programs were sensory-friendly, further meeting their needs.

#### *Improve Navigation Resources*

Participants often commented being confused by the layout of the CSTM. The Museum is currently working on sensory maps and planning more work on the Museum's wayfinding system. In addition, we suggest:

- **Maps designed for different developmental levels,** paired with clear signage throughout. Ideally, the signage would be both tactile and visual.
- **Signage** and information on the website that includes the sensory characteristics of each area [3] to aid people in choosing the best exhibits for them.
- **Wayfinding apps,** which are being explored at the Museum, without success to date.

*Augment Resources Regarding Support Persons*

Support persons were important for the Museum visits, to help customize the experience to each patron's needs. We observed that support persons helped keep patrons engaged with the exhibits through planned routes through the Museum, understood the visitor's preferences, demonstrations, mediated encounters with other visitors, and assisted with access resources such as quiet rooms. Ideas that emerged were:

- **A volunteer buddy system.** Volunteers would pair with visitors who would like 1:1.
- **Having support materials** in place to help friends or volunteers act in the capacity of a support person.
- **Offering ways to plan the visit** ahead of time such as accessible documents and videos on the website, so that support persons would need to make fewer decisions on the spot.
- **Headphones for directional hearing** through which a person using a microphone can communicate with a visitor.

*Improve Navigability and Completeness of Website*

While the CSTM offers many resources for people with disabilities, we noted that the support persons were unaware of many of them. For example, they did not know that the Museum foundation offers financial support for transportation. The website could be used to advertise these services and perhaps be expanded upon to include pre-planning information.

**Conclusion**

The goal of this case study was to access and share insights about the Museum experience that emerged during our fieldwork with individuals on the autism spectrum and their support persons. More specifically,

we aimed to determine what barriers these individuals and their caregivers may face when accessing the Museum and what accessibility features may facilitate their access and improve their experience. For this work, we collaborated with the museum, leveraged multiple stakeholders and collected two sources of data.

Emerging suggestions include 1) enhance options for reducing sensory stimulation, 2) improve navigation resources, 3) aim to create interactive exhibits for a variety of developmental levels, 4) augment resources regarding support persons and 5) improve the completeness of the Museum website. Although these themes primarily focused on areas that could be improved, we found that the areas of the Museum that were liked by participants greatly outnumbered the areas of the Museum that were disliked. Furthermore, in most cases participants were able to access and enjoy much of the Museum as it currently stands.

This work provides a holistic observation of the experience of visitors. Beyond analyzing the accessibility of a single exhibit, we discuss the overall experience of a museum visit, which includes preparation before the visit, navigation within the museum, the practicalities of long visits (e.g. necessity for breaks). Our work makes two contributions: 1) suggestions on how to enhance the accessibility of museums for autistic persons, which may be applicable to other museums, as well as support prior work; 2) a methodology useful for individuals or organizations interested in boosting accessibility in public venues. Future work includes applying this methodology to other community partners to assess and improve the holistic experience of people with accessibility needs with their facilities.

**Acknowledgements**

The Research and Education in Accessibility, Design, and Innovation (READi) training program is supported by the Natural Sciences and Engineering Research Council of Canada (NSERC) through CREATE grant (497303-2017), Carleton University, Queen's University, and the University of Ottawa. We thank the Canada Science and Technology Museum for their participation and engagement in this project.

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