

Ensuring playground access for children with vision impairment

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Abstract

Play is critical to child development and children have the right to experienced meaningful and fun play. Playgrounds provide an environment where all children including those with vision impairment can experience joy, social interaction, physical challenges and stimulation. Participation in an accessible playground can also contribute to advancing specific developmental domains that can be impacted by childhood vision impairment. However, despite the importance of play being recognised by the United Nations and guidelines being legislated in Australia, access to inclusive playgrounds that meet the needs of people with vision impairment remains challenging. An urgent need exists to address the exclusion of children with VI and their families from playground participation. This paper aims to identify inherent benefits of play for all children and to investigate what is known about inclusive playground features, specifically those that meet the needs of children with vision impairment. The challenges of meaningful inclusion of children with vision impairment is explored, including those approaches that may progress design and facilitate inclusion. Playground features such as layout, pathways, equipment, sensory elements and use of technology are discussed, along with importance of consultation, listening and learning from the voice of users.

Keywords

Playground, accessible, children, vision impairment

Introduction

Providing a quality of life for all children through real-life experiences such as play, means designing opportunities for children to take risks, face challenges, make connections and develop appropriate skills. The importance of play is evident in the 1989 United Nations Convention on the Rights of the Child (United Nations, n.d.), which determines that participation in play, age-appropriate recreational activities, rest and leisure is a fundamental childhood right. A playground is generally understood to be a place that offers an interactive functional space that is equipped with facilities for children to develop their cognitive, physical, social, and emotional skills (Fernelius & Christensen, 2017). In general, play environments

are expected to be stimulating, challenging, and educational (Woolley, 2007; Wilson, 2007).

However, for a playground to be considered “inclusive” the design characteristics depend on the accessibility and usability of the structure, resources and equipment within the built environment. Inclusive playgrounds offer unique designs for play facilities to cater for the diversity of all people, young, old, with and without disability. Fernelius & Christensen, (2017) describe inclusive playgrounds as being a physical space that offers a variety of settings, technologies, and opportunities for safe play and where interaction is beneficial to children with disabilities, including those with vision

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impairment (VI). Such playgrounds are fundamental for enabling social inclusion by promoting the social aspect of play to increase participation among children with disability and their peers.

On the other hand, when playgrounds are not designed with inclusion in mind, children (and adults) with diverse abilities are likely to face access challenges, and this may result in some people being excluded. To overcome this challenge, co-design is increasingly recognised as a valuable design methodology, particularly when working with vulnerable populations. The voices of children are often not evident in research to the same extent as older participants, with Sun et al. (2023) identifying a noticeable gap in user perception involving the voices of children with disabilities.

Inclusive design is often considered as the best approach to playground design and Universal Design (UD) is a framework that guides the planning of flexible spaces that accommodate for individual differences. As a set of environmental design principles, UD offers the potential to create inclusive environments that are accessible to as many people as possible. In this way, community spaces become inclusive environments for children and adults with disability. Rather than adding on design features at a later stage (such as ramps or handrails), which is an idea referred to as 'retrofitting', UD encourages the full consideration and implementation of features in the planning stages of a design (Stanton-Chapman & Schmidt, 2016). When retrofitting is seen as a solution in an existing playground, any design approaches taken must then also follow UD principles.

The Australian Government has recognised that access to urban open and public spaces should be universal for all people. As described in the Australian Government's National Disability Strategy (Australian Government Department of Social Services, n.d.) - Australia must strive for inclusive and accessible communities. This notion is supported by the National Construction Code which described the need for all people to have safe, equitable and dignified access (Australian Building Code Board, n.d.).

In 2018 the Australian New South Wales (NSW) State Government developed the 'Everyone Can Play' initiative (NSW Department of Planning and Environment, 2021). This set of guidelines permitted the government to strategically upgrade playgrounds across NSW to become more inclusive

of everyone within the community. The NSW Child Care Planning Guideline commented, "good playground design achieves a mix of inclusive learning spaces, to cater for all children and different modes of learning" (NSW Government Department of Planning, Industry and Environment, 2021) (p.7). Further, section 64 (a) – (c) of the NSW Government Children (Education and Care Services) Supplementary Provisions Regulation 2012 stated that, "all children must be supported to fully participate (with any necessary help and support) in programs at a service (NSW Government, 2012). If a child has a disability, they are to be given access to a) buildings, areas and facilities at the service and b) appropriate support services and specialised equipment and resources" (p. 40).

Appel (2018) has stressed that the construction of inclusive playgrounds must involve thoughtful planning with community endorsed ideas in a layout to provide various functions of tactile, auditory, visual, and physical accessibilities. While legislation has been implemented for the inclusion and access of all children within playgrounds, the benefits of investing in quality inclusive playgrounds that exceed the minimum standards of access in the legislation is crucial. When playground developers only target the minimum standards in the construction and architectural design of playgrounds, the value of play is not recognised and children with disabilities miss out. Stanton-Chapman and Schmidt (2016) have commented "despite the great strides towards expanding the rights of individuals with disabilities, at the international and national levels, many obstacles still stand in the way at local levels preventing those with disabilities from participating on the community playground" (p. 243).

Despite guidelines, codes and Acts, Australia lags in providing playgrounds that can be accessed and enjoyed by people with disabilities. Stanton-Chapman et al. (2020) have denounced most playgrounds as being inadequate for the engagement and recreational opportunities of user groups with different abilities. Stillianesis et al. (2022) concur stating that community playgrounds, more often than not, are designed with normative understandings of a child's cognitive process, mobility, and ability, and as such, do not adequately represent childhood disability. Although providing different levels of risk through play for children of all abilities is critical for cognitive development and physical wellbeing (Pierce-Jordan & Lifter, 2005), playgrounds may be stripped of challenges due to

excessive safety related concerns (Senda, 2015). The authors of this paper believe that in the case of children with VI, existing playgrounds may not provide information about layout and locations; may not contain accessible equipment; may not stimulate a broad spectrum of engagement with the senses; and lack opportunities for movement, interaction, and communication (Reinhardt et al. 2023).

An urgent need exists to address the exclusion of children with VI and their families from playground participation. The aim of this paper is to identify inherent benefits of play for all children and to investigate what is known about inclusive playground features. The authors of this paper also plan to explore the current challenges faced by children with VI in playgrounds and address future approaches that may progress design and facilitate inclusion.

Benefits of play for all children

Play is critical to child development and all children have the right to access meaningful and enjoyable play. Engaging in play is an early form of learning, whereby children develop the ability to communicate with their peers and acquire the ability to make intelligent decisions (Holloway et al. 2019). Play is integral to every child's physical, sensorimotor, neurological, and social development (Senda, 2015), as it supports the learning of adaptive, flexible, and resilient responses to challenging situations. Providing different levels of risk for children of all abilities is critical for cognitive development and physical well-being (Stanton-Chapman & Schmidt, 2016).

Play environments can encourage children to be problem solvers, enhance their social skills, stimulate their imagination and creativity, and encourage their collaborative play. Childhood play assists children to increase physical activity (Sungur, 2018), develop physical skills such as strength, coordination, and balance, as well as cognitive and emotional skills (Ginsburg, 2007). For children with VI, limited opportunities for interaction with their environment directly contributes to gross motor delays present in the first year of life such as head control, standing, crawling and walking (Hallemans, 2015; Schneekloth, 1989).

Compounding this, Haegele, (2015) and Hallemans (2015) have identified that children with VI tend to

be less physically active than their peers, placing them at increased risk of obesity and other health complications. Further, the absence of movement associated with play can contribute to physical complications such as poor posture and stunted somatic development (Ishtiaq et al. 2016).

Encouraging play in children with VI is critical across many developmental domains. For example, children with VI have also been shown to engage less in many areas of play, when compared to their sighted peers (Verver, et al. 2020). Likewise, Tzvetkova-Arsove and Zappaterra, (2016) note children and adults with VI experience challenges and developmental delays in many areas including play. Such areas include the independent exploration of unfamiliar environments and objects, initiating spontaneous play, fictional animism play or play with toys, play centred around peers rather than adults, and finally engaging in social play (Mellou, 1994).

Not surprisingly, playgrounds offer the opportunity for children to play with other children. Social play is heavily intertwined with establishing social relationships and integration with peers (Burriss & Tsao, 2002). This specific form of play is pivotal for a developing child, and its absence can have detrimental impacts. Social play aligns with what is known as the Theory of Mind (ToM) which affirms an individual's ability to recognise and understand the beliefs and mental states of others, through the self (Peterson, et al. 2000). The acquisition of ToM lays the foundation for effective social communication and connection.

It is known that children with VI often have delays in ToM development as VI may prevent exposure to the social cues which stimulate the growth of the ToM (Peterson et al. 2000). This delay may be exacerbated when a child's exposure to casual social conversations, exchanges, and important non-verbal cues (which encourage an experiential understanding of peer and personal mental states) are limited by a lack of social play (Peterson et al. 2000). An apprehensiveness towards engaging in peer orientated play may result in children with VI gravitating to adult caregivers, parents, and guardians (Burriss & Tsao, 2002), risking dependence on adults and an additional level of social isolation and separation (Emmett, 2012). Further, Ishtiaq et al. (2016) discussed a link between isolation and heightened anxiety, an inferiority complex and depression in children with

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Inclusive playground features

Harris et al. (2022) deemed universally designed playgrounds as essential for encouraging multiple forms of play that help to foster full participation, access, and the safety of typically developing children and children with disabilities such as VI. In addition, universally designed playgrounds provide small quiet places for children to play alongside larger engaging areas, as well as supporting children to play in an environment that suits their individual stimulation needs. The following six universally designed playground features contribute to enabling the full inclusion of typically developing children and children with disability.

Opportunity for 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 (American Society of Landscape Architects [ASLA], 2023).

Opportunity for risky play

Risky play allows children to test their limits and challenge their perspectives. Providing different levels of risk for children of all abilities is critical for cognitive development and physical wellbeing (Pierce-Jordan & Lifter, 2005).

Landform design

Paykok, et al. (2021) refer to unstructured play as 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. According to Wright (2019) water and sand are key considerations for ensuring that natural elements are placed in the built environment, although they must be designed safely to encourage independent play for all children.

Accessible resources

Equipment must be age-appropriate and ability-appropriate to encourage the full participation of children with and without VI. This includes clear and direct signage in language forms that are relevant to the diversity of children's communication needs (Yantzi, et al. 2010).

Playground accessibility

In 2013, Burke (2013) reported disappointingly that children with physical difficulties experience many barriers when getting into, moving around and playing in playgrounds. Yantzi et al. (2010) explained why this is the case: "They cannot get in due to the wooden borders and they cannot move around because of the use of woodchips or sand as surface materials. Those who do somehow enter cannot play with most of the play components due to a lack of ramps or transfer systems" (p.72). Similarly, most ground-level components lack the diversity of play experiences required for children with VI and this could prevent them from learning important physical, social, and emotional life skills.

Challenges associated with involving children with VI in playgrounds

Involving children with VI in play and playgrounds becomes critical for their development and quality of life. While there have been evidence-based research practices of effective inclusive playground designs, little evaluation of the playground experience of children with VI has been conducted. Several challenges have been identified in the literature and need to be considered to ensure inclusion of children with VI. These challenges involve the reliance on non-visual senses and parents, encouraging social participation and the suitability of current playground design and equipment.

Reliance on non-visual sense

Children with VI are known to naturally rely on their other senses when playing. According to Vermeersch and Heylighen (2021) when children with low or no vision engaged in play, they displayed diverse use of verbal communication, touch, smell, taste, and hearing. This diverse sensory approach must be considered in playground design to support inclusion. A variety of surfaces within a playground is essential. The touch

of grass, rubber and cement flooring were acknowledged by Albert (2017) as being dramatically different and this manipulation of the ground with added prominent objects could stimulate the perceptual growth of children with VI.

Reliance on parent/carers

Due to the nature of their VI, children are often accompanied and supervised by parents/carers whilst playing. However, parents/carers can inadvertently limit the child's play opportunities due to their natural concern for the child's safety. Research into 10–12-year-olds and their parents (Yantzi et al. 2010) found that with decreasing vision, parental confidence in a child's ability to be physically active decreased, as did the child's self-assurance in their abilities. This resulted in parental restrictions of children engaging in risk-perceived high motion playground activities. Parents have also shown a hesitancy to allow a child with VI to engage in play with sighted children, due to a fear of injury or harmful play (Columna, et al. 2017). Such parental fears largely stem from previous negative experiences, in which their child was physically or emotionally harmed during the process of engaging in play (Columna, 2017). Despite these concerns, most parents were well informed of the benefits associated with physical and social play. Nonetheless, due to the inaccessible nature of conventional play equipment coupled with personal concerns, participation was limited, resulting in overdependence on parents/carers (Columna, 2017).

Social participation

Children with VI can experience social participation difficulties during peer play with sighted children (Pierce-Jordan & Lifter, 2005). Verver et al. (2020) showed that children with VI preferred solitary play with known toys or objects. A child's ability to form connections with peers may be hindered by a limited understanding of non-verbal cues, such as facial expressions, eye contact and body language. Not being able to receive these cues and thus being unable to reciprocate cues from their sighted peers hinders children with VI, potentially creating social isolation and dependence on adults for play (Ishtiaq et al. 2016). The mannerisms displayed by children with VI may also be foreign to sighted children. Approximately 11-40% of children with VI display self-stimming behaviours (Wrzesińska, et al. 2017). Unfortunately, such mannerisms and behaviours may be alarming for sighted children, further impeding the building of social relationships.

Inclusive playground design for children with VI

The inclusive playground space should be a welcoming and friendly area which considers as many needs as possible and allows people to joyfully experience the access of play together (NSW Department of Planning and Environment, 2018). In the case of children with VI, there is no doubt that playgrounds can help meet specific needs such as orientation and mobility (O&M) and non-visual engagement, both of which demand specific design considerations beyond those of inclusion and universal design. However, most current play equipment has been found to be inadequate for play by children with VI and may set up barriers at a time when children are developmentally responsive (Rainey, et al., 2016).

The design of inclusive playgrounds must include careful planning, with the intention of catering for a diverse population by removing barriers related to culture, disability, age or socio-economic status. Inclusive playgrounds should strive to cater for individual community needs. For example, Albert (2017), Fernelius (2018) and Brown, et al. (2021) identified that the design of inclusive playgrounds should include a variety of functions involving textured grounds, sufficient space, spatial pathways, enclosed play spaces, ramp access, multi-niche settings, picnic tables, water fountains, common and recognisable objects, and sensory integrated components for auditory, visual, kinaesthetic and tactile engagement. Through careful considerations of the actual layout, these functions can be incorporated as a combination in separate spaces within inclusive playground design.

Several approaches are known to further support play for children with VI. These include a circular playground layout, careful selection of playground equipment, inclusion of specific pathways, incorporation of sensory based integration elements and use of technology.

Circular playground layout

Fernelius & Christensen (2017) acknowledged that a circular playground layout acted as an important feature in keeping children with and without disabilities engaged. A circular design allowed for increased play experiences among equipment, as children moved from one activity to the next in a circuit motion. This also proved an effective layout in providing children with disabilities with a familiar

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routine and a ritualistic track of repetitive behaviours (Fernelius, 2018).

For children with VI, knowing what to expect next in the playground experience eased anxiety, while still encouraging some form of independent play experiences through confidence growth. For instance, Verver et al. (2020) concluded that difficult and slow-to-warm-up temperament was demonstrated more frequently in children with VI than typical developing children, where they exhibited fearful inhibition that later turned into anxiety. The circular layout incorporated functions of equipment which were safe and complimentary. It was noted that this design was inclusive and promoted structured movements to increase the child's engagement. Adult supervision and guided practice were still initially required for children with VI until there were familiar with the playground layout. Inclusion of a calming or relaxation corner, whereby children with VI have a safe space to engage in stimming behaviours could also be considered.

Playground equipment

When designing and implementing adapted equipment, encouraging children with VI to have autonomous control is paramount. For example, equipment which encourages engagement with movements and actions of the user and responds directly will capture the child's attention and therefore promote learning (Zajadacz & Lubarsky, 2020). A specific example of this could include direct haptic feedback such as a sensory path, whereby the equipment vibrates based on direct touch or movement. Additionally, autonomous control can encourage children with VI to develop independence and gradually gain confidence in social contexts (McElligott & Van Leeuwen, 2004). The attainment of this confidence, as facilitated by the interactive adapted equipment, will increase social inclusion based on the premise of shared experiences when using the equipment (McElligott & Van Leeuwen, 2004).

Wide textured pathways within the playground

The development of spatial orientation skills enables children with VI to become more explorative, as they recognise the different spaces they are in when they have approached a certain area. This encourages mental mind mapping as they adapt to the environment appropriately through varied contextual experiences (Tzvetkova-Arsova & Zappaterra, 2016). Within the layout of the playground, adequate space, wide pathways, and

textured grounds can be used to help differentiate between play spaces. Wide pathways also allow others to jointly use the space, while children with VI move at their own pace to familiarise themselves with the layout of the playground. Such functions can support children with VI to independently orientate and navigate around a playground.

Sensory based integration elements

Sensory based integration elements are key within playgrounds. Albert (2017) found such elements encouraged children to develop their five senses in multi-sensory stimulus activities. In the case of children with VI, senses other than vision become the focal point in understanding their surroundings. The sense of hearing and touch become key domains for O&M. Accessible playgrounds should incorporate sensory markers such as maps and braille signage at different play sections to encourage the involvement of children with VI. Inclusion of tactile activities which rely on touch can stimulate play through sensory wall panels, interactive maze, sandpit, roller tables, water tables and enclosed structures with windows and doors. Verner et al. (2020) reported that such activities showcased inclusive practices as children with VI explored recognisable objects, while touching various materials and becoming involved in symbolic play with other peers with encouragement.

Sensory-based activities can also offer tactile and auditory elements such as musical instruments. Children can "play" the instrument with their hands or with a provided prop (e.g., a stick), to produce various sounds and vibrations to be heard and felt. Music making supports social engagement and inclusion as children share and mutually enjoy the musical experiences through different percussion sounds such as xylophones, drums, pagoda bells and wind chimes. According to Albert (2017) large musical instruments can be strategically located between play structures and swings, as audible landmarks for children with VI, to support O&M around the playground.

Technology

Technology can enhance the playground experience by presenting visual content in a way that is meaningful for planning and playground participation. This includes 3D printing (Holloway, et al. 2018); audio labelling (Holloway, et al. 2018; Coughlan, et al. 2020); and sonification (Brown et al., 2021). For O&M in new places, multi-modal communication can support pre-visit training and confidence building as well as onsite support.

3D printed models are effective in conveying 3D spatial information (Holloway et. al., 2019), as are volumetric symbols (Holloway, et al. 2023), but limited studies exist outside controlled lab environments. Additionally, smartphones and internet technologies can play a crucial role, such as Google Maps for navigating to areas of interest or beacons that can support real-time navigation within smaller spaces by providing more sensitive location awareness, and access to other contextual information about individual locations. However, studies are limited particularly for outdoor settings such as parks and focus primarily on O&M (Parker et al. 2021). Adoption of these technologies for social or physical play presents a significant opportunity.

What is needed?

Universally designed playground features help to ensure that children with VI are provided with ample opportunities for social inclusion, cognitive development, sensory stimulation, access to nature and physical exercise. However, due to the range and complexities of VI, playground developers and manufacturers must be responsive to individual needs, abilities, behaviours and skills of children who are living with VI and their inclusion in shared settings. As highlighted by Metatla, et al. (2020), while these factors are critical to consider, it is also vital to avoid a narrow VI focus that predominantly addresses the needs of this target group. Such a narrow focus could impede the goal of facilitating social interaction between both children with VI and sighted children.

Playground design that includes user consultation is vital. The Australian Early Years Learning Framework (EYLF) (Australian Government Department of Education and Training Children's Education and Care Quality Authority, 2018) encourages active partnerships with children, families, and communities by listening carefully to child and family concerns and discussing diverse perspectives on issues of inclusion, exclusion, fair and unfair behaviour. The EYLF approach should be adopted in all design approaches including playgrounds. By designing a safe, accessible, and stimulating inclusive environment that embodies 'play value' within the architectural design, future planning and development of inclusive playgrounds for typically developing children and children with VI can be achieved. The current authors are working with stakeholder groups to learn from their playground experiences, to incorporate this voice into future design.

Conclusion

It has been over 30 years since the United Nations Convention on the Rights of the Child formalised play as a fundamental human right of all children (United Nations, 1989). The more recent United Nations Convention on the Rights of Persons with Disabilities offers further support for children with disabilities regarding equal access to play (United Nations, 2006). Despite these declarations of human rights, the United Nations has acknowledged that the unique needs, interests and rights of children with disabilities have continued to be overlooked, including those concerning equal access to play opportunities (United Nations 2013). This oversight is troubling given that as reported by Brown et al. (2021), play and the design of accessible playground design has been repeatedly identified in the literature as being integral to children's cognitive, physical and social development, and to their emotional well-being. Inclusive playgrounds support positive peer interactions and social initiation for children living with and without specific needs.

When designing a safe, accessible, and stimulating inclusive playground it is critical to explore beyond accessibility guidelines and consider the importance of 'play value' on age appropriate and ability appropriate levels for children with VI. The play environment that offers a child the most variety of these developmental elements demonstrates the greatest play value (Hyder, 2004). When designing an inclusive playground, it is useful to apply the principles of UD to ensure the engagement and full participation of all children. Further research is clearly needed, by analysing and adapting the structures, materials, instructions, and activities within the physical environment, so that children with VI and their typically developing counterparts can experience higher social inclusion and cognitive development responses in the playground setting.

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