**Submission for Round Table 2022**

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16b Tactile playgrounds: improving tactility, mobility and inclusion for blind and low vision audiences in urban playground environments

Presenter:

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Title

**Tactile Playgrounds - Improving Tactility, Mobility and Inclusion for Blind and Low Vision Audiences in Urban Playground Environments**

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**Abstract (250**)

Play is an essential part of childhood. Outdoor play supports the development of physical skills such as strength, coordination and balance as well as cognitive and emotional skills (Ginsburg, 2017, Hyndman 2020). Play environments can encourage children to be problem solvers, social, imaginative, creative and collaborative. Play is worldmaking. Encouraging play is a positive method for increasing physical activity. Importantly, blind and low vision children need movement; children with vision impairment were observed to have developmental delays in gross motor skills, and manipulative (very negative word - ? delete), self-stimulating and social/play behaviours due to a lack of opportunity for gross motor interactions with the environment (Schneekloth, 1989, Lieberman, 2019). We could use instead use: It is well documented that children with BLV are much less physically active than their peers, placing them at increased risk of obesity and other health complications (Haegele, 2015; Hallemans 2015).

We will discuss our research into tactile playgrounds for inclusive access, conducted in a partnership between The University of Sydney, NextSense, Macquarie University and Monash University. We provide an overview of the research project anchored in an initial audit of an existing playground for children who are blind or have low vision children. From this case study, the research draws challenges, and outlines possibilities for a best practice for analysing and evaluating existing playgrounds and designing new strategies for audiences who are blind or have low vision . The research also discusses strategies for collaborative design that we (will) use to work together right from the start with the blind and low vision community. We discuss the preliminary findings and conclude with an outlook to future research.

**1 Introduction**

Play is widely considered the most effective context for children to learn foundational cognitive, linguistic, social and physical skills. Outdoor play involves all sensory modalities. For children who are blind, quality sensory experiences are important for taking advantage of neuroplasticity that will prepare the brain for later academic work, such as learning braille. For children with low vision, outdoor experiences may optimise use of distance vision. Inclusive contexts that promote peer interaction, physical risk taking and pretend play are essential for providing high quality experiences.

Outdoor spaces such as parks and playgrounds provide specific opportunities for intergenerational experiences between adults and children. Importantly, accessing local play opportunities goes beyond fun – it is key to enhancing quality of life, enabling development, learning, flexibility, and resilience for intergenerational users (including the elderly). However, particular community groups, such as children and adults with diverse abilities, face challenges in accessing local community areas when they are not designed with social inclusion in mind.

Urban playgrounds pose problems: playground equipment is often standardised and specified only for people with vision, and more significantly playgrounds often lack general information in the form of maps, where to find the next one (?next what) or other public infrastructure in the vicinity, etc. Playgrounds accessible for blind parents supervising sighted children, or blind children with parent supervision are not widely available in Australia . In addition, most existing playground structures could be improved by including reminders for interaction and play (counting, numbering, choreographing, etc) and specialised equipment for play and assembly.

Recent study found that the benefits of manufactured and natural playgrounds were recognised with physical activity, motor skill development and balance, all identified as key benefits for both types of playgrounds (Blaszkow T, McKenna J, Stepan A 2017). In a universally accessible playground, people with different abilities may interact on the playscape and open public space, to play, learn and recharge. The collective act of coming to one place and playing and building together becomes a shared memory for each person attending.

This discussion paper reports on our initial research into tactile playgrounds for inclusive access. The research has been developed over the last 8 months as a partnership between researchers from the fields of early childhood education, psychology, educators for people who are blind or have low vision , touch access designers, architects, and interaction designers across The University of Sydney, Nextsense, Macquarie University and Monash University.

We will provide an overview of the research project anchored in an initial audit of an existing playground for children who are blind or have low vision. From this case study, the research draws challenges, and outlines possibilities for a best practice that can be used to analyse and evaluate existing playgrounds, and to design new strategies for blind and low vision audiences. The research also discusses strategies for collaborative design that we (will) use to work together right from the start with the BLV community. We will discuss the preliminary findings and conclude with an outlook to future research.

**2 Backgrounds and Anchor Points**

Accessible and inclusive community environments are fundamental for enabling social inclusion. The implementation of inclusive playgrounds promotes the social aspect of play, to increase participation among children with disability and their peers. Inclusive playgrounds are recognised as being a physical space that offers a variety of settings, technologies and opportunities for safe play, where interaction is beneficial to children with disabilities, such as vision impairment (Fernelius & Christensen, 2017). A recent systematic review has found that parents sometimes segregate their children due to experiences of non-inclusion in playgrounds (Sterman 2016). The construction of inclusive playgrounds involves thoughtful planning with community endorsed ideas in a layout that provides various functions of tactile, auditory, visual, and physical accessibilities (Appel, 2018). Inclusive playgrounds offer unique designs for play facilities to cater for the diversity of all people, young, old, and those with and without disability.

In this context, several recent initiatives are important for this research and briefly described in the following:

* In 2018 the New South Wales Government developed the ‘Everyone Can Play’ initiative (NSW Department of Planning and Environment, 2018).[[1]](#footnote-1) This set of guidelines permitted the government to strategically upgrade playgrounds across the State to become more inclusive of everyone within the community.
* The NSW Child Care Planning Guideline (NSW Government Planning & Environment)[[2]](#footnote-2) states that ‘good playground design achieves a mix of inclusive learning spaces, to cater for all children and different modes of learning’.
* *The National Construction Code, Discrimination Disability Act 1992* (Cth), *Disability (Access to Premises – Buildings) Standards 2010* sets out that equitable access to childcare facilities must be available for all members of the community.[[3]](#footnote-3) Whilst legislation has been implemented for the inclusion and access of all children within the playground, the benefits of investing in quality inclusive playgrounds that exceed the minimum standards of access in the legislation is at times disregarded when playground developers only target the minimum standards (in the construction and architectural design of playgrounds).

Significantly, while there have been evidence-based research practices of effective inclusive playground design , there is little research that evaluates the involvement of children with blindness and low vision. As a first step, it is thus important to understand what is needed – and by whom.

**3 Playgrounds – Preliminary Surveys and Interviews**

To better understand the use of playgrounds for children with vision impairment and intellectual disability and to trial fundamental questions, two initial, small-scale surveys were conducted in 2021 with two focus groups: focus group 1 consisted of educators (four teachers working with students) and focus group 2 consisted of a representative set of playground users (parent, child and teacher). Through these surveys and group interviews of relevant stakeholders, we aim to determine a set of best practice guidelines for designing accessible and inclusive community environments that enable the social inclusion of as many people as possible to enhance community integration, belonging, health and wellbeing.

Focus Group 1

A group of four teachers working with students with vision impairment and intellectual disability were asked to reflect on their observations of these students in an unadapted school playground environment, i.e., a playground that did not meet the student's specific access needs. The teachers provided their feedback to a short audit, reporting significant safety barriers for independent movements including:

* A lack of rails for trailing and no safe paved areas
* Uneven surfaces and an absence of textured surfaces
* No colour contrast on objects such as poles and pillars in the playground

The teachers identified barriers that impacted on student play and the level of movement, resulting in low levels of self-initiated activity, particularly when students used wheelchairs. Barriers included:

* Equipment such as large blocks, stationary play equipment and bikes not adapted for the students' needs
* A lack of access to a "quiet area" e.g., no hiding nooks where students could retreat
* Students were unable to visually access the games painted on the concrete
* A lack of multisensory experience
* A lack of free movement play area
* A lack of opportunity for students to use their hands to explore spaces

When questioned about the positive aspects of the playground, teachers identified that the availability of chairs and tables allowed students to engage with one another by chatting whilst sitting and listening to music. Furthermore, the teachers were able to make significant suggestions for improvements to the playground. First, there was a need for opportunities for movement and fitness using safe, fixed equipment. Structures such as fixed bridges and steps with rails to encourage essential cardio activities - bouncing, balancing, and walking – were suggested. Also, opportunities for running with close supervision, and opportunities to hang from structures to support their own weight, and an activity area for free dancing and movement were recommended. A sensory area for students to experience by touch, sound and smell, and a fixed station for sensory play, games, music making activities were encouraged. Finally, teachers stressed the need for students to be orientated to any playground area, with support to know where they are and how to use all available activities.

Focus Group 2

A second, small interview was conducted with participants [anonymised here], and delivered the following results:

|  |  |  |
| --- | --- | --- |
| Questions | Child | Parent |
| Q1: What elements on a playground do you want/enjoy engaging with? | Swings, Running Rope, Flying fox/ Zip line, Climbing chain, Jumping balloon, Musical pipes, Stairs, Slide, Wobbly Bridge, Climbing, Rockers, Railings, Supervised free running in open space | “Swings, swings and more swings”, Rockers |
| Q2: What elements on a playground do you not want/enjoy engaging with? | Fireman’s pole, Cycling | Surfaces that get hot |
| O&M instructor and Physical Education Teacher: Skills or opportunities to develop | - Opportunities to explore, with whole body and fine motor, e.g. alcoves, fixed sensory gear-Cardiovascular activities, e.g. running rope, railings, jumping balloon, fixed exercise equipment.-Opportunity to hold own weight, e.g. zip line-Opportunity to fall safely from low height (may need to be taught)-Opportunity to commit body into space, e.g. jump from low height, run downhill safely-Opportunities to reach to sound, e.g. movement activated soundscape poles (orientation) musical instruments-Opportunities for vestibular stimulation, e.g. swings, rockers |

**4 Universal Design for Inclusive Playgrounds and Case Study**

Universally designed playgrounds consider the multiple forms of play that encourage the full participation, access, and the safety of typically developing children and children with disabilities. Providing small quiet places to play, alongside larger, engaging areas, supports children in playing in an environment that suits their stimulation needs. The following universally designed playground features have been proven to enable the full inclusion of typically developing children and children with disability in inclusive playgrounds:

* Sensory play: Sensory play offers experiences that engage the senses, such as musical corners and sandpits. Experiences that appeal to a diverse range of senses enrich the development of children (ASLA, 2021) and are extremely important for optimal development of the brain of children who are blind. Neuroplasticity related to blindness is well documented (Silva 2018). For example, tactile experiences promotes organisation of the visual cortex in blind children improving responsiveness to information typically visually perceived (Ankeeta 2021).
* Risky play: Risky play allows children to test their limits and challenge their perspectives. Outdoor risky play promotes physical activity and health . Parents of children with disabilities have been found to have a lower level of tolerance of their children’s risky play (Beetham 2019). Opportunities to promote risky play are therefore important in inclusive playgrounds.
* Landform design: Unstructured play is open-ended play and critical to brain development. Unstructured play is dependent on landform design, as the way the land is shaped and structured allows for children to explore their gross motor skills through rolling, jumping, sliding and exercising other forms of spontaneous movement skills (ASLA, 2021).
* Natural elements: Natural elements such as thorn-less plants are sources of stimulation for typically developing children and children with disabilities. Children can learn about the world by engaging with natural elements. Water and sand are key considerations for ensuring natural elements are placed in the built environment, although they must be designed safely to encourage independent play for all children (Wright, 2019).
* Accessible resources: Equipment must be age-appropriate and ability-appropriate in order to encourage the full participation of children with and without vision loss. This includes clear and direct signage in language forms that are relevant to the diversity of children’s communication needs (Yantzi et al., 2010).

Universally designed playground features help to ensure that children are provided ample opportunities for social inclusion, cognitive development, sensory stimulation, access to nature and physical exercise. However, due to the range and complexities of vision impairment, playground developers and manufacturers must be responsive to individual needs, abilities, behaviours and skills of children who are have blindness or low vision and their inclusion in shared settings.

To further investigate the adoption of Universal Design for the BLV community, the research group is at this stage developing a structured analysis of existing playgrounds, in order to derive as a first step a ‘best practice approach” to inclusive play and to develop strategies for tactile integration, wayfinding and mobility, and to be able to gain user feedback to establish a design framework for new playground designs. To this extend, a case study is currently developed as a survey of 7-10 playgrounds at Sydney Olympic Park, in collaboration with Sydney Olympic Park (SOPA).

**5 Discussion: Formulating an Approach**

Designing places where everyone can play means designing playgrounds right from the start with children and carers with different abilities, and to this extend the research investigates playground design, playground equipment, touch access and wayfinding that leverage the perceptual world of children who are blind or have low vision, to ensure full inclusion in a playground environment that is fully accessible and creates playful interactions for all children and their families.

At present, the following challenges exist:

* Playgrounds are not equipped for BLV access
* Retrofitting is highly desirable, however, not enough strategies exist to date
* There is little known of what the BLV users like or want
* No larger survey has been undertaken that would shed on light on what works and what doesn’t
* Collaboration with the BLV community is difficult to conduct in times of COVID

However, on the basis of the preliminary surveys and literature review, the research group has mapped out the following research pathways:

* exploring models of playgrounds as 3D maps
* developing equitable and inclusive playground equipment which utilise braille games, tactiles, touchables, equipment for health and play, and for storytelling, all of which will encourage natural socialisation and collaborative play
* designing guidelines and frameworks for existing playgrounds that permit retrofitting, and/or development of new concepts in these spaces
* designing spatial maps for finding playgrounds including connecting to existing systems such as BindiM aps, and the beacon infrastructure system, with development of interfaces for these systems
* designing user interfaces such as apps connecting to the playgrounds that will assist parents and carers with blindness and low vision to locate playgrounds and be aware of obstacles and potential risks when supervising sighted children

Then, a playground can provide a safe environment that enables not only movement and play for parents and children, but more importantly enables social connections for children-children, parent-children, parent-parent constellations. Importantly, this also means improving and supporting resilience to the changing nature of cities, infrastructure, employment, people and communities, for enabling sustainable, socially equitable, environmentally friendly and commercially viable communities.

**6 Conclusion**

This discussion paper for the 2022 Round Table Conference has reported on preliminary research into tactile playgrounds for inclusive access. We have outlined an overview of planning frameworks and presented a research project that will investigate playground design, equipment design and spatial maps/wayfinding strategies for universal and inclusive playgrounds that support audience engagement and increase mobility and movement. At present, common playgrounds lack accessible information on layout, equipment, and use, causing barriers to access by parents and children who are blind or have low vision. This research will, in the future, develop and enhance understanding, use, tactility and inclusion through specific play, games and other interactive scenarios, to work towards universal access and better inclusion of participants and community. As a next step, we aim to jointly - with the blind and low vision community – establish discussions and collaborative design methods for playgrounds. To this extent, we welcome contributions, suggestions and collaboration with the community to further develop this research.

**References (exert)**

Albert, S. P. (2017). *Playspace for all inclusive wayfinding* [Master thesis]. Massachusetts Institute of Technology. <https://dspace.mit.edu/handle/1721.1/111540>

Ankeeta, A., Senthil Kumaran, S., Saxena, R., Dwivedi, S. N., & Jagannathan, N. R. (2021). Visual Cortex Alterations in Early and Late Blind Subjects During Tactile Perception. Perception, 50(3), 249-265.

Beetham, K. S., Sterman, J., Bundy, A. C., Wyver, S., Ragen, J., Engelen, L., ... & Naughton, G. (2019). Lower parent tolerance of risk in play for children with disability than typically developing children. International Journal of Play, 8(2), 174-185.

Blaszkow T., McKenna J., Stepan A. (2017) Playground Research Report: A Comparison of the Safety Risks and Health Benefits between Manufactured Playgrounds and Nature Playgrounds within a School Environment. Perth (WA): Kidsafe Western Australia (AUS).

Ginsburg, K. R. (2007) American Academy of Pediatrics Committee on Communications; American Academy of Pediatrics Committee on Psychosocial Aspects of Child and Family Health. The importance of play in promoting healthy child development and maintaining strong parent-child bonds. *Pediatrics,* *119*(1):182-91. doi: 10.1542/peds.2006-2697. PMID: 17200287.

Fernelius, C. L., & Christensen, K. M. (2017). Systematic Review of Evidence-Based Practices for Inclusive Playground Design. *Children, Youth And Environments*, *27*(3), 78.

<https://doi.org/10.7721/chilyoutenvi.27.3.0078>

Fernelius, C. (2018). Evidence-Based Practices for the Design of Inclusive Playgrounds that Support Peer Interactions among Children with All Abilities. Utah State University. ProQuest Dissertations Publishing, 10638949.

Hyndman, B. P., & Wyver, S. (2020). Outdoor recreation within the school setting: A physiological and psychological exploration. In Outdoor Recreation-Physiological and Psychological Effects on Health. IntechOpen.

Lieberman, L. J., Lepore, M., Lepore-Stevens, M., & Ball, L. (2019). Physical education for children with visual impairment or blindness. Journal of Physical Education, Recreation & Dance, 90(1), 30-38.

Pierce-Jordan, S. & Lifter, K. (2005). Interaction of Social and Play Behaviors in Preschoolers With and Without Pervasive Developmental Disorder. *Topics in Early Childhood Special Education. 25* (1) 34–47.

Schneekloth, L. H. (1989). Play environments for visually impaired children. *Journal of Visual Impairment & Blindness 83*(4), 196-201.

Silva, P. R., Farias, T., Cascio, F., Dos Santos, L., Peixoto, V., Crespo, E., ... & Teixeira, S. (2018). Neuroplasticity in visual impairments. Neurology international, 10(4), 111-117.

Sterman, J., Naughton, G., Froude, E., Villeneuve, M., Beetham, K., Wyver, S., & Bundy, A. (2016). Outdoor play decisions by caregivers of children with disabilities: a systematic review of qualitative studies. Journal of Developmental and Physical Disabilities, 28(6), 931-957.

Wright, A. (2019). Incorporating Natural Play Spaces into Elementary Playgrounds for Child Developmental Benefits. All Graduate Plan B and other Reports. 1415. <https://digitalcommons.usu.edu/gradreports/1415>.

Yantzi, N., Young, N., & Mckeever, P. (2010). The suitability of school playgrounds for physically disabled children. *Children's Geographies*, *8* (1), 65-78.

<https://doi.org/10.1080/14733281003650984>

Siu, Kin Wai Michael; Wong, Yi Lin; Lam, Mei Seung,. & Lam, M. S. (2017). Inclusive Play in Urban Cities: A Pilot Study of the Inclusive Playgrounds in Hong Kong. *Procedia Engineerin* *., 198*, 169–175.

<https://doi.org/10.1016/j.proeng.2017.07.080>

Stanton-Chapman, Tina L., & Schmidt, E. L. (2017). Caregiver perceptions of inclusive playgrounds targeting toddlers and pre-schoolers with disabilities: has recent international and national policy improved overall satisfaction? *Journal of Research in Special Educational Needs : JORSEN* , *17*(4), 237–246.

<https://doi.org/10.1111/1471-3802.12381>

Author Bios

Dr Dagmar Reinhardt is an associate professor, researcher and educator at the School of Architecture, Design and Planning, The University of Sydney. Reinhardt’s research focuses on the intersection of architecture, body, space and the senses, by integration of advanced data retrieval and fabrication methods, including photogrammetry and robotics. A practising architect, her built works, competitions and installations are research-based, widely published and have received numerous recognitions and awards for affordable and multi-generational residential works ([www.reinhardtjung.de](http://www.reinhardtjung.de)). Dagmar has been working on touch access objects since 2019 with IBOS in Denmark, and since 2021 with Nextsense, with recent projects including tactile maps for ocean pool access (2021), and a collaboration with the Object Based learning team of Chau Chak Wing Museum for tactile objects that represent some artefacts of the CCWM’s vast collections.

Dr Sue Silveira is a research fellow with NextSense (formerly known as the Royal Institute for Deaf and Blind Children) She is the chief investigator on the project which has established the Australian Childhood Vision Impairment Register. Sue holds a conjoint academic position with Macquarie University and is the Course Director for the Master of Disability Studies. Sue has worked as a paediatric orthoptist and educator for over 30 years. Sue completed her PhD at the University of Newcastle, exploring the functional impact of childhood vision impairment.

Associate Professor Kathleen Tait received her PhD from The University of Queensland and is currently employed at Macquarie University. Kathleen’s expertise stems from 30 years of practical and consultative experience with students with developmental disabilities. Kathleen has held consultation and tertiary education appointments in Australia, Brunei Darussalam, Hong Kong SAR, Mainland China, and Japan. Prior to entering the field of tertiary education, Kathleen has been a special education classroom teacher, Director of an Early Intervention Centre, and State Advisor for the education of children with additional needs for EDQLD. Kathleen was commissioned by Oxford University Press (OUP) to be an author and co-editor of the 2022 text: [*Diversity, Inclusion and Engagement*](https://protect-au.mimecast.com/s/WuUICQnMBZf66vY71TGtr3t?domain=urldefense.com). Since the first edition of this text, it has become a recommended text in 28 Australian universities, and it has been rated in the top 10 best-selling books both nationally and internationally for OUP. Kathleen’s contribution to this project includes her expertise in the functional outcomes of inclusive playground design for individuals with additional needs, their families, teachers and allied health professionals.

Dr Shirley Wyver is a senior lecturer in child development in the Department of Educational Studies at Macquarie University and holds a PhD in developmental psychology. Her research was in young children's outdoor play and learning and is continued in the multidisciplinary work on the Sydney Playground Project, with investigations into a range of physical and social outcomes for young children following our outdoor play intervention. Shirley’s other research interests include: (i) children with disabilities, particularly low vision and blindness, and (ii) early bilingualism.

Leona Holloway is a Research Assistant and PhD candidate with the Inclusive Technologies group at Monash University, focusing on technologies for access to graphics for people who are blind or have low vision. She is leading the work on an ARC Linkage Project investigating the use of 3D printing for touch readers, with Round Table as a project partner. Leona established the Australia and New Zealand Accessible Graphic Group, a subcommittee of Round Table.

Tricia d’Apice is the Lead Consultant: Vision Impairment at Nextsense, Connected Services and has taught children with a vision impairment in physical education, orientation and mobility, the Expanded Core Curriculum for students with VI (ECC) and braille.

Dr Lian Loke is an Associate Professor in the School of Architecture, Design and Planning, The University of Sydney. She is a member of the Design Lab, where she pursues design-led and practice-based research to study the interactivity of humans and machines through a choreographic and somaesthetic lens. Her research explores how to design embodied and movement-based interactions and experiences with emerging technologies that support human agency, creative expression, skill and vitality, from public play to individual meditation settings. She is a member of the Arts and Cultural Advisory Committee of the Inner West Council, contributing to strategy and policy formation.

1. https://www.everyonecanplay.nsw.gov.au/, access date 07/04/2022 [↑](#footnote-ref-1)
2. <https://www.planning.nsw.gov.au/Policy-and-Legislation/Education>, access date 07/04/2022 [↑](#footnote-ref-2)
3. https://www.legislation.gov.au/Details/C2016C00763, access date 07/04/2022 [↑](#footnote-ref-3)