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RESEARCH ARTICLE

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Designing for inclusion in public playgrounds: a scoping review of definitions, and utilization of universal design

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ABSTRACT

Purpose: Public playgrounds afford children and families important opportunities for outdoor play, social participation, and inclusion. Unfortunately, many children and families experience barriers to accessing, using, and being included in public playgrounds. Consequently, Universal Design (UD) is promoted for providing conceptual guidance for designing for inclusion in public playgrounds. However, a lack of research evidence means researchers have engaged in the ongoing interpretation of the UD concept and related non-discriminatory planning and design concepts. Therefore, the aim of this study was to examine how UD, and related concepts, are used in peer-reviewed articles concerning public playgrounds.

Materials and methods: A scoping review was conducted in November 2019, which identified 15 peer-reviewed articles that met the inclusion criteria.

Results: Analysis revealed that the terms UD, inclusive design, accessibility, and usability are all being used to describe non-discriminatory planning and design concepts arbitrarily and without regard for higher or lower order concepts. Two broad interpretations were evident: (a) UD is synonymous with accessibility for some, and (b) UD is a higher-order concept that goes beyond accessibility for others. Nevertheless, findings highlight the utility of UD in underpinning the design of public playgrounds in many developed countries; however, the concept requires further clarity and specificity as it pertains to playground design and more pertinently inclusion in outdoor play.

Conclusions: We argue for further conceptual refinement to consolidate the importance and future application of UD for Play (UDP) in the design of public playgrounds that promote outdoor play, social participation, and inclusion.

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Playground; universal design; inclusive design; accessibility; usability

➤ IMPLICATIONS FOR REHABILITATION

- Most peer-reviewed journal articles reviewed fail to define what is meant by the term Universal Design.
- Of those that do provide a definition, the outcome of inclusion in play, or the application of Universal Design to enable play in public playgrounds was unclear.
- Research to date has mostly focused on related concepts, including accessibility and usability, with less emphasis on Universal Design.
- Recommend a tailored perspective of Universal Design for Play (UDP).

Introduction

Play is formalized as a fundamental human right of all children in article 31 of the United Nations Convention on the Rights of the Child [1]. Though ambiguity exists in terminology, for this paper, play is defined as "any behaviour, activity, or process initiated, controlled and structured by children themselves; it takes place whenever and wherever opportunities arise" [2,para.14c]. Within the play domain, outdoor play, or playing outdoors, is considered a "natural and critical part of a child's healthy development" [3]. Researchers have attributed a myriad of social, emotional, cognitive, and physical benefits for children engaging in outdoor play that is less supervised, less structured, more adventurous, and includes elements of challenge and risk [4–8]. Moreover, outdoor play has also been related to numerous health and wellbeing outcomes; these include positive effects on cardiorespiratory fitness [9] and cardiovascular and metabolic health biomarkers [3], together with overall health [4,10], wellbeing [11], and quality of life in children [12].

Nonetheless, the design of built environments influences people's health, social participation, and attainment of human rights [13]; therefore, the quality and benefits of play are highly susceptible to the environments in which it occurs [2]. Although children's outdoor play takes place in many environments outside [14,15], public playgrounds, the focus of this paper, afford children and families important opportunities for outdoor play, social participation, and inclusion [16–18]. Public playgrounds are generally located in neighbourhoods or at locations that playground

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users drive or take public transportation to [19] and usually contain play equipment and structures with paths to and between equipment [20]. In playgrounds, play is largely unstructured, and consequently, children have opportunities to advance their self-awareness, imagination, risk perception, and identity, as well as develop their motor and social skills [21,22]. The problem, however, is that many children and families are not afforded opportunities to capitalize on the benefits of participating in public playgrounds due to tensions between children's play needs and the formal, managed, play environments typically designed and planned by adults [23]. This may be due to issues relating to impairment, gender, poverty, or race among others [2]. Consequently, many children and their parents' experience physical barriers to access and social barriers to participation [21,24–28], meaning that access to public playgrounds is limited and the play opportunities are not inclusive.

Still, the right to play and access the physical environments (including play environments) is enshrined in article 31 of the United Nations Convention on the Rights of the Child [1] and further supported in article 9 (among others) of the more recent United Nations Convention on the Rights of Persons with Disabilities [29]. Thus, having opportunities to play and access play environments must be afforded to all children and families [30]. Despite these international declarations of human rights, problems in implementing these rights led to the publications of General Comment No. 17 on play and leisure [2] and General Comment No. 2 on accessibility [31]. Both General Comments endorse Universal Design (UD) for providing conceptual guidance for designing environments that are inclusive of all. As such, play researchers internationally have promoted UD for developing and providing public playgrounds that support outdoor play, social participation, and inclusion [14,21,25,26,32,33], to address substantial barriers that both children and their families experience [23,25], and reframe playground design as "the architecture of social participation" [13,34].

Rooted in architecture and environmental design, the term "UD" was initially coined by Ronald L. Mace, an influential architect, product designer, and educator, in 1985 to denote: "a way of designing a building or facility, at little or no extra cost, so that it is both attractive and functional for all people, disabled or not" [35]. One of the most repeatedly cited explanations of the concept of UD is the seven principles (*equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort*, and *size and space for approach and use*), developed in 1997 by the Centre for Universal Design with a group of US architects, product designers, engineers, and environmental design researchers [36], to further elaborate on the concept. In recent years, UD has "acquired global significance and become the orthodoxy of what is presented as the very best of design practice" [37,p.873]. This is emphasized by the inclusion of UD in the United Nations Convention on the Rights of Persons with Disabilities whereby UD is described as "the design of products, environments, programmes, and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" [29,p.3].

Despite such endorsement, Rob Imrie [37], a professor of sociology in the UK that has published widely on issues relating to architecture, urban design, and urban politics, criticized that the inclusion of the term "without" in the definition of UD appears to discount particular and individual-specific design elements or features that may be interpreted as assistive in relation to any type of disability. In this way, Imrie articulated that the UD concept has tensions and contradictions, between, providing designed environments that supposedly cater to all, and, ensuring that such environments are sensitized to users that are not easily met by universal solutions [37]. Moreover, Jim Sandhu [38], a professor in inclusion research in the UK, argued that there was little universality in developing the concept of UD and "not only is the link between demographics, legislation, and economics deficient but there is also an underlying assumption that there is somehow a United Nations of universal design to which all should subscribe" [38,p.44.5]. Additionally, Imrie and Hall [39] argued that UD is too idealistic and does not reflect the political nature of the process of inclusion.

Considering these issues, in 2012, Edward Steinfeld and Jordana Maisel, professors and director (ES) and research director (JM) of the Centre for Inclusive Design and Environmental Access (IDeA) in the US, proposed eight goals of UD (*body fit*, *comfort*, *awareness*, *understanding*, *wellness*, *social integration*, *personalization*, and *appropriateness*) and a refined definition for UD as "a process that enables and empowers a diverse population by improving human performance, health and wellness and social participation" [13]. The refined definition is explicit about the outcomes of UD (i.e., improved health and social participation) and recognizes that inclusion must address the full diversity of the population. Thus, UD as a concept has evolved beyond a focus of removing barriers, to also being about creating the right environmental conditions for inclusion and social participation that consider the breadth of all human abilities and functions.

Before the international endorsement of the concept of UD, a variety of related non-discriminatory planning and design concepts like "barrier-free design", "accessible design", "inclusive design", and "design for all" were prominent across the body of literature on playgrounds [20,21,25,26,32–34,40–48]. The first two concepts precede the UD concept and are associated with negative connotations of designing for a sub-set of the population (i.e., persons with disabilities) [49,50]. According to Ann Heylighen, a professor of design studies in Belgium, and colleagues [51], "inclusive design" and "design for all" concepts are synonymous with UD and noted that despite different places of origin and some semantic distinctions, all concepts share a similar purpose—of recognizing the broad spectrum of human abilities and including as many people as possible. Indeed, the "inclusive design" concept is the preferred concept in the UK [39,51,52]; and in addition to inclusive design, the "design for all" concept has become prevalent in the UK and much of northern and central Europe [49,51,53].

Nonetheless, and despite its critique, the UD concept has been identified as the way forward for best practice in designing for inclusion in playgrounds [2]. As such, the varied use of terminology across research and practice contexts has resulted in difficulties in synthesizing the body of knowledge for UD, and subsequently barriers to translating it into evidence-informed playground design. Therefore, there is a need for a comprehensive examination of how UD, and related non-discriminatory planning and design concepts, are represented in peer-reviewed articles with a view to better understanding how these design concepts contribute to the design of public playgrounds that support outdoor play, social participation, and inclusion. Hence, the aim of this study was to conduct a scoping review to carefully examine how UD, and related non-discriminatory planning and design concepts, are used in peer-reviewed articles concerning designing for outdoor play, social participation, and inclusion in public playgrounds.

Materials and methods

Based on the study aim, a scoping review was determined to be the most appropriate method. The aim was too broad to address *via* a traditional systematic review (and meta-analysis) and could be more appropriately answered through mapping the extent, range, and nature of a body of peer-reviewed literature, summarizing and disseminating research findings to date, and identifying research gaps in this area; all of which are common scoping review purposes [54,55].

To ensure robustness, the methodology for this scoping review was based on an established framework outlined by Arksey and O'Malley [54] and ensuing recommendations made by the Joanna Briggs Institute [55] and other researchers [56]. The framework includes the following phases: (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarizing, and reporting the results, described below with specific reference to their application to this study. The non-compulsory "consultation exercise" of the framework was not performed.

Phase 1: identifying the research question

This review was guided by the following questions:

1. How is UD, and related non-discriminatory planning and design concepts, used in peer-reviewed journal articles concerning designing for outdoor play, social participation, and inclusion in public playgrounds?
2. By whom, and for what purpose, is UD, and related non-discriminatory planning and design concepts, used in peer-reviewed journal articles concerning designing for outdoor play, social participation, and inclusion in public playgrounds?

Phase 2: identifying relevant studies

Following consultation with an expert librarian, the search was implemented in November 2019. We identified relevant studies by searching eleven electronic databases (full list of databases searched can be found in Table 1) and hand-searching reference lists of key studies.

Databases were searched for titles that contained at least one "playground" term as well as at least one "non-discriminatory planning and design concepts for built environments" (a full list of search terms can be found in Table 1). Appropriate Boolean operators were used to account for search term variations and maximize searches. This database search generated 117 potentially eligible studies after duplicates were removed. At this stage, the reference lists of identified studies were hand-searched to identify additional literature. This hand search yielded a further 41 studies.

The database search was designed to be as comprehensive as possible with the available resources. Specifically, no limits on a date or geographic location were placed on the database search; however, articles needed to be written in English, published in peer-reviewed journals, and available in full text (a full list of inclusion and exclusion criteria can be found in Table 1). Therefore, it is important to note that these limits result in omitting the greater body of evidence that potentially exists on this topic.

Table 1. Electronic databases, search terms, and criteria for inclusion.

Electronic databases	Academic Search Complete, CINAHL, Education, ERIC, MEDLINE, PsycINFO, SocINDEX, SPORTDiscus, Scopus, Web of Science, PubMed
Search terms	Playground terms (playground* OR "play space*" OR playspace* OR "outdoor play space*" OR "outdoor play environment*") Non-discriminatory planning and design terms (universal* design* OR "barrier free design*" OR "design* for all" OR "building* for everyone" OR "access* design" OR "inclus* design*" OR "architect* access*")
Criteria for inclusion	Written in English; Focussed on public playgrounds intended for public use; Focussed on non-discriminatory planning and design processes for built environments with the aim of promoting inclusion; Published in peer-reviewed journals; Available in full-text.

Phase 3: study selection

All identified studies were uploaded to EndNote X9 (2019) reference management software. All three authors independently screened titles and abstracts. After removal of duplicates and exclusion of studies based on title and abstract, 62 studies proceeded to full-text review. Full-text level reviewing was carried out by two independent researchers [A.M. and H.L.] corresponding with the inclusion criteria. The additional validation process was then conducted, where all included studies, and one-fifth of the excluded studies were randomly selected and reviewed by a third researcher [B.B.]. See Figure 1 for Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [57] study selection flowchart.

Phase 4: charting the data

Data were extracted into a specifically designed Excel spreadsheet for charting the data. Where available, the data charted included: reference and country, year of publication, author(s) discipline(s), terminology, and definition/description of terminology used (see Table 3). All data were then critically analyzed *via* thematic analysis [58].

Phase 5: collating, summarizing, and reporting the results

To address our research question and maximize relevance for policymakers, practitioners, researchers, and other relevant stakeholders, findings of this scoping review were reported in two ways: (1) through a descriptive numerical analysis of the evidence characteristics, and (2) through a narrative summary of the evidence base.

Methodological limitations

Measures were embedded throughout this study's design to ensure the findings are rigorous and credible. Nevertheless, there are some acknowledged limitations. Specifically, the selection of peer-reviewed journal articles, published in English, as the primary source of the review means that the data for analysis is limited by these factors. The authors acknowledge that conference proceedings, grey literature, and literature published in other languages would contribute more expansively to the debate than is possible to do here. However, to echo Heylighen et al.'s [51] observation, the innate diversity within the concept of UD presents challenges to anyone seeking to obtain a comprehensive overview. Moreover, the use of electronic databases to search for evidence may have omitted a greater diversity of evidence as UD, and related concepts, are not typically used in the subject headings and classifications of electronic databases [59].

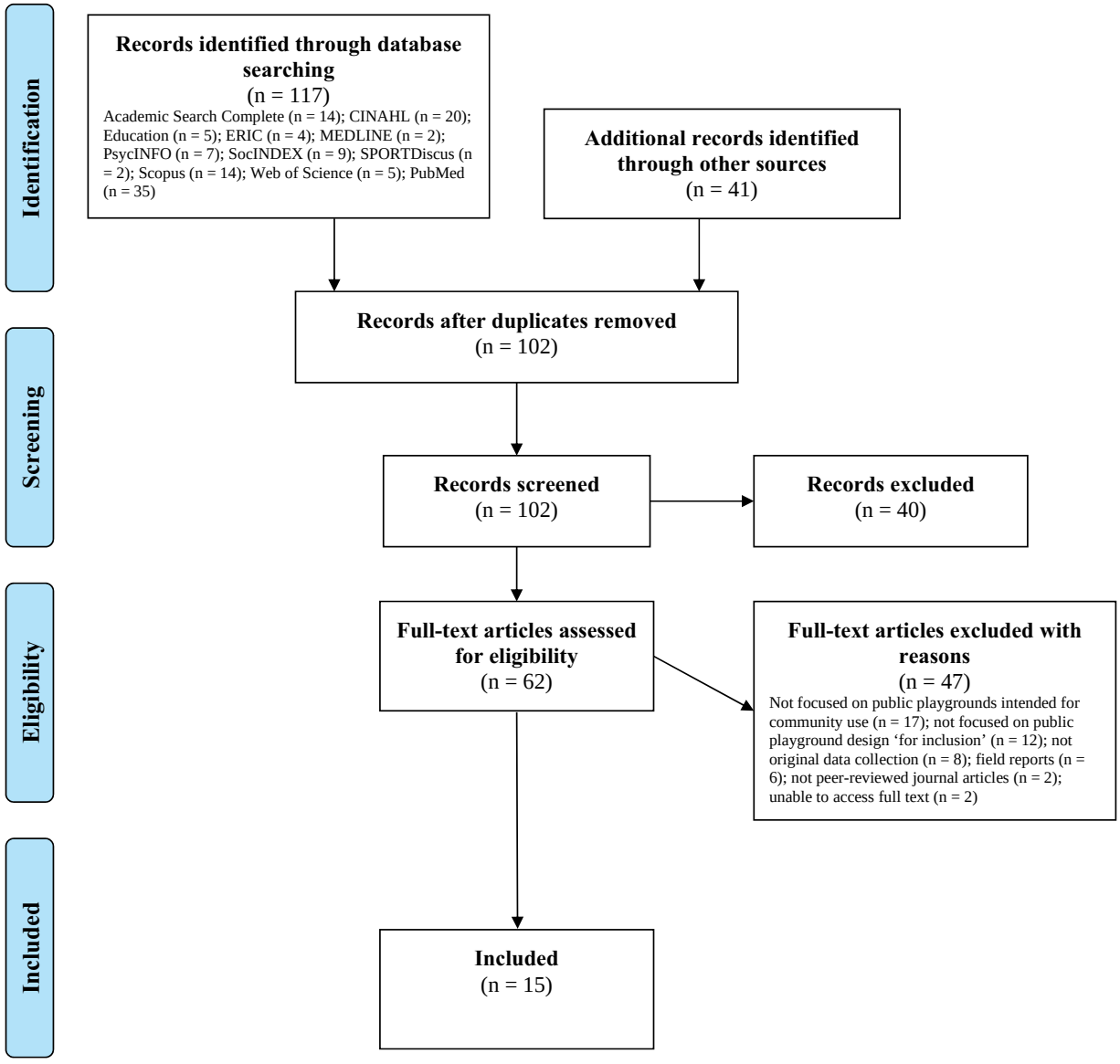


Figure 1. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) [57] study selection flowchart.The PRISMA flow diagram maps out the number of records identified, included and excluded, and the reasons for exclusion.

Results

A final sample of 15 peer-reviewed journal articles published between 1999 and 2019 met the inclusion criteria for this scoping review, with twelve of the articles identified published in the past 10 years (see Figure 2).

Descriptive numerical analysis of evidence characteristics

As shown in Table 3, the sample of peer-reviewed journal articles in this review ($n = 15$) is varied regarding disciplinary backgrounds and the ways in which UD, and related non-discriminatory planning and design concepts, are used.

Articles in this review originated from several developed countries, from northern and southern hemispheres, across continents of Asia, Australia, North America, and Europe, namely, Sweden ($n = 4$, 27%), US ($n = 4$, 27%), Ireland ($n = 2$, 13%), Turkey ($n = 2$, 13%), Canada ($n = 1$, 7%), Australia ($n = 1$, 7%), and New Zealand ($n = 1$, 7%) (see Table 2). While built environment disciplines, such as architecture, planning, and landscaping were present within this literature ($n = 5$, 33%), health disciplines made the most significant contribution ($n = 10$, 67%). Early childhood education scholars were also present ($n = 2$, 13%) (see Table 3). Given the dominant presence of health disciplines, it is perhaps unsurprising then that most of the 15 peer-reviewed journal articles were published in health and medical science peer-reviewed journals ($n = 9$, 60%), including Occupational Therapy ($n = 5$, 56%) and disability studies ($n = 4$, 44%). The remaining six peer-reviewed journal articles were published in architecture, urban environment, and environmental sciences ($n = 3$, 20%) and social sciences ($n = 3$, 20%).

All 15 peer-reviewed journal articles included in this review examined the connection between inclusion and design in public playgrounds. A combination of single method approaches [21,28,40,43,44,46–48,60,61], and mixed methods approaches [18,24,27,34,62] were employed; however, a common approach across the included peer-reviewed journal articles was to employ qualitative methods to examine users' perspectives [18,24,27,28,43,46,47], or review the built environments [18,60–62]. Nonetheless, the discourse around UD and related non-

Table 3. Terms and definitions used in included peer reviewed articles.

Reference and country	Year	Author discipline(s)	Terminology					Definition/description of terminology used				
			Inclusion	Accessibility	Usability	Inclusive Design	UD	Inclusion	Accessibility	Usability	Inclusive design	UD
Ayatac and Pola [61], Turkey	2016	Architecture; LA	•	•	•	•		ND	Inclusive spaces are all accessible; however, from time-to-time accessible spaces fail to possess the characteristics of an inclusive space.	ND	Inclusive design refers to the process in order to design products and environments that can be used by as many individuals as possible in as many occasions as possible [71].	
Fernelius and Christensen [48], US	2017	LA; Environmental Planning	•	•	•	•	•	Inclusion on the playground refers to creating an environment where all children have equal access and opportunity to engage in play as well as social interactions [65].	A playground that has as few physical barriers as possible, providing the opportunity for children of all abilities to physically approach the playground components, is deemed "accessible".	ND	An inclusive environment is designed to promote participation in the social aspects of play as well as physical access to the playground components.	ND
Lynch et al. [34], Ireland	2018	OT	•	•	•	•	•	ND	ND	ND	ND	UD is underpinned by seven principles [36] that aim to examine existing designs, guide the design process and act as a source of information on designing more usable products and environments.
Moore and Lynch [40], Ireland	2015	OT	•	•	•		•	ND	Accessibility can be defined as the encounter between the functional capacity of the individual and the demands of the physical environment [63]. Accessibility also refers to compliance with official guidelines [63].	Usability refers to the ability to access and use the environment on equal terms with others [63]. Usability does not focus on official standards and guidelines [63].		ND
Olsen and Dieser [60], US	2012	Health, Physical Education and Leisure	•	•	•	•	•	ND	ND	ND	ND	ND
Perry et al. [62], New Zealand	2018	Physiotherapy	•	•	•			ND	Accessibility is defined as, the encounter between the person's or group's functional capacity and the design and demands of the physical environment [63].	Usability is defined as, "a measure of effectiveness, efficiency, and satisfaction" using a given facility or service [63].		
Prellwitz and Skär [21], Sweden	2007	OT; Nursing	•	•	•		•	ND	ND	The concept of usability implies that a person		UD supports the need for usability by

(*continued*)

Table 3. Continued.

Reference and country	Year	Author discipline(s)	Terminology					Definition/description of terminology used				
			Inclusion	Accessibility	Usability	Inclusive Design	UD	Inclusion	Accessibility	Usability	Inclusive design	UD
										should be able to move around, be in and use the environment on equal terms with others [63,72,73].		designing products and environments that are usable by all people without specialized design.
Prellwitz and Skär [28], Sweden	2016	OT; Nursing		•			•		An accessible playground should offer an opportunity for play, the possibility to participate with other children, and a way for parents and children to be involved in shaping their community.			The aim of UD is to promote equal rights and opportunities for all. UD also promotes the understanding that people are different, and environments should afford different opportunities and solutions; the main goal is participation and inclusion [74,75].
Prellwitz and Tamm [43], Sweden	1999	OT; Psychology		•					ND			
Prellwitz et al. [44], Sweden	2001	OT; Psychology; Sociology		•					ND			
Ripat and Becker [24], Canada	2012	OT	•	•		•	•	ND	Accessible playgrounds have been suggested as a means of providing children with disabilities independence, easy access to play, and a safe, challenging, and fun environment by providing a play area in which typically developing children and children with disabilities can socialize, play, and learn together [76,77].	Application of this concept suggests that children should be able not only to access a space but also to use the play space in the same way as other children [63].		UD is a specific design approach that promotes accessibility for all individuals, regardless of ability [63].
Stanton-Chapman and Schmidt [46], US	2016	Early Childhood Education and Human Development; Owner and CEO of a playground installation company	•	•			•	ND	ND			… Go beyond what is minimally required by law and focus instead on meeting the principles of UD where every child, regardless of ability or disability, is welcomed and benefits physically,

(*continued*)

Table 3. Continued.

Reference and country	Year	Author discipline(s)	Terminology					Definition/description of terminology used				
			Inclusion	Accessibility	Usability	Inclusive Design	UD	Inclusion	Accessibility	Usability	Inclusive design	UD
Stanton-Chapman and Schmidt [47], US	2017	Early Childhood Education; Owner and CEO of a playground installation company		•		•	•		ND		ND	ND
Sterman et al. [27], Australia	2019	OT; Exercise Science	•	•				ND	ND			
Talay et al. [18], Turkey	2010	LA	•	•	•	•		ND	ND	ND	ND	

ND: not defined; UD: universal design; LA: landscape architecture; OT: occupational therapy.

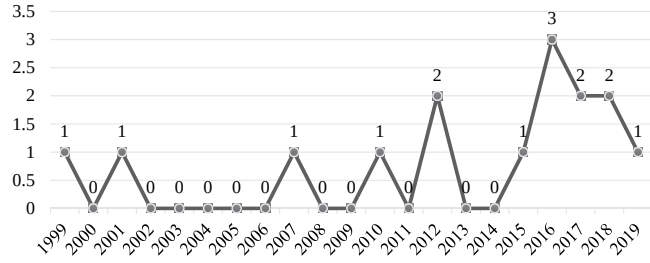


Figure 2. Number of publications in the review period ($n = 15$).The line graph plots the number of articles in each year of the review period.

Table 2. Geographical location of studies.

Geographical location	References
Europe	
Sweden	[21,28,43,44]
Ireland	[34,40]
Turkey	[18,61]
US	[46,47,48,60]
Canada	[24]
Australia	[27]
New Zealand	[62]

discriminatory planning and design concepts in the articles was generally driven by description, discussion, and commentary, rather than empirical approaches; specifically, no articles addressed the outcomes of design, to examine effectiveness. The specific intricacies relating to study populations, study design, and findings pertaining to design considerations for public playgrounds that facilitate/hinder outdoor play, social participation, and inclusion are beyond the scope of this paper and reported elsewhere [25].

Multiple terms were used to describe UD and related non-discriminatory planning and design concepts, generating a degree of inconsistency and confusion. The terms utilized across the peer-reviewed journal articles included in this review were: accessibility ($n = 15$, 100%), usability ($n = 9$, 60%), UD ($n = 9$, 60%), and inclusive design ($n = 6$, 40%) (see Table 3). Thus, research to date has mostly focussed on non-discriminatory planning and design concepts that consist of inter-related concepts, including accessibility and usability, with less emphasis on UD.

Despite multiple terms being used to describe UD and related non-discriminatory planning and design concepts, observable disciplinary patterns were noted among the 15 peer-reviewed journal articles included. For example, authors from health science disciplines frequently cited Iwarsson and Stahl's [63] definition of accessibility and/or usability [21,24,40,62]. Similarly, authors from health science disciplines commonly defined what was meant by UD [21,24,28,34]. Also, authors from built environment disciplines regularly used the term inclusive design [18,48,61] (see Table 3).

Narrative summary of main results

Three themes were identified *via* thematic analysis. The first theme describes definitions, interpretations, and utilization of UD as it relates to public playgrounds. The second theme addresses related design concepts used to describe the concept of designing for outdoor play and social participation in public playgrounds. The third theme reflects the core concept of inclusion that underpinned all peer-reviewed journal articles irrespective of what design concept was adopted.

Theme 1: definitions, goals, and principles of UD as it relates to public playgrounds

Although all 15 peer-reviewed journal articles addressed outdoor play and inclusion, UD was not the dominant design concept for public playground design. Specifically, accessibility and usability were more frequent terms used, with only nine of the peer-reviewed journal articles that originated from Sweden, US, Ireland, and Canada, referring to UD as the concept or guiding framework for playground design. The remaining six peer-reviewed journal articles that did not explicitly include a focus on UD were still included in the study because the studies referred to related terms (inclusive design, accessibility, and usability), consistent with supporting outdoor play, social participation, and inclusion in public playgrounds, as envisioned by the proponents of UD (Table 3).

When UD was used, authors seldom defined what was meant. Of the nine peer-reviewed journal articles that referred to UD, only five provided definitions of UD (see Table 3). For those that did define what was meant, it was primarily health and education professionals; in essence, they included descriptive definitions of UD as a concept or guiding framework for playground design. However, the outcome of inclusion in play, or the application of UD to enable outdoor play, social participation, and inclusion in public playgrounds was not clearly established. Instead, explicit reference was made to the aims/goals of UD and its importance in catering for diversity and providing equal opportunities for all [21,24,28,34,46].

The aims/goals referenced included promoting usability [21,34], supporting participation and inclusion [28,46], promoting equal rights and opportunities for all [28], promoting accessibility [24], as well as understanding that people are different, and environments should afford different opportunities and solutions [28]. Despite many aims/goals being articulated, only one article [34] made explicit reference to the eight goals of UD [13]. No studies had a goal relating to play, although one study recognized the need to consider play value principles alongside UD principles to maximize the possible partnership of UD and play value [34]. In this instance play value referred to fun and engaging environments that promoted outdoor play, social participation, and inclusion.

Moreover, and despite referring to many of the underlying philosophies and goals of UD, only two peer-reviewed journal articles [34,46] referred to the commonly accepted seven principles of UD [36]. One peer-reviewed journal article described the UD principles as going beyond what is minimally required by law so that all children are welcomed in the playground and benefit physically, developmentally, and socially [46]. In contrast, the other peer-reviewed journal article described the seven principles of UD as a point of reference to examine existing designs, guide the design process and act as a source of information on designing more usable products and environments [34], and further tailored the UD principles to include play as a central concern as a way of exploring the potential application of UD in designing for outdoor play, social participation, and inclusion in public playgrounds. The rationale for adapting the UD principles was based on the challenge of using these principles from a play value perspective, whereby ensuring a design is simple and intuitive for example, may limit the play value for many children.

Rather than focussing on UD, authors from architecture/planning backgrounds instead referred to "inclusive design" [48,61], using the term synonymously with UD hence the emergence of theme 2, presented next.

Theme 2: related design concepts used to describe the concept of designing for outdoor play and social participation in public playgrounds

Where UD was not used, related concepts were evident, with many authors referring to inclusive design, accessibility, and usability, consistent with supporting outdoor play, social participation, and inclusion in public playgrounds. These related concepts were evident across all 15 peer-reviewed journal articles, with many referring to the term's accessibility and usability (see Table 3). While inclusive design was used synonymously with UD, no studies utilized the five principles of inclusive design as promoted by the Commission for Architecture and the Built Environment (CABE) [64].

Whereas all studies considered accessibility as a basic issue, only six peer-reviewed journal articles provided definitions of accessibility for their studies (see Table 3). From the six definitions that were provided, four peer-reviewed journal articles focussed on accessibility as it related to the physical environment [40,48,61,62]. Accessibility has traditionally been associated with compliance with official guidelines for ensuring the built environment is designed to be accessible for all users, including those who use wheelchairs, or mobility aids [63]. However, two peer-reviewed journal articles focussed on physical accessibility as it related to the social environment [24,28], pointing to the issue of physical accessibility being fundamental for accessing the social environment.

Additionally, nine peer-reviewed journal articles referred to the usability (see Table 3). Unlike accessibility, usability does not focus on compliance with official guidelines; instead, usability refers to being able to access and use the environment on equal terms with others and thus gets closer to the end goal of inclusion [63]. This finding was supported in the definitions provided; usability was conceptualized as a design whereby children could not only access the playground but also use the playground in the same way as other children [21,24,40]. Thus, the importance of what children could do in the playground (i.e., play) was prioritized. Moreover, the same studies introduced concepts, such as equity. A further study referred to usability as a measure of effectiveness, efficiency, and satisfaction [62], pointing to the subjective nature of usability.

Theme 3: inclusion and public playgrounds

The third theme reflects the core concept of inclusion that underpinned all 15 peer-reviewed journal articles irrespective of what design concept was adopted. Specifically, inclusion was identified as a common goal or priority for public playgrounds across peer-reviewed journal articles that used and did not use UD as the guiding concept. Yet, few studies articulated what was meant by inclusion.

While eleven of the included peer-reviewed journal articles referred specifically to the term inclusion (Table 3), only one peer-reviewed journal article defined inclusion [48]. Drawing on the definition proposed by Mejeur and colleagues [65], Fernelius and Christiansen [48] defined inclusion on the playground as an environment whereby all children have equal access and opportunity to engage in both play and social interactions. From this definition, inclusion was conceptualized as providing equal opportunities for all children to participate in both the physical and social environments of the playground. While inclusion from this definition referred to all children in terms of age, gender, ability, etc., it did not include intergenerational inclusion. Similarly, the remaining ten peer-reviewed journal articles that referred specifically to the term inclusion articulated inclusion primarily as providing

equal opportunities for children to participate in both the physical and social environments of the playground. Specifically, four peer-reviewed journal articles conceptualized inclusion as promoting equal opportunities for all [21,34,40,46], one peer-reviewed journal article conceptualized inclusion as providing a space whereby all children could play together and feel included [61], and one peer-reviewed journal article conceptualized inclusion as promoting usability [24].

The fact that only four peer-reviewed journal articles conceptualized inclusion as promoting equal opportunities for all is a worrisome finding given that play is an unconditional and absolute right, as laid down in the United Nations Convention on the Rights of the Child [1]. Moreover, three peer-reviewed journal articles conceptualized inclusion as providing for children with disabilities, namely, promoting accessibility [60] and including children with disabilities [18,27]. However, demarcation towards one group (i.e., children with disabilities), results in segregation and stigmatization as opposed to promoting inclusion. One further peer-reviewed journal article referred to inclusion in the context of fencing in a playground when discussing park and playground users that may wander or run [62]. In this way, inclusion was considered in terms of safety, and thus adds a further dimension to inclusion as it pertains to play and play environments.

Discussion

Summary of principal results

The aim of this scoping review was to comprehensively examine theoretical concepts that inform our understanding of designing for inclusion in public playgrounds, and to examine how the concept of UD is being applied, by whom, and for what purpose. Across the 15 peer-reviewed journal articles identified for this review, findings demonstrate that the discourses around UD and public playground design are diverse and unclear, as the terms UD, inclusive design, accessibility, and usability are all being used arbitrarily. Also evident was the lack of regard for higher or lower order concepts, which has potentially led to further inconsistency and confusion. Thus, the multiple terms, and usage of concepts arbitrarily, shows the youth of the approaches and the need for further development and research to acquire some common understanding.

Moreover, much of the discourse reviewed here focussed on making public playgrounds accessible to meet the needs of sections of the population (i.e., persons with disabilities), leading to an incomplete representation of UD, and subsequently what children could do in the playground (i.e., play) was not prioritized. Specifically, two broad interpretations were evident: (a) UD is synonymous with accessibility for some authors, and (b) UD is a higher-order concept that goes beyond accessibility for others. It is important to confirm that accessibility is considered an essential dimension of UD and provides a critical contribution to supporting participation in public playgrounds for segments of society that are often overlooked (e.g., children with motor and physical disabilities and their families). However, addressing accessibility factors alone provides a solution that falls short of the ambition to provide equity of play experience and social participation as envisioned by proponents of UD [46,47]. The outcome of inclusion is therefore not achieved when accessibility alone is addressed, and children and their families are still excluded on playgrounds as has been noted elsewhere [26,41].

Consequently, from the data analysis of these 15 peer-reviewed journal articles, the interchangeable use of concepts, such as accessibility, usability, and inclusion represents a discourse that lacks congruency. This may be due to the diverse disciplines involved, which have been shaped by different theoretical influences. Nonetheless, while the concept of designing for inclusion was indeed a common goal across all 15 included peer-reviewed journal articles, the vision of, and means to achieve inclusion clearly lack consistency in terms of theoretical grounding. If UD is to take its place as the endorsed solution for enabling inclusion in designing for all, more efforts are required to embed and advance the theory of inclusion, with the vision and concepts of UD, among diverse disciplines and stakeholders who are involved in research and provision for play in public playgrounds.

Despite this limited understanding, findings highlight that UD as a higher-order concept that goes beyond accessibility has utility for underpinning the design of public playgrounds in several developed countries, namely, Sweden, US, Ireland, and Canada. In each case, UD served to guide the study of play in playgrounds, from a more robust theoretical approach to inclusion, that considered the provision of equal opportunities alongside diversity among child population, and according to how the design enhanced play value, based on principles of equity of experience, social participation, and belonging. However, few peer-reviewed journal articles articulated what this means for public playground design and had not researched the impact or outcome of using UD concepts in design. Thus, we cannot yet determine whether UD can provide equity of play experience and social participation if we do not fully understand the application or cannot clearly define the concept as it relates to public playgrounds.

Fundamentally, a significant challenge identified included a lack of a comprehensive definition of what an inclusive playground is or should be. Inclusive playgrounds were primarily examined as spaces designed to support the inclusion of children with disabilities, with little regard for what inclusion is or how best to support the participation of all public playground patrons. For example, no studies addressed inclusion as an intergenerational issue although playgrounds have been identified as sites for intergenerational use [34,66]. Therefore, the question persists; if a lack of consensus continues as to what constitutes an inclusive playground, how can UD contribute to the realization of public playgrounds that provide equity of play experience and social participation? Unless a clear definition of inclusive playgrounds is established, it is difficult to progress knowledge on how then to design playgrounds that are inclusive for all.

Comparison with literature and plausible explanations for results

Our principal results support an observation by Jane Bringolf [67], Chair of the Centre for Universal Design Australia, that a lack of understanding of the UD concept has allowed the terms "accessibility" and "disability" to inhabit the language of UD meaning that UD is bounded by such concepts, and thus, progress towards the design of environments that benefit everyone is hindered. Therefore, it is perhaps unsurprising that the primary focus on accessibility and disability issues in these peer-reviewed journal articles neglects the needs of other diverse user groups of children who may have a comparable need for inclusion, albeit with a different range of needs [2]. For example, children from diverse cultural and family backgrounds and those from socioeconomically disadvantaged environments require play and social participation experiences where segregation and stigmatization are not perpetuated in public playgrounds. Thus, accessibility as a concept that facilitates physical participation, particularly for

persons with disabilities, does not achieve the same outcome as UD, i.e., inclusion.

Nevertheless, Valerie Watchorn and colleagues [59] recently asserted that while much of the current discourse on UD and the built environment focuses on the person and the environment, much less attention has been directed towards what people do in built environments (e.g., play in public playgrounds). To address this gap, play researchers have begun to focus their efforts on how to design for play in public playgrounds, as it is through play that inclusion occurs. However, efforts to date have confirmed that designing for inclusion in public playgrounds is especially complex when considering the need to design for play [14,25,34]. Specifically, play researchers have identified that the current iteration of the seven principles of UD is not fit for purpose when considering the need to provide for play and support progressive levels of play challenge. For example, if a playground component needs to be simple and intuitive, according to UD principles, how can this support challenge which is a core feature of play value [14,34,42]. Thus, it is perhaps unsurprising that researchers have called for further interdisciplinary research that examines UD and considers how the principles of UD can be tailored to include play as a central concern as it relates to playgrounds [25,34]. Importantly, this has been hampered due to the inconstancies of approaches used across disciples and highlights the importance of this review to try and illuminate the issues arising, and rally researchers to strengthen insights and consensus.

Our suggestion to further enhance understanding of how UD can be utilized as a means to enhance play in public playground design is to learn from how UD has been tailored for learning approaches aiming to meet the needs of all students (Universal Design for Learning/UDL) [68], UD also needs to be tailored for play to meet the needs of all children (Universal Design for Play/UDP). While some efforts have been made by occupational scientists and therapists to tailor the principles of UD to include play as a central concern [34,41,42], further refinement through research and validation from a range of disciplines and investigations are required to enhance the clarity with which equity of play experience and social participation is defined, understood, and ultimately applied in strategic planning for public playgrounds.

Future research and implications

Our findings show an increasing interest in non-discriminatory planning and design concepts for public playground design, with 12 of the peer-reviewed journal articles identified published in the past 10 years. Nevertheless, while a range of disciplines and perspectives are evident in the body of knowledge presented, the discourse is notably from several developed countries, with more than half of the articles originating in European countries which raises the question of representation. Therefore, future research efforts need to address this knowledge gap, and carefully examine how UD, and related non-discriminatory planning and design concepts, are used in studies from the global south as well as the global north concerning designing for outdoor play, social participation, and inclusion in public playgrounds. Moreover, it is acknowledged that this review was completed in 2019; thus, the inclusion of newer research to capture the greater body of evidence would be of benefit in future research efforts.

Nonetheless, the findings of this research are timely as more and more efforts to disseminate the importance of UD for public playground design are materializing in various formats. Certainly, several international and national initiatives promote UD for public playground design. Internationally, the UN Convention on the Rights of Persons with Disabilities [29], General Comment No. 17 [2], and General Comment No. 2 [31], all endorse UD. In Europe, European Standard EN 17210:2021 *Accessibility and usability of the built environment – Functional requirements* [69] endorses UD for public playground design. It unequivocally states that "universally designed playgrounds, considering also the requirements of all children regardless of size or ability, provide more opportunities for all children to play, and for social integration" [69,p.255]. Also in Ireland, the context in which this study was undertaken, the new Community Participation Bill 2019 [70] specifically requires local authorities to build inclusive public playgrounds and promotes the concept of UD as a way of exceeding minimum accessibility standards. It articulates the need "apply the principles of universal design to the provision of playgrounds and play equipment to maximize the range of play opportunities available to all children" [70,p.3]. Furthermore, initiatives by the Centre for Excellence in Universal Design at the National Disability Authority in Ireland, such as funding projects that explore UD and public playground design [41], continue to ensure that there is a growing awareness of, and demand for, inclusive public playgrounds.

Conclusion

The recent discourse around UD and public playground design in peer-reviewed journal articles indicate that the terms UD, inclusive design, accessibility, and usability are all being used arbitrarily and without regard for higher (goes beyond accessibility) or lower order (focuses solely on accessibility) concepts, which has potentially led to inconsistency and confusion. Still, the core concept of inclusion underpinned all 15 included peer-reviewed journal articles, irrespective of what design concept was adopted; therefore, given that achieving inclusion is a defining feature of UD, it merits consideration for underpinning the design of public playgrounds.

Even so, the UD concept is widely endorsed, and an assumption is being made that UD translates into practice by its endorsement. However, there is a need for further development and research to acquire some common understanding of its relationship with inclusion in public playgrounds. It is evident from this review that UD, as it relates to public playgrounds, is in its early stages of maturity, given that only 15 peer-reviewed journal articles met the inclusion criteria for this review. Therefore, what is missing is the nuances and intricacies of research that supports its position as a concept that achieves inclusion.

Moreover, the discourse reviewed here also reflects a dominance of accessibility factors over considerations of what people do in these spaces (i.e., play participation). If UD is intended as a means of going beyond designing for access, addressing accessibility factors alone provides a solution that falls short of the ambition to provide equity of play experience and social participation as envisioned by proponents of UD [49,50]. Therefore, to reach its stated goals, UD must be more inclusive of play as a central concern for public playground design.

Enlarging the discourse on UD to include play as a central concern, multi- and trans-disciplinary collaboration (within and outside the professional realm), and multicultural perspectives (from the global south as well as global north), will enhance the clarity with which UD is defined, understood, and ultimately applied in strategic planning for public playgrounds, from a UD for Play (UDP) perspective. Balancing this call for expansion, and echoing the recommendation set forth by Watchorn and colleagues [59] is

for the consistent use of "universal design" as a strategy to manage and promote the synthesis of a more diverse discourse accessible to all stakeholders.

Ethical approval

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